

ACCIDENT

Aircraft Type and Registration:	1) Cirrus SR20, G-GCDC 2) Piper PA-38-112 Tomahawk, G-BLWP
No & Type of Engines:	1) 1 Teledyne Continental IO-360-ES piston engine 2) 1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1) 2008 (Serial no: 2008) 2) 1978 (Serial no: 38-78A0367)
Date & Time (UTC):	20 January 2016 at 1419 hrs
Location:	Runway 10, Swansea Airport
Type of Flight:	1) Private
Persons on Board:	1) Crew - 1 Passengers - 2 2) Crew - None Passengers - None
Injuries:	1) Crew - None Passengers - None 2) Crew - N/A Passengers - N/A
Nature of Damage:	1) G-GCDC - Propeller, left and right wings, main landing gear, left elevator, nosewheel detached, and engine shock-loaded 2) G-BLWP - Right wing
Commander's Licence:	Private Pilot's Licence
Commander's Age:	66 years
Commander's Flying Experience:	641 hours (of which 70 were on type) Last 90 days - 2 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further inquiries by the AAIB

Synopsis

During pre-flight checks, the pilot realised that he had inadvertently engaged the autopilot with the corner of his kneeboard. After correcting this, he performed a number of touch-and-go landings. During the final touch-and-go, the aircraft lost control and deviated to the left of the runway, eventually impacting a parked aircraft. The reason for the accident could not be established but is considered likely to be a combination of the gusting wind from the right, a bounced landing and wingtip strike, the effect of applying full power during the touch-and-go and the possibility of inadvertent autopilot engagement.

History of the flight

The pilot planned to perform circuits at Swansea Airport along with a short local flight. He reported performing the usual pre-flight checks which are listed on one of the aircraft's digital displays. One of these is a check of the aircraft's electric trim which was found to be "abnormal". The pilot reported that the trim was "lethargic and resistant to my commands from the 'Cooley hat'¹ trim controller" and that the correct takeoff trim could not be set.

During troubleshooting, the pilot pressed the autopilot disconnect button and the disconnection warning sounded. Further investigation revealed that the pilot's kneeboard, which was strapped to his right leg, had inadvertently nudged the autopilot control panel and engaged the autopilot HDG (heading) mode (see Figure 1). This came as a surprise to the pilot as it was the first time he had experienced this issue with his kneeboard after "dozens of flights in this aircraft". He repeated the action and demonstrated it to his passengers on three further occasions.



Figure 1

G-GCDC pilot's kneeboard showing proximity to autopilot control panel

After moving the kneeboard further up his leg, the pilot considered that the issue had been resolved and continued with his flight preparations.

The aircraft took off at 1329 hrs for a flight over the west of the Gower Peninsula and then returned to the airfield to perform three touch-and-go landings. This was followed by a local flight over Swansea before returning to the airfield for another planned touch-and-go on Runway 10. The pilot reported that the weather was hazy, slightly grey and damp with

Footnote

¹ The term Cooley hat refers to a conical trim button located on top of the control yoke.

10 km visibility and no significant cloud cover, with wind from 100° to 120° at 10 kt, gusting to 16 kt. He described his approach as “routine” achieving an “acceptable rate of descent” using 100% flap and a speed of 78 KIAS.

As the aircraft overflew the runway numbers, the pilot reduced the rate of descent to deliberately avoid being on the ground at the intersection with Runway 04/22 (See Figure 2); there are some reported ridges at this point which have caused bounced landings in the past. As the pilot waited for the aircraft to touch down, he noted a slow drift to the left side of the runway which was assumed to be caused by gusting wind from the right. The aircraft then rolled to the left allowing the left wheel to contact the runway and the aircraft to bounce. The pilot was unaware of any other ground contact and elected to continue with his touch-and-go by applying full power.

The pilot was unsure of subsequent events but reported a sudden turn to the left, rolling to about 45° left and adopting a high pitch attitude. The aircraft was recovered to a wings level attitude over the Taxiway Bravo with the aircraft described as flying at 20 ft agl by a member of the airport’s staff who witnessed the event. The aircraft then descended and the nosewheel struck a grass verge and detached. The propeller struck the ground and the aircraft slid along the apron until it impacted a parked aircraft (G-BLWP).

All occupants were wearing full harnesses, were uninjured and exited the aircraft through the doors. There was no fuel leak and the aircraft’s airbags did not deploy. It was subsequently discovered that the left wingtip had also contacted the runway at the estimated point of the first touchdown.

