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MISCELLANEOUS

(ALL TIMES IN THIS BULLETIN ARE UTC)

AAIB Special Bulletins / Interim Reports

AAIB Special Bulletins and Interim Reports

This section contains Special Bulletins and Interim Reports that have been published since the last AAIB monthly bulletin.

ACCIDENT

Aircraft Type and Registration:	Airbus A319-131, G-EUOE
No & Type of Engines:	2 x IAE V2522-A5 turbofan engines
Year of Manufacture:	2001 (Serial No 1574)
Date & Time (UTC):	24 May 2013 at 0716 hrs
Location:	London Heathrow Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 5 Passengers - 75
Injuries:	Crew - None Passengers - None
Nature of Damage:	Fire damage to the right engine; mechanical damage to: fuel and hydraulic pipes, slats, flaps, horizontal stabiliser, landing gear and fuselage skin
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	50 years
Commander's Flying Experience	14,337 hours (of which 8,036 were on type)
Information Source:	AAIB Field Investigation

Notification

At 0836 hrs local on 24 May 2013, the Air Accidents Investigation Branch (AAIB) was notified of an occurrence involving an Airbus A319 departing from London Heathrow Airport. An investigation was commenced immediately and a team of AAIB Inspectors was deployed. In accordance with the provisions of Annex 13 to the Convention on International Civil Aviation, Accredited Representatives from the Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA) in France and the National Transportation Safety Board (NTSB) in the USA were invited to participate in the investigation.

Synopsis

As the aircraft departed Runway 27L at London Heathrow Airport, the fan cowl doors from both engines detached, puncturing a fuel pipe on the right engine and damaging the airframe, and some aircraft systems. The flight crew elected to return to Heathrow. On the approach to land an external fire developed on the right engine. The left engine continued to perform normally throughout the flight. The right engine was shut down and the aircraft landed safely and was brought to a stop on Runway 27R. The emergency services quickly attended and extinguished the fire in the right engine. The passengers and crew evacuated the aircraft via the escape slides, without injury.

Subsequent investigation revealed that the fan cowl doors on both engines were left unlatched during maintenance and this was not identified prior to aircraft departure.

History of the flight

The aircraft was scheduled to operate from London Heathrow to Oslo. This was the first flight following overnight maintenance. Nothing unusual was noted during the pre-flight preparations.

The pilots reported that the takeoff from Runway 27L seemed normal, although the commander commented that on rotation he felt a slight bump, which he believed to be a wheel running over a runway centreline light. Early in the climbout ATC informed the crew that their aircraft had left debris on the runway. The flight crew were later advised by the cabin crew that panels were missing from the engines.

As the fan cowl doors detached they caused secondary damage to the airframe and aircraft systems. The symptoms seen by the flight crew included: engine thrust control degradation, the loss of the yellow hydraulic system, and a significant fuel leak. After the loss of the yellow hydraulic system the crew declared a PAN, with the intention of returning to Heathrow once they had fully assessed the situation. ATC provided radar vectors for the ILS to Runway 27R.

During the approach to land, an external fire developed on the right engine. An engine fire warning on the flight deck prompted the crew to declare a MAYDAY. Although both engine fire extinguisher bottles were discharged and the right engine was shut down, the fire was not completely extinguished. The left engine continued to perform normally throughout the flight.

The aircraft landed safely and was brought to a stop on Runway 27R at Heathrow. The airport fire service attended and quickly extinguished a small fire on the right engine. The passengers and crew evacuated via the escape slides on the left side of the aircraft, without injury.

Aircraft damage

Examination of the aircraft revealed that the inboard and outboard fan cowl doors from both engines had detached. Remnants of the doors were recovered from Runway 27L.

The detached fan cowl doors had struck and damaged the inboard leading edge slats, left and right fuselage skin close to the wing roots, overwing fairings, inboard flaps and left belly fairing. In addition, the right engine outboard fan cowl had struck the right wing leading edge at the outboard end of Slat 3, damaging this slat and the inboard end of Slat 4. The outboard flap track fairing on the right wing was punctured and the left horizontal stabiliser leading edge and lower skin were damaged.

Debris had also struck the left main landing gear, damaging the leading edge of the landing gear door and a hydraulic brake pipe.

The right main landing gear outer tyre was damaged during the landing and had fully deflated.

The right engine was extensively fire damaged. The damage was concentrated in the left and right thrust reverser 'C' ducts and common nozzle assembly. A low pressure fuel pipe was punctured by the remnant of the inboard fan cowl that remained attached to engine. The source of ignition that led to the in-flight fire is still under investigation.

Fan cowl description

The engine fan cowling is composed of two semi-circular composite fan cowl doors. The doors are fastened by four latches attached to the lower edge of the right door. Each latch operates a hook that engages with an eye bolt on the lower edge of the left door. Due to the low ground clearance of the nacelle, fastening the fan cowl door latches usually requires maintenance personnel to lie on the ground to access the latches. The fan cowl door latches are difficult to see unless crouched down so that the bottom of the engine is clearly visible.

The fan cowl doors can be propped open by two stays mounted on the inside of each door, to allow access for servicing. When the doors are lowered from the propped-open position, a 'hold open' device on the bottom of the fixed engine inlet cowl prevents the fan cowl doors from closing fully under gravity. In this condition the fan cowl doors stand slightly proud of the nacelle (Figure 1), to provide a visual cue that the doors are not latched.

Additional information

Following the event photographs of the aircraft, taken prior to pushback, were provided to the AAIB. These photographs show the fan cowl doors unlatched on both engines.

The aircraft had undergone scheduled maintenance overnight. This required opening the fan cowl doors on both engines to check the Integrated Drive Generator (IDG) oil levels.

Figure 1

Generic photograph showing fan cowl doors in the unlatched condition

Safety information

Following previous events of fan cowl door separation on A320-family aircraft, Airbus recommended that operators strictly adhere to Aircraft Maintenance Manual (AMM) task 71-13-00 for proper latching and closing of fan cowl doors after each maintenance action requiring cowl opening.

The Airbus A320-family Flight Crew Operating Manual (FCOM) Standard Operating Procedure (SOP) PRO-NOR-SOP-05 for the exterior walk-around includes a check on each engine that the fan cowl doors are closed and latched. To perform this check it is necessary to crouch down so that the latches are visible.

The Airbus '*Safety First*' magazine, Issue 14 dated July 2012, contains an article relating to the prevention of fan cowl door loss. At that time there had been 32 reported fan cowl door detachment events, 80% of which had occurred during the takeoff phase of flight. On some occasions significant damage was caused to the aircraft, however, none of these events had resulted in a subsequent engine fire.

This event has shown that the consequences of fan cowl door detachment are unpredictable and can present a greater risk to flight safety than previously experienced.

The following Safety Recommendation is therefore made:

Safety Recommendation 2013-011

It is recommended that Airbus formally notifies operators of A320-family aircraft of the fan cowl door loss event on A319 G-EUOE on 24 May 2013, and reiterates the importance of verifying that the fan cowl doors are latched prior to flight by visually checking the position of the latches.

Published 31 May 2013

AAIB Field Investigation reports

ACCIDENT

Aircraft Type and Registration:	Piper PA-38-112 Tomahawk, G-BODP
No & Type of Engines:	1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1981 (Serial no: 38-81A0010)
Date & Time (UTC):	16 August 2012 at 1935 hrs
Location:	Near Bruera, Cheshire
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - 2 (Fatal) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	50 years
Commander's Flying Experience:	10,440 hours (estimated) (of which at least 150 were on type) Last 90 days - 135 hours (estimated) Last 28 days - 45 hours (estimated)
Information Source:	AAIB Field Investigation

Synopsis

The instructor and student were conducting PPL training for slow flight aircraft handling. At an estimated height of between 2,000 and 3,000 ft, the aircraft turned rapidly through about 180° and descended at a high rate, crashing in a field. The evidence indicated that the aircraft had been in a spin to the left when it struck the surface. Both occupants were fatally injured.

A manufacturer's revision to the Pilot's Operating Handbook (POH), dated May 2012, included advice on the altitudes at which slow flight and stall manoeuvres should be initiated, to provide an adequate margin of safety in the event of an inadvertent spin. This revision, which related to a Safety Recommendation made by the United States of America's National Transportation Safety Board (NTSB) in 1997, reached the flying school in the month following the accident.

History of the flight

The aircraft was on its sixth training flight of the day from Hawarden Airport, with an instructor and student on board. The instructor had operated three of the earlier flights and another instructor had flown the aircraft on the other two, including its penultimate flight. This other instructor had noted no defects on the aircraft, which had been refuelled to full tanks two flying hours prior to the last flight.

The instructor taking over the aircraft, for the last flight, had signed its technical log, noting that the flight was for Exercise 10a (slow flight) and that the remaining fuel was 69 litres. This fuel should have been sufficient for a planned flight of one hour, with reserves of between one and two hours.

The aircraft took off at 1906 hrs and, remaining on the Hawarden Tower radio frequency, the instructor arranged a Basic Service with the Air Traffic Control Officer (ATCO). At 1909 hrs, the instructor requested to operate "NOT ABOVE 4,500 FT." The ATCO responded, "NO ALTITUDE RESTRICTION, REMAIN OUTSIDE CONTROLLED AIRSPACE". This was acknowledged by the instructor. There were no reports of any further radio transmissions by the crew, on this or any other frequency. It was usual for the instructor to land 15 minutes before the airfield closed, to leave sufficient time for a second approach should that become necessary. That evening, Hawarden Airport was scheduled to close at 2000 hrs.

The aircraft initially departed to the south, passing over Wrexham, before routing north-east. No other traffic was reported to be in the area and, although a Basic Service placed no requirement on ATC to monitor the position of the aircraft, the ATCO occasionally confirmed G-BODP's position by referring to the radar display located in the ATC tower.

At 1934 hrs, the ATCO noticed that the aircraft was no longer generating a radar return and attempted to contact the aircraft on both the Approach and the Tower radio frequencies. Concerned by the lack of a reply, Hawarden ATC commenced overdue action and requested that a Police Air Support Unit helicopter search the aircraft's last known position. Shortly after this, the emergency services received phone calls reporting that, at about 1935 hrs, an aircraft had crashed near the village of Bruera.

All three emergency services attended the accident site and discovered that both occupants of the aircraft had been fatally injured.

Witnesses

Three eyewitnesses near Bruera saw parts of what were believed to be the last moments of the flight.

Eyewitness A was driving an agricultural vehicle about 0.75 nm south of the accident site. He had seen an aircraft but, as this was a common sight, had not paid it any particular attention. A minute or two later, he noticed a "cigar shape" which he assumed was an aircraft in a steep descent; he later thought that it might have been turning. The aircraft was only in sight for about two seconds before the witnesses's view was blocked by trees and hedges. He was unable to locate the aircraft again when his view became clear about one minute later.

Eyewitness B was to the north of the accident site, driving a car southbound on Chapel Lane, between 0.55 and 0.25 nm from the accident site. He saw an aircraft descending "vertically", nose down, at a height of a few hundred feet but only had the aircraft in sight for a total of two to three seconds. He stated that he saw a steady red light in the centre of the aircraft during its descent and, as such, did not believe the aircraft had been rotating. He continued driving south, looking in the general direction of where he had last seen the aircraft, and saw an aircraft's vertical fin in a field of crop. He reached the aircraft within a few minutes of the accident but it was apparent to him that both occupants had received fatal injuries.

Eyewitness C was in a field 0.65 nm north of the accident site. She had been aware of an aircraft operating in the local area but had no reason to pay particular attention to it and was unconcerned. A movement then attracted her attention and she looked up to see an aircraft in a steep "vertical" descent. She watched the aircraft for about six seconds until it went out of sight behind some trees. She then heard a loud noise and noticed roosting birds take flight. This witness had not heard any aircraft noise during its descent and described the aircraft's attitude as being nose down. She also recalled seeing an item or object falling at the same speed as the aircraft, displaced (from her perspective) to the right. This object was described as white with a red or orange top.

Weight and balance

Allowing for fuel burnt during start, taxi and the 30 minutes of flight before the accident, the aircraft was calculated to have been below its Maximum Take Off Mass (MTOM) at the time of the accident. The aircraft's centre of gravity was calculated as being in the middle of the allowable range throughout the flight.

Wreckage and impact information

The wreckage was located in a wheat field, in which the crop was approximately 80 cm high. The wings were still attached to the fuselage and were largely intact. All the main parts of the aircraft were present and all of the wreckage was located within a few metres of the fuselage or wings. It was concluded that the aircraft had struck the ground intact at low forward speed, with a high rate of descent. There was no evidence of a fire.

Approximately a third of the engine was embedded below the surface, in soft ground, inclined approximately 45° nose down and about 20° left wing low. When the engine was removed from the ground, both propeller blades were still attached. There was little evidence (such as chord-wise scoring, leading edge notches or the tips being bent forward) of the propeller being under power when it struck the ground.

Both the fuel tanks in the wings had ruptured and no fuel was found in either of the two tanks. However, when the engine was lifted, there was a significant pool of fuel approximately 30 cm below ground level, underneath where the engine had been situated, which was considered to have drained from one or both of the wing tanks.

The left main landing gear leg had detached and was lying next to the left wing. Approximately one metre ahead of the left wing there was a linear ground mark, which was consistent with the leading edge of the left wing striking the ground before rebounding. The wheel on the right main landing gear leg was embedded in the ground and there was little evidence of any forward motion. There was a vertical 20 cm deep hole in the ground, below the right aileron mass balance, which itself had earth marks covering 20 cm of its length.

It was concluded that the aircraft had struck the ground in a nose down, left wing low attitude, with the left wing striking the ground before the right wing. The right main landing gear and the right wingtip then probably struck the ground more or less vertically. From the small wreckage area, the relatively modest damage, the asymmetric damage to the wings and main landing gear legs, and the aircraft's attitude when it struck the ground, it was concluded that the aircraft was probably in a spin to the left on impact with the surface.

Meteorology

The UK Met Office provided an aftercast for the accident area. Additionally, Aircraft Meteorological Data Relay (AMDAR) wind information was obtained from two aircraft that had departed from Liverpool Airport that evening (see Tables 1 and 2). Although the AMDAR information was from positions no closer than 10 nm to the accident site and was not precisely at the time of the accident, it did provide a vertical cross-section through the air mass, which helped to develop a model of the likely wind conditions.

The Met Office estimated that, at the time of the accident, the wind at 2,000 ft was from 200° at 25 to 30 kt. Generally, visibility was assessed as having been in excess of 20 km, with the cloud base no lower than 5,000 ft. However, an approaching front meant that the cloud base was lowering towards an altitude of between 2,500 and 3,000 ft amsl. At 1920 hrs, Hawarden reported a surface wind of 140°/6 kt, greater than 10 km visibility and few (1 to 2 octas) clouds at 3,000 ft.

Altitude in Feet AMSL	Wind direction / speed
898	163°/20 kt
1,601	174°/24 kt
2,099	172°/23 kt
2,500	185°/25 kt

Table 1

AMDAR information reported near Liverpool Airport at 1721 hrs

Altitude in Feet AMSL	Wind direction / speed
1,099	174°/24 kt
1,699	172°/23 kt
2,201	185°/25 kt
2,700	189°/23 kt

Table 2

AMDAR information reported near Liverpool Airport at 2044 hrs

Pilot information

Instructor

The instructor started flying in 1987. He held a Commercial Pilot's Licence (Aeroplanes) (CPL(A)) which was valid until August 2014. His CPL included a Flying Instructor rating, restricted to single-pilot, single-engine aircraft, in accordance with Joint Aviation Regulation-Flight Crew Licensing (JAR-FCL) part 1.330. He was not permitted to instruct aerobatics or at night. His Flight Instructor rating was renewed by flight test in February 2012 and was valid until March 2015.