Two weeks after the pilot’s statement was received at the AAIB, he raised the possibility of the autopilot being inadvertently engaged during the final stages of the flight. He recalled that the heading would have been set to north and that, if the autopilot had engaged during the touch-and-go, this would have exacerbated the turn to the left. The aircraft was not examined by the AAIB but, after the event, it was reported that the roll trim was set to left roll.

Aircraft information

The SR20 control surfaces are controlled by the pilot through either of two single-handed side control yokes mounted beneath the instrument panel. G-GCDC was fitted with two large electronic flight display units: the Primary Flight Display (PFD) and the Multi-Function Display (MFD) along with three conventional instruments, an altimeter, airspeed indicator and artificial horizon. When power is applied at low airspeed, the slipstream effects from the propeller are such that the aircraft will yaw to the left unless it is countered by applying right rudder.

Autopilot

The aircraft was fitted with an S-TEC 55X autopilot which can control the roll and pitch axes of the aircraft. A number of autopilot modes are available which are selectable by pressing the appropriate mode selector switch. A visual indication is provided on the PFD and the

autopilot selection panel when the autopilot engages. The autopilot can be engaged at any time, including on the ground, as long as there are no system failures which inhibit it. The aircraft's Pilot Operating Handbook (POH) indicates that the autopilot may be engaged at heights above 400 ft agl.

When the autopilot is engaged in the HDG (heading) mode the aircraft will turn to and follow the heading selected by the pilot on the heading bug. There is no audible alert when this autopilot mode is engaged.

Autopilot heading control is achieved using an interface to the electric roll trim motor. The amount of autopilot trim authority is limited to allow the pilot to override any autopilot input using control yoke and rudder inputs. The aircraft's POH states that *'It is possible to easily override full trim or autopilot inputs by using normal control inputs'*.

The autopilot can be disengaged by a number of means but normally by pushing the disconnect button on the control yoke. Pitch or roll control inputs to the control yoke will not disengage the autopilot. Disconnection will trigger an audio alert and an appropriate display on the PFD screen and the autopilot control panel.

Pilot information

The pilot successfully completed the SR20 *'Cirrus Transitional Training Course'* in May 2013. He last flew with an instructor in February 2014 which included crosswind landings, but not in a Cirrus aircraft. The pilot confirmed his familiarity with the crosswind landing and touch-and-go requirements of flying the Cirrus, including the need to apply right rudder to counter the propeller slipstream effects.

In the calendar year prior to the accident, the pilot had flown for 24 hours in this aircraft. In November 2015, he flew five touch-and-go landings. The next flight was the accident flight where three touch-and-go landings were successfully performed prior to the accident.

Other events

The aircraft manufacturer confirmed that they were not aware of any other instances of inadvertent autopilot engagement by a pilot's kneeboard. A search of the AAIB and NTSB (USA) accident database did not reveal previous accidents or incidents involving inadvertent autopilot engagement in such a manner.

Recorded information

The aircraft was fitted with a Recoverable Data Module (RDM) which is a crash-hardened recorder located in the vertical stabiliser. This was recovered to the AAIB and downloaded but the last recorded flight was in September 2013. The electronic flight displays also recorded some data including engine parameters and position but only at six second intervals and no autopilot information could be recovered. Heading information was calculated from recorded position but analysis of a dynamic event, such as a loss of control on landing, is not possible with such a low sampling rate. Salient parameters are shown in Figure 2.

Engine rpm increased from 2,160 rpm to 2,460 during the touch-and-go (maximum recorded for this flight was 2,660 rpm) but then reduced to 1,550 rpm as the aircraft departed to the left of the runway. Due to the position and sampling rate resolution, it could not be established whether this reduction in rpm was prior to, or as a consequence of, the propeller strikes on the paved surface. The last recorded position corresponded with that indicated by the pilot.