A logbook (marked '9') was held at the flying school. It commenced on 15 October 2008 and was completed up until 5 May 2012. Other logbooks were not located. Flying school colleagues believed that the pilot's flying career had been entirely on single engine piston aircraft. Logbook '9' noted a total of 10,330 hours and included about 150 hours on the PA-38. There were no references in this logbook to spinning.

The investigation was informed by former students that the instructor had previously worked for at least one other school equipped with a PA-38, so his experience on type is believed to have been in excess of the 150 hours recorded in logbook '9'. He commenced flying for the Hawarden based school in December 2011, flying both the PA-38 and PA-28. The flying school calculated that the instructor flew an average of about 45 hours per month during the summer. It was, therefore, estimated that his total hours were slightly in excess of 10,400 hours.

Student

The student pilot had completed an air experience flight in March 2011 and commenced training for his Private Pilot's Licence (Aeroplanes) (PPL)(A) in May 2012. All his training flights had been in the PA-38, with the same instructor, and the accident occurred on his eighth flight. The student's training records showed consistent progress and the record for his flight on 27 June 2012 stated *'Very good. Exercise completed, Exercise 10A next.'* The student's logbook included details of a flight on 11 July 2012. The remarks column, signed by the instructor, noted the training conducted as exercises *'10a & 10b'* but there was no corresponding entry in the student's training records to amplify this information.

The student had seven hours total flying experience and had just had a five-week break from flying.

Medical

The instructor held a current JAA Class 1 medical certificate.

Post-mortem examinations were conducted by a specialist aviation pathologist. He commented that there was no evidence in either occupant of any natural disease and no compelling evidence for any other medical factors which could have had a bearing on the cause of the accident. The accident was considered to be non-survivable.

Recorded information

Radar data for the accident aircraft was available from three radar heads; Clee Hill, St Annes and Manchester. Each radar head had recorded a combination of primary and secondary returns. However, the secondary returns were Mode A only; hence no altitude information was available. The coverage for each radar head differed, due to their different locations and the elevation of the terrain between the radar head and the aircraft. The first radar contact for the flight was at 1906:35 hrs (Clee Hill), placing the aircraft over the departure end of Runway 22 at Hawarden Airport.

The first radar head which lost contact was St Annes, at 1933:34 hrs, as the aircraft was tracking south-west. Manchester radar head lost contact at 1933:40 hrs and, finally, Clee Hill's last recorded contact was at 1933:46 hrs, over the field where the aircraft crashed.

Clee Hill's radar track for the last eleven minutes of the flight is presented at Figure 1; the time between consecutive points (radar returns) is eight seconds. Figure 2 plots the variation in calculated groundspeed (both point-to-point and five-point average) and the

Figure 1

Clee Hill radar track for the last eleven minutes of the flight

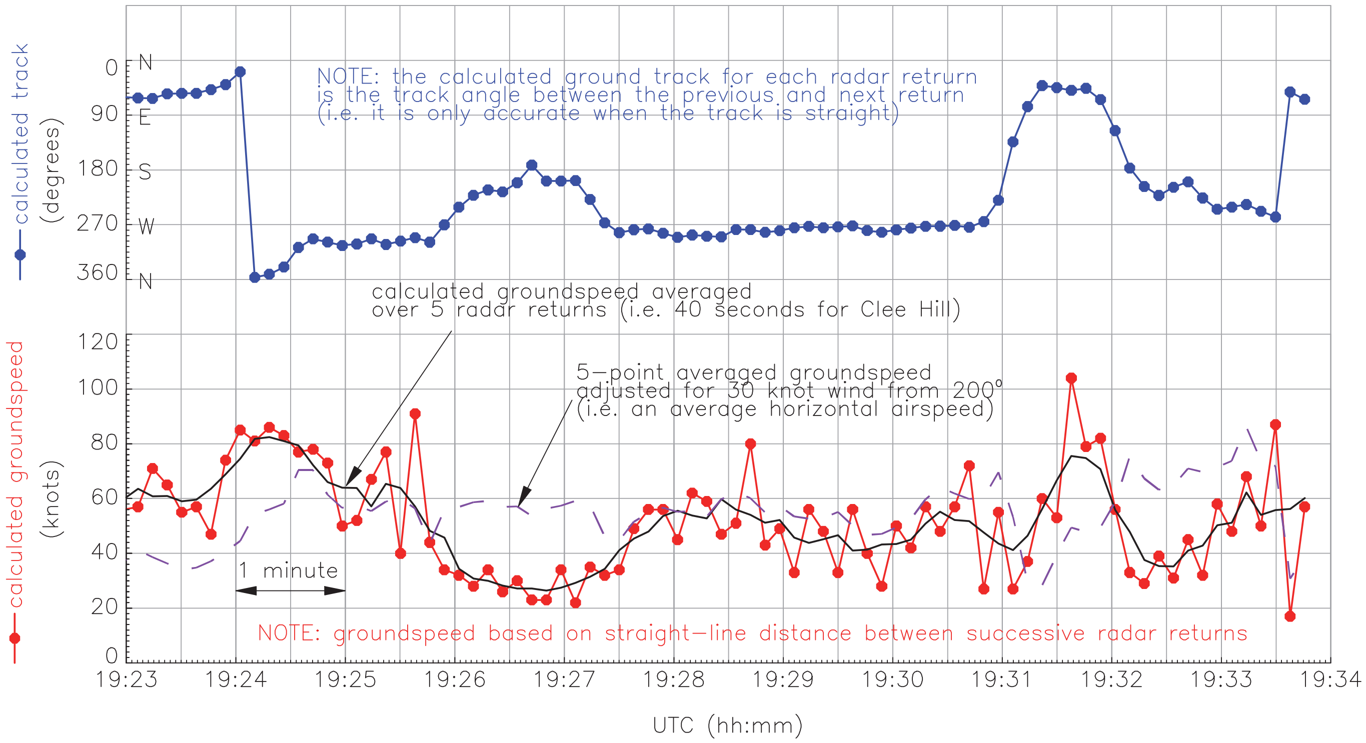


Figure 2

Variation in groundspeed and track for the last eleven minutes of the flight (Clee Hill radar)

corresponding aircraft track for this final portion of the flight. Figure 2 also includes a plot of the estimated horizontal component of the aircraft's airspeed, based on the five-point average groundspeed, corrected for a nominal wind of 200°/30 kt.

Slow speed flight

The five-point averaged groundspeed, adjusted for a 30 kt wind from 200º, gave airspeeds of between about 35 and 90 kt. Given the lack of altitude information, a more accurate wind correction could not be made. Additionally, a vertical speed component could not be included because it was not known whether the aircraft was climbing, descending or flying level. Consequently, the range of airspeeds are more an indication of a variation between slow and cruise airspeeds, rather than specific, accurate values.

As an example, in Figure 2 between 1926 hrs and 1927 hrs, when the calculated average groundspeed was about 30 kt, the aircraft was tracking about 200º ie into the nominal wind. In Figure 1, this corresponds to the section of the aircraft's track in the Manchester CTA where the radar returns appear to be overlapping and the aircraft turned 90º to the left, onto a south-south-westerly track, and then turned right onto a westerly track. Adjusting for a 30 kt wind from 200º gave an airspeed of approximately 60 kt.

Final radar contact

The last two returns from Clee Hill indicate that the aircraft had altered course, through 180º, onto a north-easterly track. The radar data suggests that this track reversal happened between two returns (ie over 8 seconds). However, inaccuracies in the radar data (illustrated in the point-to-point groundspeeds in Figure 2) precluded any further meaningful numerical analysis of the track reversal.

The aircraft's average groundspeed during the 40 seconds preceding this track reversal was about 60 kt and increasing. This equated to an airspeed of 70 kt and above.

Aircraft height

Radar contact is reliant on line-of-sight between the radar head and the target aircraft. Line-of-sight can be interrupted by intervening structures or terrain and it was possible to model, theoretically, the lowest altitude of the radar coverage at a particular point over the ground, for each radar head. The radars at St Annes and Manchester could, in the area surrounding the accident site, track aircraft down to an altitude of between 600 and 700 ft amsl (about 520 to 620 ft agl). Whereas, the Clee Hill radar coverage extended down to between 200 and 300 ft amsl (about 120 to 220 ft agl).

The entire flight was well within the range of each radar head, so it was assumed that radar contact was lost when the aircraft descended below the base of the relevant radar's coverage. Accordingly, between the last Manchester radar head return at 1933:40 hrs and 1933:44 hrs, when the next contact should have been made, the aircraft descended below approximately 600 ft amsl (520 ft agl). Similarly, for the Clee Hill radar (which has a sweep rate of eight seconds) between 1933:46 hrs (the last contact) and 1933:54 hrs, the aircraft descended below about 200 ft amsl (120 ft agl). This would have required a rate of descent of between 1,300 and 5,000 ft/min.

Airspace

Relevant controlled airspace, shown on Figure 1, comprised Airway N864 and the Manchester Control Area (CTA), both of which required ATC's permission for entry. The base of N864 was at 3,000 ft amsl and the base of the Manchester CTA was at 2,500 ft. Hawarden Airport is located 5 nm west-north-west of the accident site and the Hawarden Air Traffic Zone is beneath Airway N864. There was no evidence that the aircraft entered either areas.

Aircraft information

The PA-38 Tomahawk is a two-seat training aircraft of conventional aluminium alloy construction. It has a single engine and a fuel tank in each wing. It has conventional flying controls, consisting of ailerons, rudder, elevator and flaps.

The Pilot's Operating Handbook (POH) lists the stalling speed for a PA-38, with flaps up, (with both outboard and inboard flow strips installed) as 52 kt.

In the event of an engine failure, the speed to be flown is 70 kt.

Section 4 of the POH:

> *'describes the recommended procedures for the conduct of normal operations for the Tomahawk.'*

It states that a one turn spin would:

> *'require 1,000 to 1,500 feet to complete'*

and that normal spin recovery, using the proper technique;

> *'may take up to 1-1/2 turns…Normally the engine will continue to run during a spin, sometimes very slowly. If the engine stops, take normal spin recovery action.'*

Intentional spins:

> *'should only be started at altitudes high enough to recover fully by at least 4,000 feet AGL …'*

The UK CAA supplement to the PA-38 Pilot Operating Handbook states:

'Spin recovery

1. Apply and maintain full rudder opposite the direction of rotation.

2. As the rudder hits the stop, rapidly move the control wheel full forward and be ready to relax the forward pressure as the stall is broken.

3. As rotation stops, centralize the rudder and smoothly recover from the dive.'

It continues with further advice on spinning:

'The recommended procedure has been designed to minimize turns and height loss during recovery. If basic or standard recovery is employed (during which a pause of about 1 second – equivalent to about one half turn of the spin – is introduced between the rudder reaching the stop and moving the control column forward) spin recover will be achieved with equal certainty. However, the time taken for recovery will be delayed by the length of the pause, with corresponding increase in the height lost.

In all spin recoveries the control column should be moved forward briskly, continuing to full forward position if necessary. This is vitally important because the steep spin attitude may inhibit pilots from moving the control column forward positively.

The immediate effect of applying normal recovery controls may be an appreciable steepening of the nose down attitude and an increase in rate of spin rotation. This characteristic indicates that the aircraft is recovering from the spin and it is essential to maintain full anti-spin rudder and to continue to move the control wheel forward and maintain it fully forward until the spin stops. The airplane will recover from any point in a spin in not more than one and one half additional turns after correct application of controls.

Mishandled Recovery

The airplane will recover from mishandled spin entries or recoveries provided the recommended spin recovery procedure is followed. Improper application of the recovery controls can increase the number of turns to recover and the resulting altitude loss.

Delay of more than about 1 ½ turns before moving the control wheel forward may result in the aircraft suddenly entering a very fast, steep spin mode which could disorient a pilot. Recovery will be achieved by briskly moving the control wheel fully forward and holding it there while maintaining full recovery rudder.

If such a spin mode is encountered, the increased rate of rotation may result in the recovery taking more turns than usual after the control column has been moved fully forward.

Dive Out

In most cases spin recovery will occur before the control wheel reaches the fully forward position. The aircraft pitches nose down quickly when the elevator takes effect and, depending on the control column position, it may be necessary to move the column partially back almost immediately to avoid an unnecessarily steep nose down attitude, possibly negative "g" forces and excessive loss of altitude.'

Previous Safety Recommendation

In October 1997 the National Transportation Safety Board (NTSB) issued Safety Recommendation A-97-045. This recommendation was one of five issued following a fatal accident to a PA-38, registration N2495L. The NTSB recommended that the FAA:

> *'...immediately require that the slow flight & stall training in the PA-38-112 be conducted at or above the minimum altitude currently specified in the PA-38-112 pilot's operating handbook for spin training...'*

The FAA agreed that:

> *'...slow flight & stall training in the PA-38-112 should be conducted at or above the minimum altitude specified in the POH. On 8/18/97, the FAA sent a letter to all regional flight standards division managers requesting that they inform all known operators of the PA-38-112 of this recommendation.'*

In May 2012, Revision 14 to the POH was issued by the manufacturer. Section 4.35 '*Stalls*' was amended and renamed as '*Stalls and Slow Flight*'. The amendment added the following text:

> ***'caution***
>
> *Slow flight and stall manoeuvres should be initiated at altitudes high enough to fully recover by at least 4,000 feet AGL, to provide an adequate margin of safety in the event of an inadvertent spin.'*

The manufacturer's UK agent confirmed that the manufacturer operates an update alerting service for owners who register their details directly with the, USA based, manufacturer. In addition, the current revision status of various documents, including the PA-38 POH could be found on the manufacturer's website under '*customer service information*'[1].

Although POH Revision 14 was dated May 2012, the UK agent commented that the revision was only available from September 2012; after the date of this accident.

Training syllabus

At the time of the accident, the PPL syllabus in use, for regulatory purposes, was the JAR-FCL 1 syllabus. Exercise 10a was listed in the JAR-FCL 1 syllabus as '*slow flight*', the objective of which was:

> *'to improve the student's ability to recognise inadvertent flight at critically low speeds and provide practice in maintaining the aeroplane in balance while returning to normal airspeed.'*

The flying school used JAR compliant student study guides from various aviation publishing outlets. The guides split Exercise 10a into two parts, with the exercise first being flown at 10 kt above the stalling speed, then again at 5 kt above the stall. The PPL syllabus continues with Exercise 10b '*stalling*'. In total, the JAR PPL required a minimum of two hours of stall and spin awareness training. The syllabus did not require the student or instructor to spin the aircraft.

Conduct of the exercise

The instructor's methodology was reviewed by interviewing three students who had completed both Exercises 10a and 10b with him recently. The three students each had between 10 and 20 hours flying experience.

Footnote

[1] www.piper.com/company/publications/Customer_Service_Info.pdf

The interviews revealed that there was some variation in altitude flown while conducting the exercises. One student had flown Exercise10a at 6,000 ft amsl. For this student, the instructor had delayed Exercise 10b, while waiting for a suitable cloud base, before the exercise was eventually completed at about 3,000 ft. Another student recalled completing Exercise 10b at 2,100 ft amsl, as the cloud base had been between 2,200 and 2,300 ft. The third recalled the altitude as being about 3,000 ft.

All the students recalled that, at some point, the instructor had demonstrated a full stall involving a significant wing drop. Two of the students recalled that the left wing had dropped, the third could not recall which wing it was.

Procedures

The flying school's Flying Order Book (FOB) detailed the local flying area for activities such as stalling and spinning as being clear of the airways, to the south of the airfield.

Section 3.1 *'Minimum Altitude For Training'* stated that:

> *'Stalling…exercises will commence from an altitude which will allow recovery to straight and level flight by 3000 feet AGL when flying solo and 2000 feet AGL when flying dual*
>
> *Recommended minimum commencement altitudes are:*
>
> *Stalling… 2500 feet dual.'*

In September 2012, in response to Revision 14 of the PA-38 POH the school updated the Flying Order Book:

> *'Stalling and spin recovery exercises will commence from an altitude which will allow recovery to straight and level flight by 4000 feet AGL for PA38.*
>
> *Recommended minimum commencement heights, PA38, are:*
>
> *Stalling 4250 feet.*
>
> *Spinning 5000 feet.'*

Spinning

A spin is a condition of stalled flight in which the aeroplane describes a spiral descent. During a spin an aircraft is stalled and rotating about all three axes; rolling, yawing and pitching, as well as sideslipping, while losing height rapidly.

Engineering investigation

The flying controls, including elevator trim, were checked and no evidence of anything unusual was found.

The flap lever was still attached to its mounting bracket, and the pin, which is attached to the lower end of the lever, was found in the flaps up détente. The damage to the central fuselage was such that the pin could not be moved from this position. It was concluded that the flaps were probably up when the aircraft struck the ground.

Whilst there was significant disruption to the cockpit area, the carburettor heat appeared to be in the ON position and the mixture lever appeared to be in the RICH position.

The fuel selector appeared to be selected to the left tank (there are three positions LEFT, RIGHT and OFF). The fuel selector was removed from the wreckage and a simple blow test demonstrated that the left tank was selected, although from this test it was not possible to ascertain if it was fully open. The valve was disassembled and found to be in good working condition, but the male locating key was found to be just outside the groove for the left tank position. It is conceivable that the key could have been forced out of the groove during the impact sequence.

The majority of the engine was intact. However, there was significant damage to the carburettor. The starter ring gear, which is located just behind the propeller, had broken into two parts with a circumferential fracture. There was no indication of any rubbing on either of the two fracture surfaces, which was further evidence that the engine was not turning when it struck the ground.

A small but significant quantity of fuel was found in the mechanical fuel pump and it was concluded that it was unlikely that the aircraft had suffered from fuel starvation. Nothing significant was found that might explain why the engine appeared to have stopped prior to the aircraft striking the ground. One of the magnetos only produced a spark for one cylinder. However, this was readily explained by the damage to the casing that appeared to have caused the drive pinion to disengage from the rotor gear.

Analysis

The instructor had significant experience instructing the PPL(A) syllabus. He held an appropriate licence, rating and medical certificate, and was current. There was no compelling evidence of any medical factors that could have had a bearing on the cause of the accident.

The departure from Hawarden was without incident and the instructor's request to operate up to 4,500 ft was consistent with an intention to be above 3,000 ft agl when conducting either slow flight or stalling. However, the aircraft's ground track was mainly in the area bounded by airway N864 or the Manchester CTA and, although no altitude data was available, there was no evidence that the aircraft infringed this controlled airspace. Consequently, at the time of the accident the aircraft could have been operating below 3,000 ft agl and above the 2,000 ft agl required by the Flying Order Book. Interviews with students suggested that the instructor had previously completed Exercises 10a and 10b below 3,000 ft. Although the aircraft's airspeed during the flight could not be calculated accurately, its variation was consistent with an exercise on slow flight.

The radar data indicated that the aircraft would have been at or above an altitude of about 700 ft amsl when its position was last recorded by St Annes and Manchester radars. The final two radar positions, from Clee Hill, showed that the aircraft's track had changed direction rapidly through 180°, on to a downwind heading, and the reducing radar coverage from the three radar heads indicated a high rate of descent. This, combined with the vertical nature of the descent identified by the eyewitnesses, the ground marks and wreckage disposition are all indicative of a spin.

A spin is a likely outcome of a loss of control at low airspeed but, although the exercise that was being taught involved slow flight, why the spin occurred and which pilot was handling is not known. The aircraft was at too low a height for an intentional spin and the manoeuvre was neither required nor planned as part of the training. In addition, there were no references to spinning in the instructor's logbook, which went back to October 2008.

The POH data indicates that recovery from a spin, at the height at which the loss of control appears to have occurred, would have been unlikely in the height available. During spin recovery, the immediate effect of applying normal recovery controls may be an appreciable steepening of the nose down attitude and an increase in rate of spin rotation. Whether the witnesses saw the beginning of a recovery is not known, but the evidence from the distribution of the wreckage was that the aircraft was in a spin when it struck the surface.

There was no indication of a radio call from the crew, advising of a problem with the aircraft, and no evidence of a mechanical or a control problem was found during examination of the wreckage. The recorded and reported fuel state was sufficient to complete the flight and the fact that fuel was found below the engine would also suggest that there had not been a problem with the fuel line or fuel selector. The finding of fuel in the fuel pump was strong evidence that running out of fuel or fuel starvation was unlikely to have been a factor in this accident.

The engine did not appear to have been operating with any significant power when the aircraft struck the ground, and may not have been turning at all. No cause for an engine failure could be found but the POH states that the engine may stop while the aircraft is spinning. However, it was not possible to determine when the engine power reduced.

Safety action

In 1997, the NTSB recommended that:

> *'slow flight & stall training in the PA-38-112 be conducted at or above the minimum altitude currently specified in the PA-38-112 pilot's operating handbook for spin training…'*

A manufacturer's revision to the POH, dated May 2012, cautioned that:

> *'Slow flight and stall manoeuvres should be initiated at altitudes high enough to fully recover by at least 4,000 feet AGL, to provide an adequate margin of safety in the event of an inadvertent spin.'*

This revision reached the UK in the month following the accident and the flying school amended their procedures.

Conclusion

The aircraft struck the ground while in a spin. There was no evidence to suggest pilot incapacitation or a fault with the aircraft as being causal to the accident but an engine failure prior to the loss of control of the aircraft could not be ruled out. Although it was not possible to determine why the aircraft entered a spin, the radar data indicates that this happened when the aircraft was at a height from which recovery was unlikely to be successful.

ACCIDENT

Aircraft Type and Registration:	Glaser-Dirks DG-100 glider, G-DDFN
No & Type of Engines:	None
Year of Manufacture:	1975 (Serial no: 30)
Date & Time (UTC):	4 August 2012 at 1131 hrs
Location:	Pluckerston Farm, Kirriemuir, Angus
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Fatal) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Bronze gliding certificate
Commander's Age:	59 years
Commander's Flying Experience:	28 hours (of which 5 were on type) Last 90 days - 2 hours Last 28 days - 1 hour
Information Source:	AAIB Field Investigation

Synopsis

Whilst turning to the right, the glider was seen to enter a spin from which it recovered after about two turns. The glider was seen to fly normally for about a minute and it then entered a second spin, from which it did not recover. The pilot was fatally injured.

History of the flight

The pilot had joined the gliding club at Drumshade in April 2010 and followed a structured period of training, gaining his Bronze gliding certificate in July 2011. He purchased G-DDFN in August 2011 and kept it, rigged, in a hangar at the gliding site.

On the day of the accident, the pilot was the first to arrive at the gliding site and was seen by another member at about 0900 hrs, working on the club tractor. He was intending to carry out a 100 km cross-country flight, which included a 50 km leg, as part of a requirement for a Silver gliding cerificate. Club members assisted him to move his glider to the launch point, where he carried out the daily inspection and control checks. The airbrake stowage boxes in the wings had a significant amount of water in them due to recent rain, which was removed using a sponge and the boxes dried.

The weather was good, with visibility in excess of 10 km and cloud generally 'broken' at 1,500 to 3,000 ft, with some showers forecast. At the time of the accident the visibility was good and the cloud base above 2,500 ft.

At about 1115 hrs the glider was positioned for a winch launch on the easterly runway. The launch appeared normal, with the glider releasing at the top of the climb. Club members did not continue to watch the glider but concentrated on preparing the other gliders for flight.

Recorded information was available from an electronic flight logger recovered from the aircraft. The recorder contained a track log of the entire accident flight, with GPS-derived position, groundspeed, altitude and pressure altitude. The data is illustrated in Figure 1, showing the track over the ground.

The launch and subsequent manoeuvres including the accident were observed by a witness who was at the eastern end of the strip. He saw the glider flying in right-hand orbits to the northeast before appearing to enter a steep nose-down spin. The glider recovered after what he estimated to be about two turns and headed away from the field, to the north, before making another orbit to the right. The witness described the orbits as having a "gentle bank angle". The glider then appeared to enter another spin, from which it did not recover, and was seen to impact the surface of a crop field.

The witness alerted the club members to the accident and they contacted the emergency services before attending the scene. The pilot had been fatally injured in the impact.

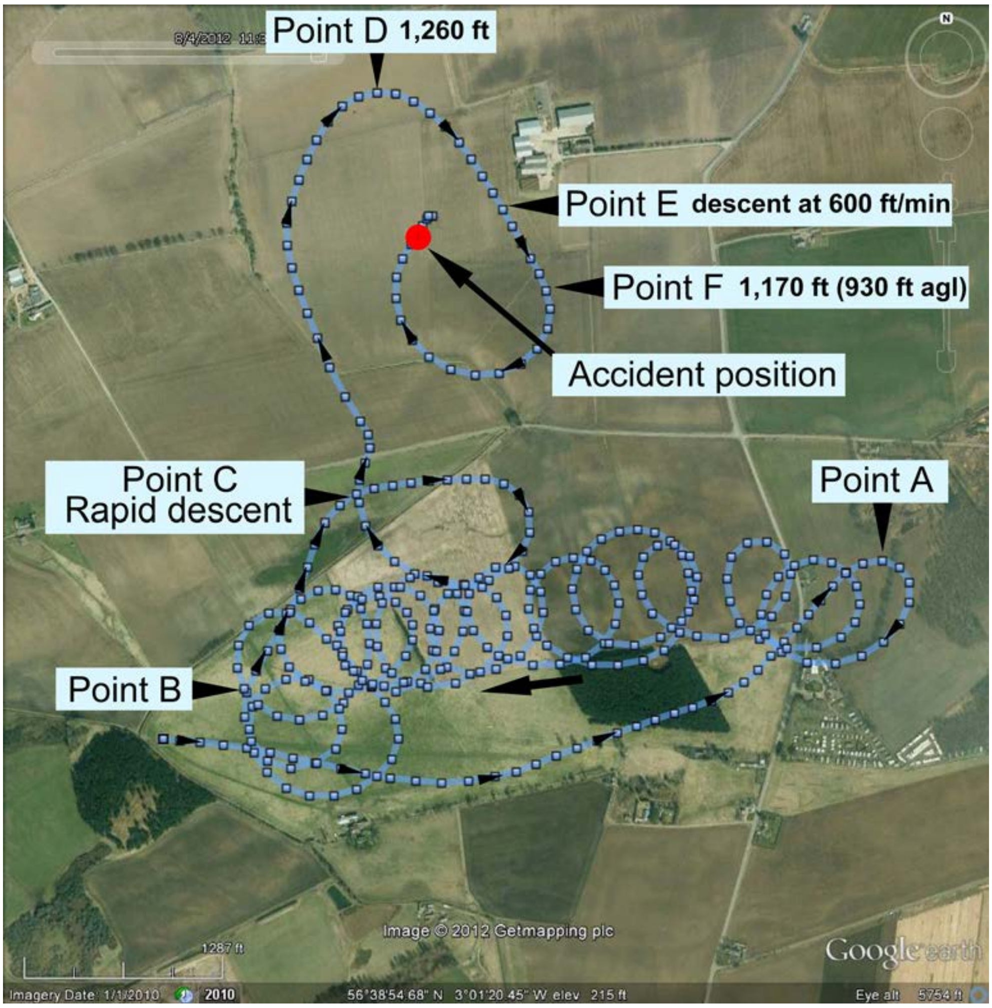


Figure 1

G-DDFN – Flight recorder GPS track

Medical and pathological information

A post-mortem examination was carried out by a forensic pathologist. The pathologist established that the pilot had died as the result of injuries received in the accident, which the pathologist considered non-survivable. While there was some evidence of hypertensive heart disease, which could have produced an incapacitating episode, the circumstances of the accident, including the aircraft recovering from one spin, suggested this was unlikely to have been a factor.

The toxicological analysis confirmed the presence of the pilot's prescription medication and there was no evidence of other drugs or alcohol.

Video of previous flights

The pilot had been in the habit of wearing a head-mounted camcorder. There was no video recording of the accident flight but on-board video recordings of five previous flights were on the memory card. These showed that the pilot, when orbiting to the left or right to gain height in thermals, maintained his airspeed between about 40 kt to 45 kt and used approximately 30° angle of bank. Entry into a turn was typically smooth with some adverse yaw initially[1] but when established in the turn it was correctly balanced with rudder.

Flight Handbook for DG-100

The Flight Handbook does not promulgate a stalling speed but an independent flight test document stated:

> *'Level flight stall occurred at about 36 kts. Very little buffeting preceded the stall.'*

Deliberate spin entry and the procedure for spin recovery are set out in the Flight Handbook:

> *'1. Spins:*
>
> *Entry: Start a slow pull-up. When the aircraft starts to buffet apply full back stick with rudder in the desired direction of rotation.*
>
> *Recovery: Rudder in the direction opposite to rotation, pause, then ease the stick forward. When rotation stops, neutralize rudder and gently recover from dive.'*

From discussion with pilots who had flown the DG-100, its handling qualities were described as benign and docile.

Recorded information

Introduction

As noted above, recorded information was available from a flight recorder[2] recovered from the aircraft. The recorder contained a track log of the entire accident flight, with GPS-derived position, groundspeed, altitude and pressure altitude recorded once every two seconds. A portable data assistant device[3] (PDA) operating a navigation application[4] was also recovered. The pilot had entered a triangular route of approximately 63 nm (116 km) into the PDA, with the first leg to Alyth, second leg to Fordoun and return leg to Drumshade.

The data is illustrated in Figure 1, showing the track over the ground, and Figures 2 and 3, showing time-history plots of track, groundspeed and altitude parameters.

Footnote

1 The tendency for the aircraft to yaw in the opposite direction to the turn.

Footnote

2 EW manufactured microRecorder approved by the International Gliding Commission (IGC).
3 Hewlett Packard IPAQ model 4700, provided with a GPS signal from the EW manufactured microRecorder.
4 XCSoar.