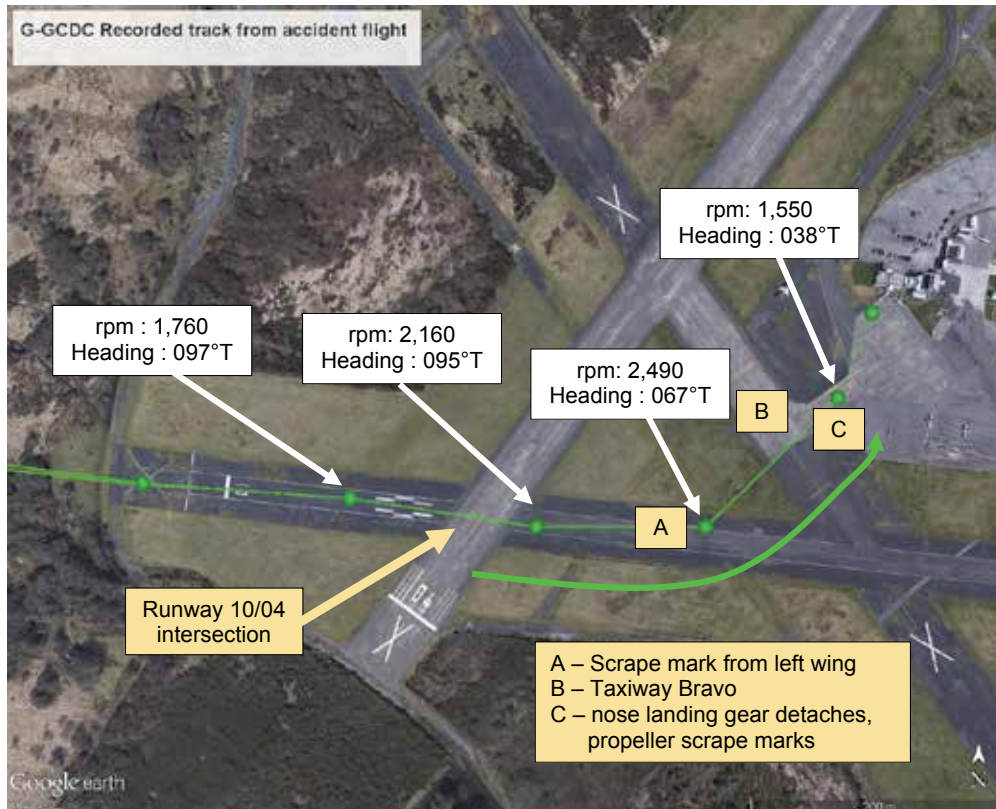


Figure 2

Salient recorded parameters

Discussion

The pilot reported that during the pre-flight checks, the autopilot heading bug was not aligned with the runway heading but probably set to north. Autopilot engagement is possible at any time as long as no system failures are present. This allowed identification of the inadvertent activation of the heading mode during the pre-flight checks, leading to an adjustment of the kneeboard position with a view to preventing recurrence. Despite “many dozens” of previous flights wearing this kneeboard, the pilot was unaware of having inadvertently engaged the autopilot with it. He thought it likely that a combination of kneeboard and seat positioning on this flight had exacerbated the situation.

Prior to the accident, the pilot had successfully completed three touch-and-go landings on Runway 10. For the accident landing, he reported that the approach to Runway 10 was normal. At the touchdown point, the aircraft drifted and rolled to the left, causing it to bounce on the left main landing gear and for the left wingtip to contact the runway. In the absence

of recorded data, the cause for this initial deviation to the left could not be determined. It was considered to be either due to the effects of a gust of wind from the right, an inadvertent engagement of the autopilot with the pilot's kneeboard, or a combination of both.

After the initial bounce, the pilot applied full power to continue the touch-and-go. The effects of this will be a yaw to the left, from the propeller slipstream, which is normally countered with right rudder. The amount of right rudder application is unknown and, after full power was applied, the aircraft lost control and turned rapidly to the left. The pilot did not recall seeing any autopilot annunciation changes on the PFD, but may not have been able to due to the rapid nature of the ensuing events.

He reported regaining control as the aircraft crossed Taxiway Bravo but the nose then dropped, the aircraft descended rapidly, the nose gear detached and the propeller impacted the paved surface. The aircraft then slid across the ground, eventually impacting a parked aircraft.

After the accident, aircraft examination revealed the roll trim was to the left and, as the pilot stated that he had not commanded it, it is considered likely to have been commanded by the autopilot. Unfortunately, no evidence was recovered that could confirm the status of the autopilot throughout the accident sequence, including the times of any engagement. However, the aircraft manufacturer confirmed that the autopilot trim authority is limited to ensure that the pilot can always override an autopilot input using control yoke and rudder inputs.

The exact cause of the accident could not be established due to lack of evidence. It is likely to have been caused by a combination of the gusting wind from the right, the bounced landing and wingtip strike, the effect of applying full power during the touch-and-go and the consequence of a possible inadvertent autopilot engagement by the corner of the pilot's kneeboard.

Unexpected control inputs at critical stages of flight can be hazardous. Although unaware of any previous events of this specific nature, and none being recorded on the AAIB or NTSB accident databases, the aircraft manufacturer is considering promulgating details of this event in its routine safety bulletins available to pilots operating its aircraft.