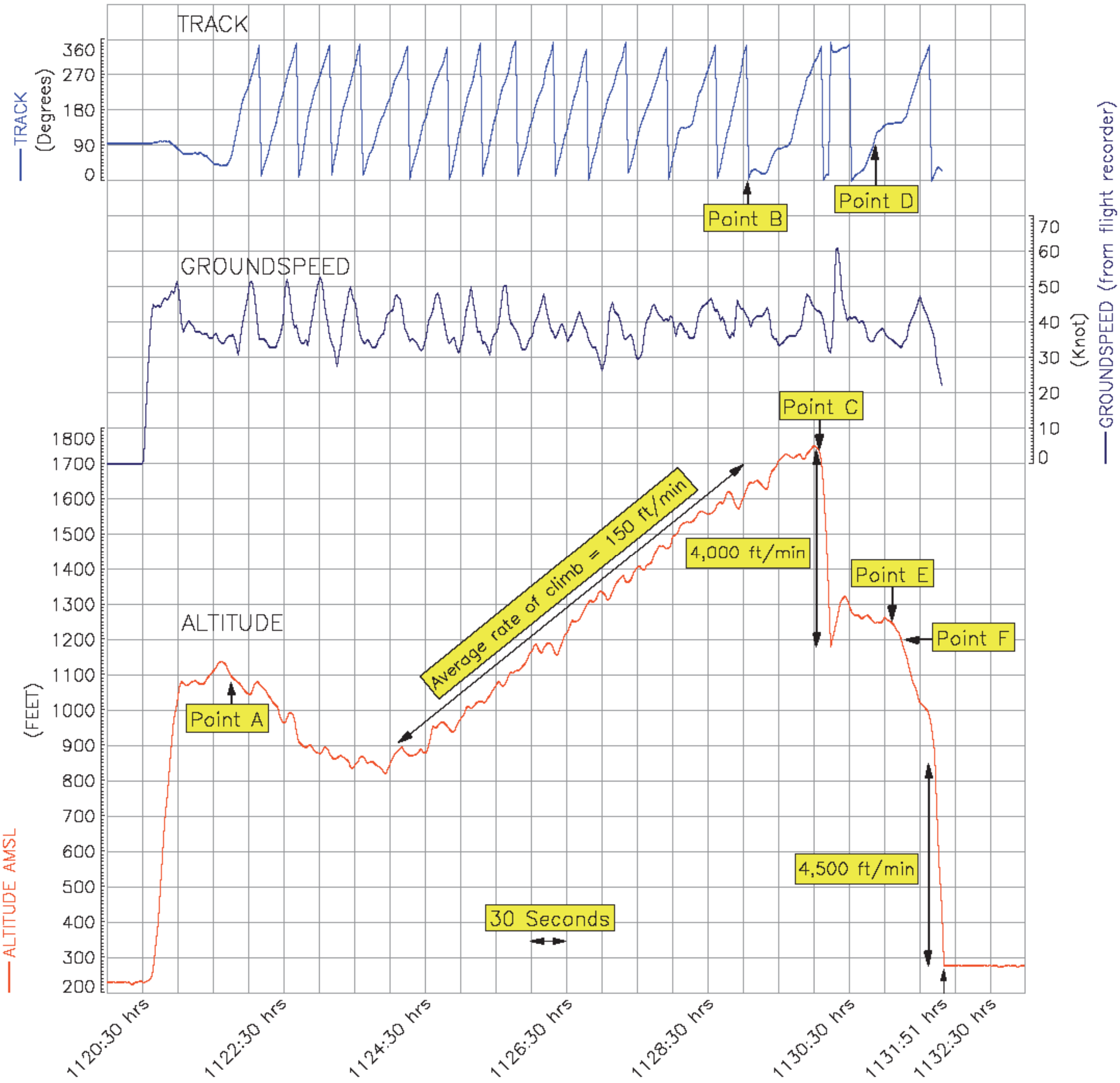


Figure 2

G-DDFN –Altitude, track and groundspeed
(Takeoff to ground impact)

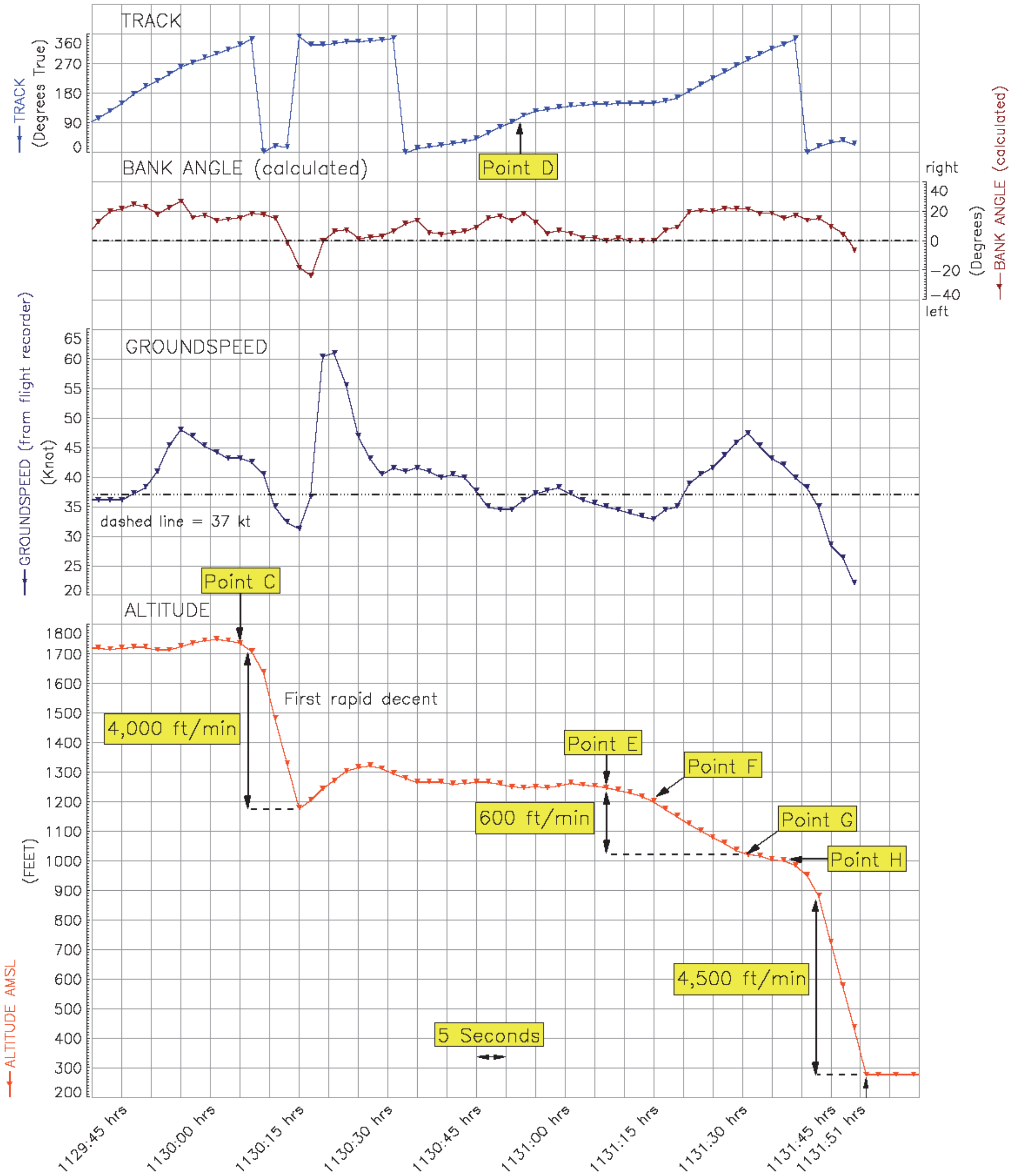


Figure 3

G-DDFN – altitude with track,
groundspeed and bank angle (calculated)
(Final minutes of flight)

Interpretation

The track log commenced at 1119:35 hrs, with the glider at the threshold of the easterly grass runway. The glider was then launched to an altitude of 1,080 ft (about 850 ft gl) and flew to the east of the airfield ('Point A' in Figures 1 and 2). Having descended, after launch, to an altitude of about 825 ft (600 ft agl), the pilot then flew a continuous series of clockwise thermalling turns, climbing at an average rate of 150 ft/min, carried to the west by the wind. Analysis of this period of thermalling flight indicated an average bank angle[5] of about 21° and an average airspeed of about 39 kt.

At 1129:05 hrs the glider was at 'Point B', about 220 m to the east of the airfield's western boundary at an altitude of 1,640 ft (1,400 ft agl). It then flew north, still climbing and made a turn to the right; at 'Point C' the aircraft reached its maximum altitude of 1,750 ft (1,540 ft agl), with airspeed calculated as about 36 kt, and a bank angle of about 18°. The glider then started to descend rapidly, reaching a rate of about 4,000 ft/min (~66 ft/sec). After six seconds, and at an altitude of 1,180 ft (970 ft agl), the descent was arrested and the glider recovered to about 1,270 ft (1,050 ft agl) with the airspeed stabilised at about 45 kt.

The glider then flew north for a further 30 seconds before making a gradual right turn towards the airfield; it was 0.7 nm from the airfield and at an altitude of 1,260 ft (940 ft agl) ('Point D'). A few seconds later, with the airspeed at about 40 kt, it started to descend at a rate of about 600 ft/min (10 ft/sec) ('Point E') and as the glider descended, the airspeed also slowly reduced. About ten seconds later, at 'Point F' and 1,170 ft (930 ft agl), it started a gradual right turn at a bank angle of about 20°. After 14 seconds the descent rate briefly reduced to about 200 ft/min and the glider then descended rapidly, at a rate of about 4,500 ft/min (75 ft/sec) before impacting the ground[6]; the time of impact was 1131:51 hrs.

Flight recorder altitude recording

The flight recorder incorporates an internal sensor for the measurement of pressure altitude. The unit was taken to the manufacturer where the pressure altitude recording function was demonstrated to be accurate to within 35 ft when set at altitudes of 2,000 m (6,562 ft) and below. A test simulating a rapid descent was also conducted. The unit tracked the descent profile with an average accuracy of 43 ft.

Engineering

Aircraft information

The DG-100 is a single-seat 15 m wingspan sailplane of glass-fibre construction. It has a 'T-tail' configuration, with an 'all-flying' tailplane, which is equipped with full span trailing edge anti-balance/trim tabs. The aircraft is fitted with airbrakes, which operate on the wing upper surfaces.

G-DDFN was constructed in 1976 and the most recent aircraft log book entry, which was for the Annual Inspection and Airworthiness Review Certificate (ARC), was dated 18 May 2012, with the ARC expiring on 15 June 2013. The most recent flight listed in the log book occurred on 12 April 2012, with the aircraft at a total of 1,127 hours and 1,093 launches.

Footnote

5 The calculated bank angle is based upon a level, balanced turn having been flown. The bank angle referenced in this report is an approximated value only.

6 At impact, the flight recorder GPS-derived position was in error by 75 m north of the actual impact site. The flight recorder continued to operate after the impact, during which, the GPS position gradually updated to that of the actual impact site. It is most likely that this error was a result of optimal satellite reception having been lost during the final descent, with the aircraft in a spin. As such, the accuracy of the groundspeed and calculated airspeed may not be relied upon during the final descent.

Accident site details

The aircraft had crashed into a field of standing barley approximately 0.5 nm north of Drumshades airfield. It was a compact site and the marks on the ground made by the aircraft, together with the disposition of the wreckage, indicated a steep nose-down attitude at impact. The mark made by the outer portion of the right wing leading edge was heavily bowed, curved up towards the tip. The aircraft nose had broken off in the impact and was buried in the ground to a depth of around 0.6 m. and orientation of the nose indicated an impact heading of 310º, although it was apparent that the aircraft had subsequently rotated to the right by approximately 70º. The mark made by the outboard portion of the left wing reflected the fuselage rotation and was straight rather than bowed. The fuselage was partially broken open where the wings were attached but had remained intact aft of this point.

The evidence at the site was consistent with the aircraft being in a spin to the right at impact, with initial ground contact being made by the right tip, followed by the nose and, finally, the left wing. The bowed shape of the right wing imprint is likely to have been made as a result of the leading edge progressively contacting the ground as the aircraft rotated.

Both airbrakes were found in their extended positions. The associated operating linkage was distorted at several locations, caused by contact with adjacent parts of the airframe, for example the wing root structure at the point through which each airbrake operating rod passed. The positions of these distortions relative to the structure indicated that the linkage had been displaced towards the 'airbrakes open' limit of the available travel, indicating that the airbrakes had been deployed at the time of the impact. In the cockpit, the airbrake handle is a short steel tube welded at approximately 90º to the operating rod, which moves in a fore-aft direction in a slot on the left side of the cockpit. The plastic cover from the handle was found on the cockpit floor and the handle itself had been distorted in a forward direction, indicating that the pilot may have had his hand on the airbrake control at the time of the impact.

Detailed examination of wreckage

Following an on-site inspection, the aircraft wreckage was recovered to AAIB's facility at Farnborough for a more detailed examination, principally of the structure and flying control system. This examination showed that all the damage to the structure and flying control system was consistent with the final impact with the ground and did not indicate any pre-existing defect or failure.

The airspeed indicator was mounted in the instrument binnacle in front of the pilot; although the glass face was broken, it was otherwise intact. After being connected to a calibrated pitot tester it was found to be accurate to within 2-3 kt. Much of this discrepancy was accounted for by a loose indicating needle, which most probably was a result of the mechanism being subjected to a severe blow during the impact.

The connection of the static vent to the airspeed indicator terminated in chambers within layers of fibreglass on either side of the nose. These were checked and found to be free from obstructions.

In summary, the examination of the aircraft did not reveal any evidence of a pre-impact failure or defect that could have had a bearing on the cause of the accident.

Airbrake deployment prior to final descent

A copy of the flight recorder record was provided to the aircraft manufacturer, to determine whether the airbrakes had been open in the moments prior to the final descent, when the rate of descent had been 600 ft/min and the calculated airspeed was about 40 kt ('Point E' in Figures 1, 2 and 3). The manufacturer concluded that either the airbrakes had been open, or the aircraft had experienced rapidly sinking air at this point.

An evaluation flight was flown in the same model at a similar weight to that of the accident flight. With the airbrakes in the fully open position and the rate of descent established at between 650 ft/min and 700 ft/min, the airspeed stabilised at about 50 kt. The manoeuvre was flown twice, with the same result. It was also found that if the airbrake handle was unlocked and the pilot then released his grip of the handle, the airbrakes would open to between one-quarter and one-third of their fully open position when the aircraft was at an airspeed of 40 kt and in wings-level flight, such as preceding the second spin.

Analysis

The pilot was properly licensed to conduct the flight and the aircraft, as far as could be established, was serviceable. The weather was suitable for the flight being undertaken and the pilot had carried out the necessary flight planning.

From witness reports and the track log data, it appears that the winch launch and initial thermalling flight were normal, with an average climb rate of about 150 ft/min. The average airspeed in this period was only a few knots above the '1g' stalling speed for the glider, about 36 kt, but this is usual for a glider in weak soaring conditions, with the pilot trying to fly at close to the 'minimum sink' airspeed. However, at about 'Point C', turning to the right, the speed probably decayed and the glider entered a spin, from which the pilot was able to recover. The height loss during the recovery was 500 ft.

After that initial spin, the pilot flew to the north before making a turn to the right onto a south-south-easterly track. From the flight evaluation manoeuvres performed later, the combination of rate of descent and airspeed suggests that the airbrakes may have been fully open at that stage, likely to have been a deliberate action by the pilot. At this point, it appears that the pilot was probably returning to the gliding site, perhaps as a result of a medical problem or the unsettling experience of the inadvertent spin, to join the circuit on the downwind leg at the normal initial height of 500 ft agl. At 'Point F' the glider was at 930 ft agl so using the airbrakes to lose the height would have been reasonable. At 'Point H' the glider was still at 750 ft agl and levelled off in a turn to the right. Whether this was intended to be another orbit to lose more height is not known but the airspeed was about 40 kt, still close to the stall. It could not be determined whether the airbrakes had been closed or were still extended to some degree at this point - but the glider entered a second spin from a height of 750 ft agl and did not recover. It is possible that the airbrakes had remained open, or they opened unintentionally because they had not been fully 'locked' after the intentional descent. In either case, this would have caused an increase in the stalling speed as well as increasing the height needed to recover. The airbrakes were found to be open at impact and although unlikely, the pilot may have opened them during his attempted recovery from the spin.

The post-mortem examination of the pilot identified a heart condition but it is unlikely that this would have contributed to the accident, although this, or another medical effect, could not be ruled out. Further, it is reasonable to assume that the pilot, having entered and recovered from the first spin, would have paid particular attention to ensuring that a safe airspeed was maintained. The fact that the pilot appears not to have retracted and locked the airbrakes when levelling off, and allowed the airspeed to decay, may further indicate that the pilot's performance was in some way impaired.

Conclusion

The investigation concluded that the glider entered a spin due to the low airspeed whilst turning to the right, with the airbrakes extended to some degree. No specific reason was identified for the decay in airspeed leading to this spin. The aircraft did not recover from the spin and the extension of the airbrakes may have delayed the spin recovery.

ACCIDENT

Aircraft Type and Registration:	Schempp-Hirth Nimbus-3 glider, G-EENN
No & Type of Engines:	None
Year of Manufacture:	1981 (Serial no: 9)
Date & Time (UTC):	4 September 2012 at 1233 hrs
Location:	Portmoak Airfield, Scotlandwell, Kinross
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Fatal) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	FAI Gold C Certificate and 2 Diamonds
Commander's Age:	49 years
Commander's Flying Experience:	1,325 hours (of which at least 100 were on type) Last 90 days - 1 hour Last 28 days - 1 hour
Information Source:	AAIB Field Investigation

Synopsis

The glider was being winch launched from a grass airfield. At an early stage of the launch the right wing tip contacted the ground, the left wing lifted and the glider cartwheeled to the right before coming to rest, inverted. The pilot was fatally injured.

Three Safety Recommendations are made to the European Aviation Safety Agency and the British Gliding Association concerning cable release mechanisms.

History of the flight

On the morning of the accident the pilot travelled from his home to Portmoak Airfield, where his glider was kept in a trailer. During the morning he rigged the glider himself and then towed it behind his car to the launch area. Two winch cables were laid out for use, a southern one and a northern one. He positioned his glider ready for the launch approximately 31 metres to the south of the southern cable, in order to avoid a marked area of bad ground. When he was ready for the flight the winch operations had finished for the morning so he waited in his glider for the launching to resume.

The weather conditions were clear with a gusty wind from the south-west at an average speed of 18 kt. An 18 kt wind at 20° off the runway direction (Runway 27) would give a crosswind component of 6 kt.

At approximately 1230 hrs the winch operator was ready to resume. Two student glider pilots walked out from the clubhouse to assist with the launch. The first one, the wing holder, spoke with the pilot to check he was ready and hooked the southern winch cable onto the glider. He then picked up the right wing tip to steady it in preparation for the launch. He commented, afterwards, that the wing was moving up and down considerably in the wind but that he was still able to hold it. When the pilot indicated that he was ready, the wing holder gave the 'take up slack' followed by the 'all out' signals.

The second student, the signaller, was in the launch hut, positioned approximately 60 metres from where G-EENN was launched. He advised the winch operator of the type of glider, using a handheld radio, and relayed the 'take up slack' and 'all out' to the winch operator by the use of light signals. The winch operator did not have a clear view of the gliders at the launch area, because of a slight rise in the ground, but he could see the gliders as soon as they became airborne.

During the launch, the wingtip holder was unable to keep pace with the glider for more than a step or two before he had to release the wing. As soon as he let go he saw the right wing drop towards the ground, then lift up again. The wing then dropped again and the wingtip ran along the ground. He expected the pilot to release the winch cable, but the launch continued with the right wing running along the ground. After a short period, the left wing lifted and the glider briefly became airborne before cartwheeling and coming to rest upside down.

The wingtip holder ran over to the pilot who was trapped under the aircraft and tried to assist by lifting up on a wing. Finding the glider was too heavy, he attempted to help the pilot, who was trapped under the aircraft, but realised that he had suffered fatal injuries.

Airfield information

Portmoak is an all-grass airfield with two separate runways, 27/09 to the north, and 28/10 to the south, divided by a paved track. The northerly runway is generally used for aerotowing and the southerly for winch launches.

The airfield has a weather station which is mounted on top of the clubhouse and records the wind parameters once a minute. The conditions recorded at the time of the accident are shown in Table 1.

Time (hr/min) GMT	Wind speed (kt)	Gust speed (kt)	Direction (°M)
1226	18	18	248
1227	16	16	248
1228	14	16	248
1229	13	12	248
1230	14	21	248
1231	17	21	248
1232	16	16	248
1233	16	16	248

Table 1

Recorded wind speed and direction

Pilot information

The pilot had been gliding for more than thirty years and had attained a Fédération Aéronautique Internationale (FAI) Gold 'C' Certificate with 2 diamonds. He had owned this glider for 2 to 3 years and had flown it regularly during the summer months, using both aerotows and winch launches. His flights were typically in excess of two hours duration.

In the 12 month period preceding the accident the pilot had recorded in his personal log book 59 hours of flight time with 17 launches, 9 of which were winch launches, all at Portmoak. The most recent flight entered in this log book was for 26 May 2012.

The aircraft log book recorded that there were no flights in June or July 2012.

The Portmoak club records for the pilot showed that he had undertaken one winch launch on 9 August 2012 with a flight duration of 12 minutes. No evidence was found of any other flights made by the pilot between 26 May 2012 and 4 September 2012.

Medical and pathological information

The pilot was employed as an Air Traffic Controller (ATCO) and held a valid European Class 3 medical certificate for ATCO duties.

A post-mortem examination revealed that the pilot had died as a result of multiple injuries, including a severe head injury, consistent with having been caused at the time the glider crashed. A consultant aviation pathologist advised that the injuries suggested an impact deceleration in excess of 80g and that no additional or alternative personal safety equipment would have affected the outcome.

Aircraft information

Description of glider

The Nimbus-3 is a single-seat high-performance glider constructed from carbon fibre and fibreglass with a maximum takeoff weight of 750 kg. It has a 25.5 m wing span and conventional flying controls operated by a control column and rudder pedals. It is also equipped with airbrakes, trailing edge flaps and a single-wheel, retractable, main landing gear. The wing tips are angled upwards and rubbing strips are fitted on the lower surface of each wing close to the wing tip. The glider can also carry water ballast in integral tanks fitted inside each wing. In G-EENN the pilot was secured by a four-point harness. For winch launches, the cable is attached to the cable release mechanism situated beneath the cockpit, just in front of the main wheel. On G-EENN the cable was released by the pilot pulling on a yellow coloured 'T' handle located just in front, and to the left, of the control column. A photograph of the cockpit of G-EENN, taken by a previous owner (Figure 1), shows the position of the cable release and rudder pedal adjustment controls.

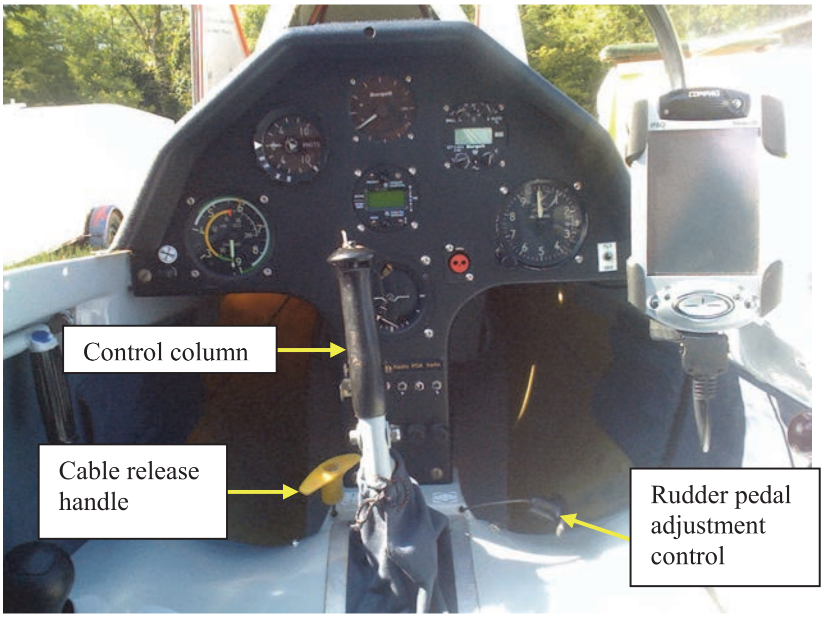


Figure 1

Photograph of the cockpit in G-EENN taken several years prior to the accident

The cable release mechanism will also automatically back-release the cable if the glider over-flies the winch with the cable still attached.

Description of the winch

A Skylaunch winch was used to launch G-EENN. This type of winch is equipped with controls that allow the operator to preset the 'glider type' and the headwind component of the surface wind, thereby providing a suggested winch speed. For the Nimbus-3 it is suggested that the 'glider type' should be set at 'A-'. These presets position a gate in the throttle quadrant that introduces a resistance to the movement of the throttle beyond the suggested takeoff position; the operator can still move the throttle through this resistance. During the launch the operator watches the glider and moves the throttle forward until he feels the resistance. He then uses his experience to control the launch speed by adjusting the position of the throttle. Once at a safe height, the glider pilot may signal a low launch speed by lowering the aircraft nose or a fast launch speed by yawing the glider.

The procedure to launch a glider is as follows (Figure 2):

- The headwind is selected on (A).
- The glider type is selected on (B).
- The cable drum is selected.
- Once the operator receives the signal to 'take-up slack' he moves the transmission selector lever (C) from neutral to drive and the cable starts to wind in slowly.
- Once the operator receives the signal 'all out' he moves the throttle (D) to the gate, the winch engine accelerates and the glider is launched.
- The winch is equipped with a guillotine (E) that, in an emergency, can be used to release the cable at the winch. The winch cable brake (F) is not used during the launch.

Following the accident, the preset for the headwind component was found to be set at 15 kt and the 'glider type' was set at 'B'. The weak link fitted to the launch

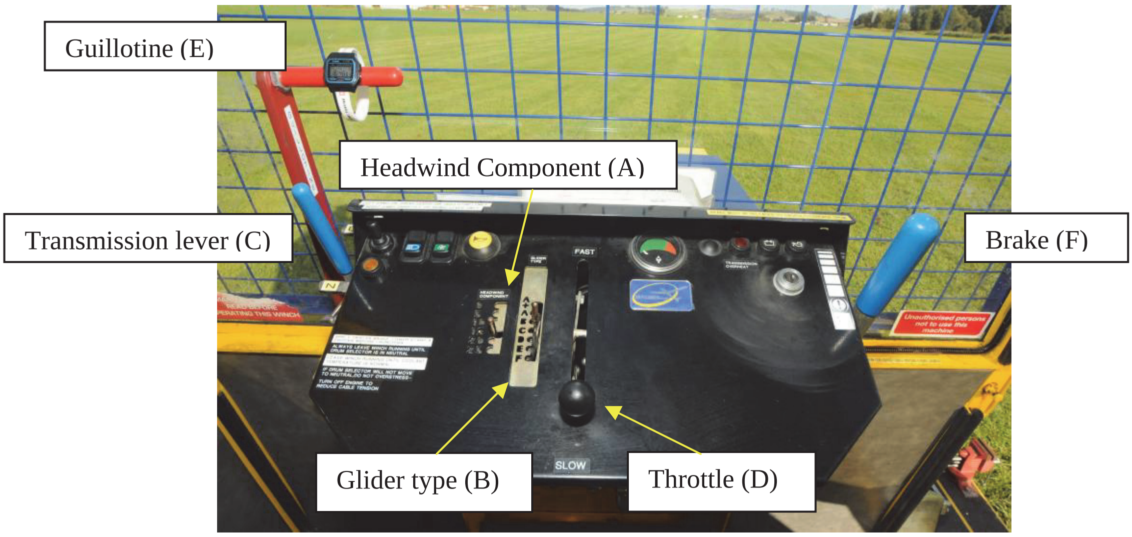


Figure 2

Winch controls

cable was coloured red, which signified that it was rated at 750 daN. This was within the Nimbus-3 design requirement that the weak link used in the winch cable should have a maximum breaking force of 910 daN.

A representative from the winch manufacturer advised that he considered the settings used for the launch of G-EENN were appropriate and he would expect the glider to become airborne in approximately 30 m and within 3 to 4 seconds.

At Portmoak, launch signals are relayed by light signals to the winch operator from a launch hut positioned alongside the launch area.

Accident site

At the time of the accident, the airfield had been set up such that the winch was situated at the western end of the southern grass runway and the launch hut was sited 916 m away, approximately 75 m from the eastern perimeter track. The gliders were launched from the south side of the launch hut on a heading of 277° and the two winch cables were identified as the 'south' cable and the 'north' cable. The grass in the vicinity of the launch site was reasonably short and was not considered to be a factor in the accident.

The winch cables were pulled to a position marked by two cones and flags with sufficient space for a glider to be launched from either side of the cones. An area of soft ground adjacent to the cones was marked by two tyres. G-EENN was launched from the southern position using the 'south' cable and from the ground marks it was established that at the start of the launch it was approximately 60 m from the launch hut. After the accident the 'north' cable, which was still in the position where both cables had been delivered, was found to be approximately 30 m north of the position from where G-EENN was launched (Figure 3).

G-EENN came to rest in an inverted position approximately 100 m from its launch point. The pilot, who remained secured in the cockpit by his harness, had sustained a fatal head injury. Marks in the grass were consistent with the right wing rubbing along the ground for a distance of 29 m during which the heading changed from around 277° to 317°. The marks reappeared after several metres and ran for a further 22 m before

Figure 3

Launch area at time of the accident, looking north-west disappearing when the glider would have been on a heading of 341°. The ground marks and wreckage trail indicated that the glider impacted the ground in a nose-down inverted attitude, approximately 35 m from the last mark made by the wingtip. The glider then bounced twice before coming to a halt.

Examination of the glider

The glider was examined prior to being moved and was assessed as being in a serviceable condition at the time of the accident, with no evidence of there having been a mechanical control restriction. When tested, the cable release operated when the release handle was pulled and the back-release system was found to operate correctly. There was no water ballast in the glider. From the wreckage it was not possible to establish the position of the flaps at the time of the accident.

Photographs of the launch

A number of photographs were taken of the launch sequence and from the metadata it was possible to establish the time that each image was captured. The first photograph showed the glider in a level attitude with the wingtip holder holding the right (downwind) wing. The airbrakes were closed and the winch cable was connected. The second photograph, taken 24 seconds later, is reproduced at Figure 4 and shows the glider airborne with the wing tip rubbing along the ground. The airbrakes are still closed, the left aileron is deflected upwards and the right aileron is deflected downwards. The winch cable has just released, the angle of bank is estimated to be approximately 40° to the right and the glider's cockpit is at a height of approximately 20 ft. The third photograph was taken one second after Figure 4 and shows the glider in a very steep nose-down attitude, just prior to it impacting the ground. It was not possible to determine from the photographs the precise flap setting, but they were at, or close to 0º.

Testing

Tests were carried on a Nimbus-3 glider with a similar cockpit layout to G-EENN to establish if it is possible for the pilot to operate the winch cable release handle without restricting the movement of the control column.

The winch cable release handle fitted to the test glider had a much longer operating cable, which was contained in a black conduit, than the handle fitted on G-EENN (Figure 5). Therefore the tests were carried out using the black rudder pedal adjustment handle, which although situated on the opposite side of the control column, was more representative of the winch cable release handle fitted on G-EENN. The pilot who operated the controls during the tests was approximately six foot tall and of average build.

During the tests the flaps were set at +1° and the outboard trailing edge of the right flap was used as a reference point against which to measure the position of the trailing edge of the adjacent aileron. The position of the control column was measured with reference to a point in the cockpit.

Figure 4

G-EENN, cable just released

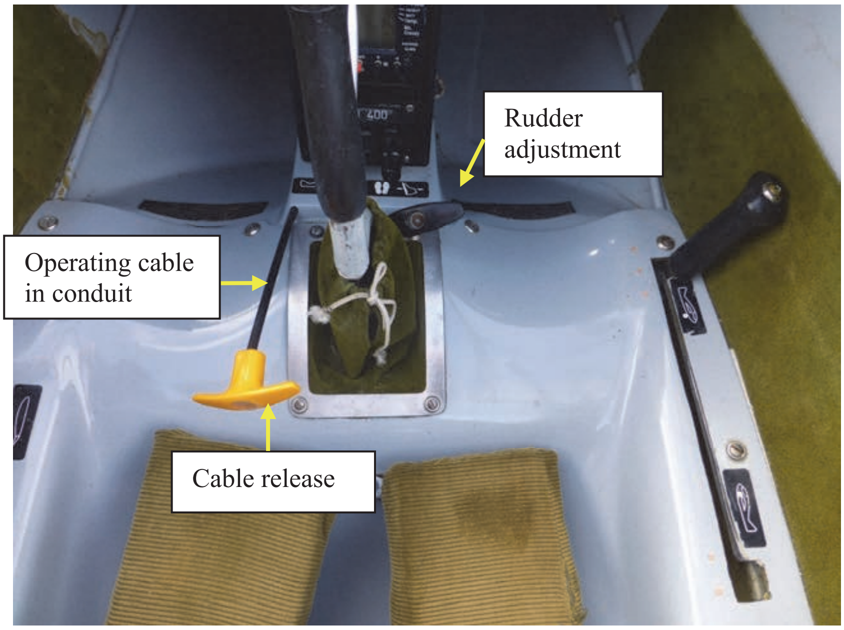


Figure 5

Cockpit layout in glider used in test

In the first test the range of movement of the right aileron trailing edge was established with the control column in the neutral, full right (full up) and full left (full down) position. In the second test the pilot used his left hand to hold the control column while he moved the control column as far as he could to the right; the position of the aileron (restricted up) and control column was measured. The control column was then moved fully left the same distance that the pilot had been able to move it to the right. The position of the aileron (restricted down) was measured. The results are:

Neutral	5 mm up
Full up	30 mm up
Full down	7 mm down
Restricted up	18 mm up
Restricted down	2 mm down

The tests showed that when the pilot kept his hand on the rudder adjustment handle, movement of the control column to the right was restricted by the control column making contact with his right hand, which was constrained by his leg (Figure 6). The maximum distance that the control column could move corresponded to the aileron surfaces moving approximately 55% of their full range. When the test was repeated using the winch cable release handle equipped with the longer operating cable contained in the black conduit, the control column and ailerons could be moved through their full range of travel.

The release mechanism on another model of glider, from the same manufacturer, was examined and it was noted that the cable release handle was in the same location as on G-EENN. On this glider it was assessed, given the length of the operating cable, that some pilots might not be able to operate the cable release without restricting the range of movement of the ailerons. The investigation was advised that similar arrangements exist on some other gliders. However, not all gliders are fitted with a 'T' handle and some, for example, use a spherical knob, which can be difficult to operate quickly. The investigation was advised that some pilots attach a lanyard to the release mechanism.

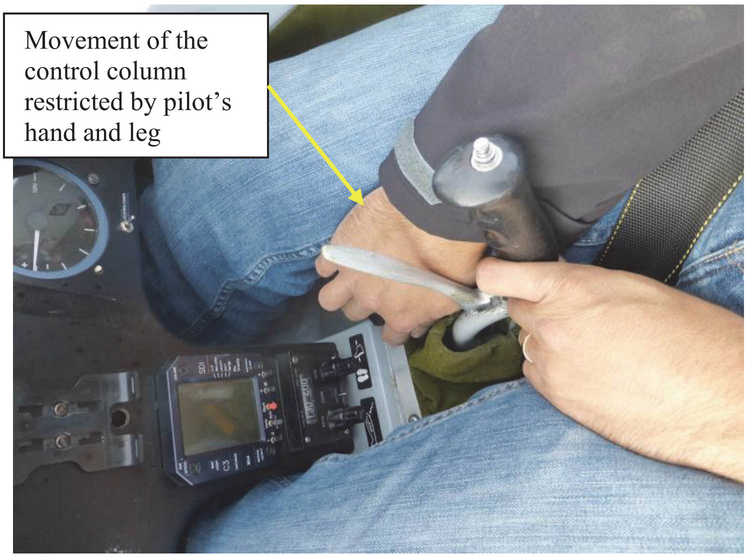


Figure 6

Movement of control column restricted by pilot's hand

Previous winch launch accidents

Schleicher ASW 20L, September 2006

In September 2006 a Schleicher ASW 20L glider, BGA 4354, was launched from Runway 13 at Keevil airfield. As the glider became airborne its right wing tip made contact with the ground and it rolled uncontrollably to the right and came to rest in an inverted attitude. The pilot was fatally injured. The winch cable remained attached to the glider throughout the accident sequence. With regard to the location of the cable release handle the AAIB accident report[1] records:

> *'The application of left aileron would properly have made it difficult to reach the release handle and operate it in the very short time available to regain control of the aircraft….it is possible that he was unable (Pilot) to apply sufficient force to it (release handle) to release the winch cable, especially if he was simultaneously applying full left aileron.'*

Figure 7 shows the location of the cable release on a Schleicher ASW 19 glider, which has a similar arrangement to the ASW 20L. The photograph was taken with the control column in the full left position.

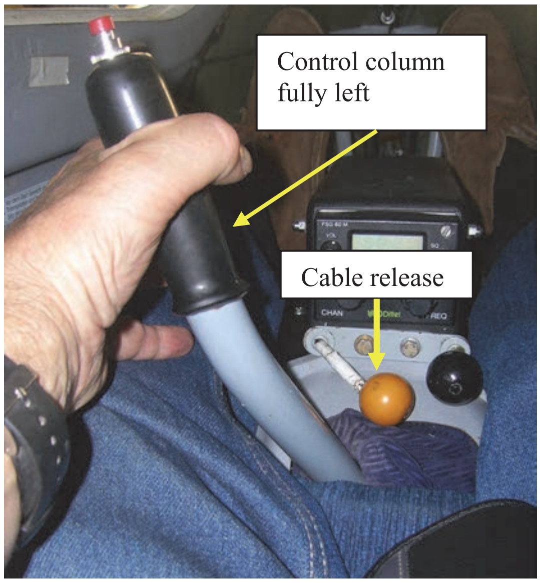


Figure 7

Location of cable release on ASW 19 glider

Footnote

[1] AAIB report BGA 4354, 23 September 2006, EW/C2006/09/06. Published in AAIB Bulletin 08/2007.

Nimbus-2 in September 2007

A Nimbus-2 glider was involved in a similar accident[2] in 2007 when the left wingtip contacted the ground during a winch launch and the aircraft cartwheeled. The pilot was seriously injured in the accident. He commented afterwards that he had not realised that the wing had touched the ground during the launch. He also said that he had considered that, in the event that the wing did touch the ground, there could be time for a stop signal to be sent from the signaller (launch controller) to the winch operator.

Certification standard

Under European legislation, each aircraft type is categorised as either an EASA Type Certificated (TC) aircraft, which is subject to European airworthiness regulations, or an EASA Annex II aircraft, which are subject to National airworthiness regulations. In April 2012, approximately 2,350 EASA TC and 500 Annex II gliders operated in the UK. The Annex II gliders operate under a British Gliding Association (BGA) Certificate of Airworthiness under the delegated approval of the Civil Aviation Authority.

The Nimbus-3, which is classified as an EASA TC aircraft, was originally certified against Joint Aviation Authority JAR-22[3]. With regard to cockpit controls, the current specification for cockpit controls detailed in the EASA Certification Standard for Sailplanes and Powered Sailplanes, (CS) 22.777, states:

'(b) The controls must be located and arranged so that the pilot, when strapped in his seat, has full and unrestricted movement of each control without interference from either his clothing (including winter clothing) or from the cockpit structure. The pilot must be able to operate all the controls necessary for the safe operation of the aeroplane from the seat designated to be used for solo flying.

(c) In sailplanes with dual controls it must be possible to operate the following secondary controls from each of the two pilots' seats –

(1) release mechanism ……………………;'

Dynamics of a wing drop

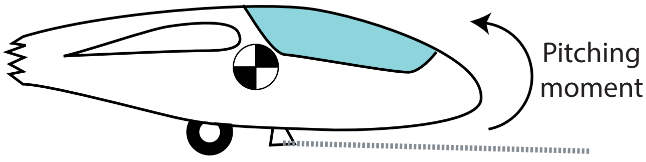
The dynamics of a winch launch involve a number of complex forces and moments that can quickly develop and place the glider in an unrecoverable situation. Some of the factors that cause these forces and moments are:

Location of the release hook

The hook used for winch launching is normally located below and forward of the glider Centre of Gravity (C of G) (Figure 8a). If the hook is located along the centre of the lower fuselage, then during the launch the force on the cable will initially attempt to rotate the glider nose upwards about the C of G. If the hook is off-set from the centre line, or the winch cable is set at an angle to the glider's heading, then there will be an additional rolling moment during the launch once airborne (Figure 8b). In general, the greater the misalignment between the glider and the winch cable the greater the rolling moment.

Footnote

2 Investigated and reported by the BGA.
3 April 1980, Change 1.



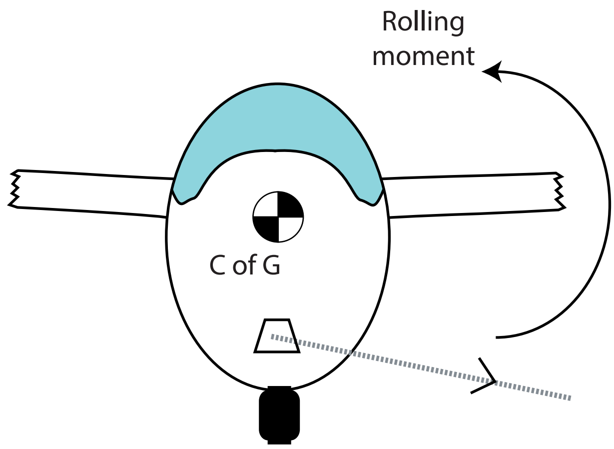


Figure 8a and 8b

Location of winch hook

Wing tip in contact with the ground

The drag from a wing tip running along the ground will impart a yawing moment in the direction of the dropped wing. The longer the wing span the greater the yawing moment. There is also a risk that the wing tip will dig into the surface, even at relatively low speeds, and cause the glider to ground loop or cartwheel. The speed of the glider, shape of the wing tip and the texture and softness of the ground are all variables that will determine the outcome of a wing drop.

Offset cable

If the winch cable is not aligned with the glider then the glider may yaw towards the direction of the cable during the initial acceleration. The length of the grass, surface texture and the amount of misalignment between the cable and glider will all contribute to the rate and amount of yaw.

Crosswind

The glider will attempt to weathercock into the wind, principally due to the fin. The direction and strength of the crosswind can either improve or worsen the yawing effect of a misaligned cable or offset hook.

Aerodynamic factors

As the glider yaws, the outer wing travels faster than the inner wing, thereby generating a potential dissymmetry of lift that causes a rolling moment towards the inner wing. With the glider yawed, the forward fuselage may partially blank the inboard section of the inner wing causing a reduction in lift, which contributes to the rolling moment towards the inner wing. As the glider rolls towards the inner wing, the angle of attack and the lift on the outer wing will reduce thereby helping to counter the rolling moment. Moving the ailerons to counter the rolling effect will reduce the lift and drag on the outboard wing, which might reduce the yawing moment. The use of rudder to counter the yaw may also contribute to the rolling moment.

Example of a wing drop

A wing drop accident can be considered in two phases; start of launch and weight-off the main wheel. In this example the release hook is mounted along the longitudinal axis, there is a crosswind from the left, the winch cable is offset to the right and the right wing tip is on the ground (Figure 9).

Start of the launch

As the winch cable is wound in, the glider will accelerate along the ground and yaw rapidly to the right, about its main wheel, to align with the direction of the cable. The left wing will produce more lift than the right wing causing a rolling moment to the right. Releasing the cable at this early stage may prevent an accident.

While the crosswind will have the effect of countering the yaw to the right by 'weathercocking' the glider into the direction of the wind, the drag on the right wing tip will increase as the glider's speed increases, which further increases the yawing and rolling moment to the right. There is an increasing risk that the wing tip will dig into the ground and the glider's momentum will cause it to ground loop or cartwheel.

Weight off the main wheel

With a modern winch the weight will come off the main wheel approximately three to four seconds after the start of the launch sequence. With the main wheel off the ground, and the winch cable offset from the glider's heading, the force from the winch cable will introduce a rolling moment (R_c) about the glider's C of G (Figure 10).

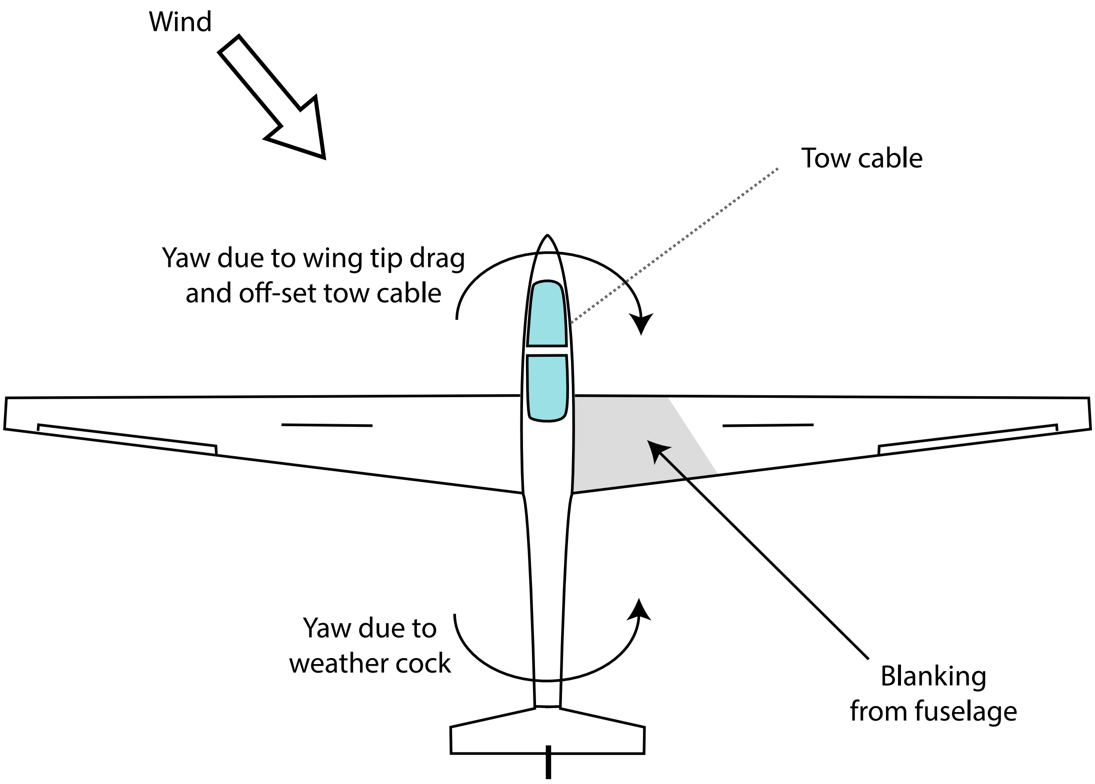


Figure 9

Example of winch launch dynamics

This rolling moment acts in addition to the aerodynamic effects (R_L), and further increases the down load and drag on the right wing tip. The risk of an accident and injury to the occupants will have substantially increased.

Wing off the ground

Once the glider gains sufficient height for the right wing tip to leave the ground then the combination of the roll and yaw may cause it to enter a sideslip that will further increase the yawing and rolling momentum. At some point the momentum and attitude of the glider is such that the glider can not be recovered and an accident is inevitable.

BGA safety initiatives

In 2005, following a study and analysis of winch launch accidents, the BGA identified winch launching as a target area for the reduction of accidents. In October 2005 the BGA Safe Winch Launching Initiative was started. This campaign was aimed at reducing the numbers of winch launch accidents by raising awareness through the distribution of information and advice to pilots. A follow-up analysis showed that for the first three years of the campaign the rate of accidents appeared to have reduced markedly, but that in the fourth year the rate increased.

On the *'Safe Winch Launching'* page of the BGA website there is a note that accidents resulting from power loss during launch, for example cable break or winch failure, have declined dramatically but:

> *'Cartwheeling accidents - predominantly to experienced pilots - are still happening as a result of not releasing the cable if the wing drops during the ground run'*

The *'Safe Winch Launching'* booklet, available on the same site, contains the following advice:

> *'If you need to release you must be able to do that instantly. That means being strapped in tightly, with no soft cushions, and with your hand firmly on the release. It is important to understand that "if you cannot keep the wings level, release immediately" means release before the wing touches the ground.'*

The BGA produced an educational DVD in 2012, for distribution to all instructors. The material includes a presentation entitled *'Stop the Drop'* which specifically addresses the avoidance of wing-drop accidents. The opening slide notes:

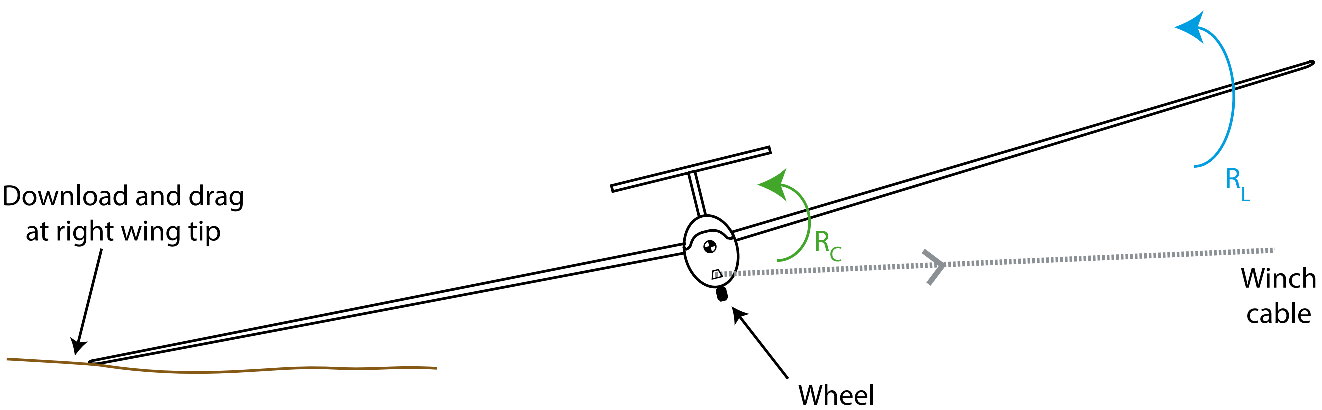


Figure 10

Rolling moment due to offset winch cable

> *'The aim of this presentation is to help you to stop wing drop accidents whether you are in the glider or not.'*

The presentation includes material on the circumstances that may lead to a wing drop and ways of anticipating or avoiding it, for example the advice that:

> *'If glider is offset from cable by more than one wingspan, move the glider closer before launch.'*

Analysis

A winch launch is a very dynamic process during which the glider accelerates rapidly and becomes airborne in a short space of time. In this accident, during the launch, the right wing touched the ground and there was a loss of directional control. The situation developed very rapidly, to a point from which the glider was not recoverable.

Glider and winch

It was assessed that at the time of the accident the glider was serviceable. The glider's weight and balance, the winch operation, cable and weak link, were considered not to have been factors in the accident.

Accident sequence

The ground marks indicated that shortly after the start of the launch, the glider started to veer to the right and the right wing rubbing strip ran along the ground for approximately 29 m before the mainwheel left the ground. The right wing tip then ran along the ground for a further 22 m. The photograph at Figure 4 showed that the winch cable had released by a height of approximately 20 ft; but it was not possible to establish if the pilot released the cable, or whether the back-release mechanism had operated. The glider's heading had changed by approximately 67° before it cartwheeled about the right wing and impacted the ground in a nose-down, inverted, attitude.

The ground marks from the right wing are consistent with the experience of the winch manufacturer that the glider should become airborne in approximately 30 m and 3 to 4 seconds. With this information, and the metadata on the last two photographs of the accident flight, it is estimated that the total flight time was around 5 to 6 seconds. It was assessed that it was around 4 seconds from the start of the launch until the cable released, by which time glider was in an unrecoverable attitude.

Directional control

The directional control of the glider during the launch would have been influenced by a number of factors. The surface wind was from approximately 20º to the left of the launch direction and varying in strength between 12 kt and 21 kt. The wind direction could have had two different effects, inducing a tendency to weathercock to the left, and a tendency to lift the left wing.

The starting position of the glider, to the south of the winch cable, would have caused an initial pull to the right as the launch started and the cable straightened. The rapid acceleration of the glider meant that the wing holder was not able to hold the wing for more than one or two paces. The right wing then dropped to the ground and, once on the ground, created drag, increasing the tendency to turn to the right.

The left wing would now be developing greater lift than the right, and any wind from the left at this stage could also cause the left wing to lift. Once the main wheel left the ground the pull from the cable acting below the C of G of the glider would have imparted an additional rolling moment to the right.

Release of the winch cable

The advice from the BGA is that if the wing touches the ground during the launch then the pilot should immediately release the winch cable. Although the right wingtip of G-EENN contacted the ground at an early stage of the launch, the cable was not released and the launch continued. The investigation examined possible reasons why the pilot did not, or could not, release the cable until it was too late.

One reason that should be considered is that the pilot may not have initially been aware that his wing tip was on the ground. This type of glider has a long wing and only a small roll angle is required before the wing contacts the ground.

The pilot was an experienced glider pilot, although he had made only one flight in the previous three months. The BGA analysis suggests that experienced pilots may be more prone to not releasing the winch cable early enough, though the reasons for this are not clear. It may be that there is a greater tendency based on their own past experience with aerotows, with slower accelerations, to believe that a wing drop can be corrected. It could also be that at the time of their ab-initio training, there was a different emphasis on the need to have one hand securely on the release handle during a winch launch.

The cable release handle in G-EENN was fitted in a position such that the pilot would probably not have been able to keep his hand on it and still achieve full roll control authority. It is not known whether he was in the habit of keeping his hand on the release during a winch launch, but if not, there was the potential for a critical delay in operating the release handle.

Stopping the launch

The winch operator was too far away to be able to see what was happening at the early stages of the launch and would have needed to receive a 'stop' signal. There is provision for a 'stop' signal to be sent to the winch operator but the relay of such a signal would need to be made as soon as any launch problem became apparent. The time to signal, and for action to be taken, would be very short, and while it might work in some circumstances, it would not be a reliable method. On this occasion both the wing holder and the launch signaller saw the wing touch the ground but events then developed quickly, so it is unlikely that either of them had time to consider and make a 'stop' signal. Therefore, the responsibility to release the cable would have to rest with the pilot.

Moving the cable

One of the factors in the accident was the pilot's decision to move the cable a considerable distance away from where it had been laid out, presumably in an attempt to avoid an area of wet ground. The offset of the cable would have generated several adverse effects as the launch progressed, all of which would have contributed to the right roll, and made recovery to wings level difficult or impossible. Whether he considered these effects, and how they would have affected the launch when he moved it, is not known.

Choice of launch

There have been several previous winch launch accidents involving gliders with large wing span. The Nimbus-3 is a heavy glider with a particularly long wing and it may be that there is a greater likelihood of a wing touching the ground during takeoff, perhaps without the pilot's being aware of it. By contrast, during an aerotow there may be time for the pilot to correct a wing-drop situation, but in the case of the winch launch, time is more critical.

The choice for a pilot between a winch launch and an aerotow may be influenced by many factors and it could be that there is a relatively higher risk with a winch launch, although aerotow carries separate risks. Overall, there does not appear to be enough data to determine the relative safety of a winch launch compared to an aerotow.

Safety action

The BGA has identified winch launching as a target area for improving safety and have provided comprehensive information on their website. This safety initiative is continuing and is likely to be the most effective method of informing pilots of the pitfalls associated with winch launching and the best practice to avoid them. Therefore no safety recommendation is made in this area.

Safety Recommendations

The current EASA certification standard for Sailplanes and Powered aircraft does not specify that operation of the cable release mechanism should not restrict the range of movement of the flying controls. Therefore the following Safety Recommendation is made to the EASA

Safety Recommendation 2013-008

It is recommended that the European Aviation Safety Agency amend the certification standard for Sailplanes and Powered Sailplanes (CS 22) to include the requirement that the cable release mechanisms can be operated at any stage of the launch without restricting the range of movement of any flying control.

To ensure that action is taken to review the operation of the cable release mechanism on gliders that operate on an EASA Certificate of Airworthiness, the following Safety Recommendation is made to the EASA:

Safety Recommendation 2013-009

It is recommended that the European Aviation Safety Agency require that Type Certificate holders of EASA Type Certificated gliders ensure, where practicable, that the cable release control can be operated at any stage of the launch without restricting the range of movement of any flying control.

At the time of this accident there were approximately 500 EASA Annex II gliders operating in the UK, under BGA Certificates of Airworthiness. To ensure that action is taken to review the operation of the cable release mechanism on these gliders, the following Safety Recommendation is made to the BGA:

Safety Recommendation 2013-010

It is recommended that the British Gliding Association ensure that, where practicable, the cable release control on EASA Annex II gliders can be operated during any stage of the launch without restricting the range of movement of any flying control.

AAIB correspondence reports

These are reports on accidents and incidents which were not subject to a Field Investigation.

They are wholly, or largely, based on information provided by the aircraft commander in an Aircraft Accident Report Form (AARF) and in some cases additional information from other sources.

The accuracy of the information provided cannot be assured.

ACCIDENT

Aircraft Type and Registration:	Cessna 402B Utililiner, G-NOSE
No & Type of Engines:	2 Continental Motors Corp TSIO-520-EB piston engines
Year of Manufacture:	1975 (Serial no: 402B-0823)
Date & Time (UTC):	14 March 2013 at 1102 hrs
Location:	Shrivenham, Oxfordshire
Type of Flight:	Aerial Work
Persons on Board:	Crew - 1 Passengers - 2
Injuries:	Crew - None Passengers - None
Nature of Damage:	Minor damage to right emergency exit door
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	27 years
Commander's Flying Experience:	3,000 hours (of which 250 were on type) Last 90 days - 54 hours Last 28 days - 20 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

As the aircraft descended through 4,500 ft, at 170 kt, the right emergency exit door departed the aircraft. No injuries were caused by the release of the door, which was found on the driveway of a domestic property. A reason for the release of the door could not be positively determined.

History of the flight

The aircraft had been tasked for an aerial photography sortie in the Swindon area. The crew for the flight consisted of the pilot, an observer sitting in the left cockpit seat and an experienced aerial photographer, seated by the right emergency exit door, in the rear of the aircraft. During the pre-flight checks the security of all of the aircraft doors was checked by the pilot and no abnormalities were noted. After completion of the survey the pilot turned the aircraft to return to East Midlands Airport and initiated a decent from 5,800 ft to 4,000 ft. The aircraft's airspeed increased from 140 kt to 170 kt and as the aircraft descended through 4,500 ft the pilot heard a loud bang and felt a distinct change in air pressure. The photographer reported that the right hand emergency exit had departed the aircraft. The pilot declared a PAN and slowed the aircraft to 140 kt before completing an uneventful flight to East Midlands.

The emergency exit door was found, relatively undamaged, on the driveway of a domestic property in Shrivenham. There were no reported injuries.

Cessna 402B emergency exit door

The right emergency exit door fitted to G-NOSE consisted of a windowed panel, approximately 60 cm x 100 cm, Figure 1. The door is fitted with a flange on its upper edge which locates in a groove in the upper door aperture. The lower edge of the door is secured by two locking pins which pass through lugs on the lower edge of the door. The locking pins are attached by a cable to the door release handle, located in a receptacle on the cabin wall, immediately below the door. The locking pins are prevented from disengaging from the door lugs by two shear pins. Pulling the door release handle breaks the shear pins and withdraws the locking pins from the door lugs. It also operates an arm on the lower edge of the door aperture which pushes the door away from the fuselage side. A 'tell-tale' wire is fastened between the lever arm and the aircraft structure which breaks if the lever arm moves from its normal, stowed position.

Figure 1

G-NOSE right emergency exit door

Investigation

Examination of the door confirmed that there was no evidence of adverse wear to the door attachment flange or to the two securing lugs. An inspection of the aircraft, carried out by the operator, confirmed that the door release handle had not been operated and was secure in its receptacle. The 'tell-tale' wire attached between the door release arm and the fuselage was found intact and the shear pins retaining the door locking pins were in place.

The photographer stated that, during the flight he had not noted any unusual noises or drafts coming from the door. He also confirmed that, when the door departed the aircraft, he was facing away from the door, switching off the camera equipment.

The door had not been the subject of recent maintenance and an inspection of the aircraft structure and door release mechanism did not identify any defects which would have allowed the door to be released without pulling the release handle.

There remains a possibility that the relative movement between the right exit door and the aircraft structure, coupled with dynamic flight loads, may have been sufficient to disengage the locking pins and release the door.

ACCIDENT

Aircraft Type and Registration:	Alpi Aviation SRL Pioneer 400, G-CGAJ
No & Type of Engines:	1 Rotax 912 ULS piston engine
Year of Manufacture:	2009 (Serial no: 01)
Date & Time (UTC):	17 December 2012 at 1029 hrs
Location:	Gloucestershire Airport
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to landing gear and left wing and flap
Commander's Licence:	Private Pilot's Licence
Commander's Age:	69 years
Commander's Flying Experience:	1,490 hours (of which 130 were on type) Last 90 days - 20 hours Last 28 days - 7 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

After the aircraft had taken off from a private strip, the pilot was unable to retract the landing gear or, subsequently, obtain down-and-locked indications. Anticipating that the gear was not fully locked down, he continued to his destination where the left main and nose landing gear legs collapsed following the touchdown. It is thought that maladjustment of the landing gear mechanism had caused failure of a main gear screwjack during the takeoff.

Description of the aircraft

The Alpi Aviation Pioneer 400 is a recent four-seat development of the Pioneer 300 light aircraft, which has two seats. G-CGAJ was undertaking the process of type appraisal by the Light Aircraft Association (LAA) with a view to the eventual issue of a full United Kingdom Permit-to-Fly.

The aircraft is fundamentally of wooden construction and features a retractable tricycle landing gear. Retraction and extension is by an electric motor which drives three screw jacks (one for each landing gear). When the legs are fully extended, the jacks operate overcentre mechanisms which lock the landing gear down. If the electric motor fails, for any reason, a hand crank can be used to drive the mechanism manually.

The indications for the landing gear are conventional. Three green lights illuminate when the landing gear is down and locked and a landing gear unsafe amber light indicates that it is in transit or unsafe. A red light and audio warning indicate that the landing gear is not locked down when the throttle is closed.

History of the flight

The aircraft departed from a private airstrip near Abergavenny, with two people onboard, for a flight to Gloucestershire Airport. After takeoff, the pilot selected the landing gear up but the landing gear actuator circuit breaker tripped. He reset the circuit breaker and it immediately tripped again. He then attempted to carry out the emergency manual landing gear procedure but was unable to move the landing gear up or down.

The pilot decided to continue to Gloucestershire Airport, where he considered the facilities were better able to deal with a possible emergency landing. Whilst en route, he made further attempts to lower the landing gear and succeeded in obtaining a green safe indication for the right main landing gear only, but with the GEAR UNSAFE amber light also illuminated. Upon arrival at Gloucestershire Airport, he performed a low circuit and requested a visual appraisal from the ATC Tower. He was advised that all three landing gear legs appeared to be down. The pilot therefore commenced an approach to Runway 22, stopping the engine with the propeller in the horizontal position before landing. At first, the touchdown appeared to be normal but then the left main landing gear, followed by the nose gear, collapsed and the aircraft veered off the left side of the runway, striking a disused concrete manhole cover and causing damage to the left wing and flap.

Examination of the aircraft

The aircraft was examined by an engineer from the LAA the day after the accident. He found that all three landing gear screw jacks had fractured, almost certainly because they had been subjected to loads through the landing gear due to the overcentre mechanisms not being made. It appeared that the left main landing gear jack had probably failed during the takeoff and that the motor end of the fractured screw had rotated for a few turns before jamming against the rear spar, causing the circuit breaker to trip. In this condition, the manual extension mechanism would not operate.

The LAA noted that such a system relies heavily on correct rigging and adjustment of the mechanical components and the various microswitches, both for correct system operation and also for early indication that the system may be going out of adjustment. A number of recommendations on this subject have been drawn up by the LAA for discussion with the aircraft manufacturer.

ACCIDENT

Aircraft Type and Registration:	BRM Citius, I-9631
No & Type of Engines:	1 Rotax 912 ULS piston engine
Year of Manufacture:	2008
Date & Time (UTC):	22 April 2013 at 1200 hrs
Location:	7 nm east of Swansea Airport
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to landing gear, right wingtip, propeller and fuselage
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	46 years
Commander's Flying Experience:	14,200 hours (of which 600 were on type) Last 90 days - 223 hours Last 28 days - 82 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft was one of two which encountered rapidly deteriorating weather conditions during a ferry flight. The pilot carried out a forced landing, during which the nose landing gear struck a surface obstacle, causing it to buckle and swing the aircraft into a bank. The pilot and his passenger were uninjured.

History of the flight

The aircraft was one of two which had been purchased in Italy and were being flown to Carlow in Ireland, where they were to be based and transferred to the Irish aircraft register. The aircraft were flying a leg between Exeter and Haverfordwest when they encountered deteriorating weather conditions. The forecast weather had included visibility of more than 10 km with a cloud base of 1,200 to 1,500 ft, occasionally lowering to 8 km and 800 ft.

As the aircraft approached Swansea, the weather ahead was worsening, and the pilot received a report from Swansea Airport of visibility between 3,000 m and 4,000 m, with a cloud base between 400 ft and 600 ft. The pilots of both aircraft decided to land at Swansea to await a weather improvement, but then encountered rapidly reducing visibility, leaving only the coastline below them visible. They descended to below 200 ft and followed the coast, before deciding that a forced landing on the beach was the only available option.

The pilot of I-9631 then identified a large area of open ground which was being worked on. It had a track running through it which was being used by trucks (it was later learnt that the site was being prepared for the construction of a university campus). He overflew the site, to check its suitability, and guided the second pilot to a safe landing. The pilot then landed his own aircraft. Although the landing itself was successful, the aircraft encountered a rock or ridge that caused the nose landing gear to buckle, swinging the aircraft into a bank. The pilot and his passenger were uninjured.

ACCIDENT

Aircraft Type and Registration:	Jodel D120 Paris-Nice, G-BKGB
No & Type of Engines:	1 Continental Motors Corp C90-14F piston engine
Year of Manufacture:	1964 (Serial no: 267)
Date & Time (UTC):	6 April 2013 at 1330 hrs
Location:	Near Rhigos Airfield, South Wales
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to right wing outboard
Commander's Licence:	Private Pilot's Licence
Commander's Age:	71 years
Commander's Flying Experience:	1,404 hours (of which 1,030 were on type) Last 90 days - 8 hours Last 28 days - 6 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft had just gone around because the pilot felt that his groundspeed was too high. As the aircraft turned onto the crosswind leg, the engine stopped suddenly. The subsequent forced landing in a field adjacent to the airfield was successful but the right wing was damaged when it struck a sheep although the animal did not appear to have been injured.

History of the flight

The aircraft was returning to Rhigos from Kemble, Gloucestershire. An approach was made to grass Runway 08 which is 600 metres long. Because of the possibility of soft ground, pilots were advised to avoid either end and instead use the middle section, which the pilot tried to do. However, having descended from 2,500 ft with carburettor heat applied, the eventual touchdown was judged by the pilot to be somewhat fast and he decided to go around, selecting full throttle and carburettor heat closed.

Because of the presence of power lines close to its eastern end, a circuit on Runway 08 requires a climbing turn to the right early in the takeoff sequence. The pilot commenced the turn but, as the aircraft was about 90º to the runway, the engine stopped abruptly and with no warning. He managed to complete the turn onto downwind and performed a forced landing in a field. Unfortunately the field contained sheep, one of which was struck by the right wing which suffered damage but the sheep appeared to escape without noticeable injury.

Using a combination of towing and taxiing under its own power, the aircraft was recovered onto the airfield. There was no immediately obvious reason for the engine failure but the maintainer of the aircraft has commented that the weather conditions were conducive to carburettor icing.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-161 Cherokee Warrior II, G-BTNE
No & Type of Engines:	1 Lycoming O-320-D3G piston engine
Year of Manufacture:	1981 (Serial no: 28-8116212)
Date & Time (UTC):	7 April 2013 at 1303 hrs
Location:	Earls Colne Airfield, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 3
Injuries:	Crew - None Passengers - None
Nature of Damage:	Severe damage to wings and fuselage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	48 years
Commander's Flying Experience:	182 hours (of which 31 were on type) Last 90 days - 8 hours Last 28 days - 6 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft touched down on Runway 24L at Earls Colne Airfield after a longer than normal flare. When the pilot applied the brakes the aircraft veered to the left onto the grass and struck two parked aircraft.

History of the flight

The pilot departed from Wellesbourne Airfield with three passengers to fly to Earls Colne Airfield. The weather was good, with a light surface wind from 190° at 05 kt and isolated scattered and broken cloud between 2,000 ft and 4,000 ft. The transit was uneventful and after passing over Clacton Airfield, the pilot contacted Earls Colne. He was passed the surface wind which was light and variable, with Runway 24L as the landing runway. This has an asphalt surface, 939 m long and 20 m wide, with an LDA of 778 m.

Having joined the circuit, the pilot established the aircraft on the final approach, but considered that he was high and executed a go-around. The second approach was normal and stabilised at 70 kt with two stages of flap selected. The aircraft was flared at the usual height but appeared to 'float' further than normal and the pilot estimated that he had used up half the runway length when the mainwheels touched down.

When the brakes were applied, the aircraft veered suddenly to the left. Despite the pilot's attempts to correct the heading with right rudder, the aircraft continued to the left onto the grass. He decided to go around and applied power but the wheels appeared to dig in and, although the aircraft accelerated, there was insufficient airspeed to take off. He closed the throttle and applied maximum braking, but was unable to prevent his aircraft from colliding with two aircraft in the parking area. The pilot isolated the fuel and electrical systems before all those onboard evacuated the aircraft through the normal exit.

The pilot assessed the cause of the accident as a loss of control on landing as he was unable to correct the veer to the left on the runway. This caused the aircraft to run onto the grass and despite his efforts to correct the situation he was unable to avoid the parked aircraft.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28R-180 Cherokee Arrow, G-AWAZ
No & Type of Engines:	1 Lycoming IO-360-B1E piston engine
Year of Manufacture:	1968 (Serial no: 28R-30512)
Date & Time (UTC):	7 April 2013 at 1645 hrs
Location:	Elmsett Airfield, Suffolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to propeller, nosewheel doors and exhaust pipe
Commander's Licence:	Private Pilot's Licence
Commander's Age:	61 years
Commander's Flying Experience:	377 hours (of which 280 were on type) Last 90 days - 1 hour Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft was returning to Elmsett following a recreational flight of about 20-25 minutes. The pilot reports that, after a normal approach, he called finals at about 2 miles, selected the landing gear down and applied two stages of flap. Slowing to 80 mph, he applied the third stage of flap and touched down on the mainwheels but, as he allowed the nose to lower, it continued to drop and he heard the propeller strike the ground before the aircraft slid gently to a stop.

The pilot was surprised that the nose gear had collapsed because he felt that he had made a "text book" landing. When the maintenance company arrived to recover the aircraft, they were able to manually extend the nose gear and move it into downlock, following which it was towed to a hangar. The pilot could not recall whether he had seen the 'three greens' indication which would be expected for a correctly locked landing gear.

The maintenance company have reported that, having raised the aircraft on jacks, numerous selections of the gear resulted in the nose gear locking down normally and all indications and audio warnings functioned correctly. No pre-existing mechanical or electrical faults have been identified.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28R-201 Cherokee Arrow III, G-OARO
No & Type of Engines:	1 Lycoming IO-360-C1C6 piston engine
Year of Manufacture:	1988 (Serial no: 2837006)
Date & Time (UTC):	26 March 2013 at 1200 hrs
Location:	Bembridge Airport, Isle of Wight
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Shock loading to engine, damage to landing gear, right wing and propeller
Commander's Licence:	Private Pilot's Licence
Commander's Age:	61 years
Commander's Flying Experience:	371 hours (of which 10 were on type) Last 90 days - 3 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot reduced engine power too early on short finals, causing the aircraft to sink and strike soft ground before the paved runway surface. The aircraft, which suffered substantial damage, continued forward onto the runway and was taxied clear before being shut down.

History of the flight

The pilot departed from Wycombe Air Park for the flight to Bembridge, flying in company with another aircraft. The occupants of both aircraft were members of the same group; the passenger on the accident aircraft was also a pilot and it was intended that he would act as pilot-in-command for the return leg to Wycombe.

The pilot was familiar with Bembridge, having last flown there some seven weeks earlier in a Cessna 172. The flight proceeded normally in fine weather conditions. The pilot identified an easterly wind and planned to land on Runway 12, a hard runway 837 m long and 23 m wide, with a threshold displaced by 24 m. The runway was the same width as that at the pilot's home base at Wycombe, but 100 m longer.

The pilot attempted to contact Bembridge on their Air/ Ground frequency but received no reply. As the aircraft neared the airfield, he saw that the circuit was clear and proceeded to position for Runway 12 while making blind radio transmissions. The aircraft turned left onto final approach but was somewhat high and slightly fast. The pilot corrected, and reported regaining the ideal approach path at about 1 nm from the runway, with speed reducing to approach speed.

The pilot throttled back just before the aircraft reached the paved runway surface. It sank and struck the soft ground before rolling onto the runway. Although the nose landing gear had evidently been damaged, the pilot was able to taxi along the runway before vacating and shutting down. A later inspection of the threshold area showed that the aircraft had touched down about 18 m short of the runway, creating deep ruts in the soft ground. It was judged that most of the aircraft damage had occurred as it transitioned from the soft ground to the hard runway.

The pilot reported that he had reduced power too early, causing the aircraft to land short. The soft ground had added to the severity of the damage caused when the aircraft made contact with the edge of the paved surface.

ACCIDENT

Aircraft Type and Registration:	Rockwell Commander 112, G-BDLT
No & Type of Engines:	1 Lycoming IO-360-C1D6 piston engine
Year of Manufacture:	1975 (Serial no: 363)
Date & Time (UTC):	2 February 2013 at 1450 hrs
Location:	Lee-on-Solent Aerodrome, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to nose landing gear, propeller and engine mounting
Commander's Licence:	Private Pilot's Licence
Commander's Age:	42 years
Commander's Flying Experience:	137 hours (of which 13 were on type) Last 90 days - 10 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot was completing his third flight of the day, and his second landing that day at Lee-on-Solent Airfield. The weather was fine, with a northerly surface wind of 18 kt; Runway 05 was in use. During the landing roll, the aircraft veered to the left and the pilot was unable to regain control through use of the rudder pedals. The aircraft left the paved surface and encountered soft ground at the runway edge, causing the nose landing gear to dig in and collapse.

ACCIDENT

Aircraft Type and Registration:	Flight Design CTSW, G-DEWE
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2009 (Serial no: 8435)
Date & Time (UTC):	6 April 2013 at 1320 hrs
Location:	Old Sarum Airfield, Wiltshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Serious) Passengers - 1 (Minor)
Nature of Damage:	Severe damage to forward fuselage and fin
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	77 years
Commander's Flying Experience:	1,574 hours (of which 183 were on type) Last 90 days - 3 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft bounced slightly on landing. The pilot opened the throttle to assist with controlling the aircraft, but the engine did not respond. After a series of pitch excursions, the nose landing gear collapsed and the aircraft inverted.

History of the flight

The aircraft was landing at Old Sarum following a flight from Dunkeswell Airfield near Exeter. The purpose of the 50 minute flight had been to check the operation of a recently installed oil thermostat system. The pilot contacted Old Sarum at about 10 nm range, and positioned for an approach to Runway 06. He flew a low drag, low power descent, in order to check that oil temperature was maintained. He checked the engine response during the descent, and it was satisfactory.

The weather conditions were fine, with an estimated surface wind from 070° at 15 kt. The pilot experienced turbulent air, so flew the final approach 10 kt faster than usual, with a reduced flap setting. He flared the aircraft and flew level above the runway to slow down. The aircraft dropped onto the runway on its main wheels, causing it to make a small bounce. The pilot opened the throttle to assist with controlling the bounce, but the engine did not respond. The aircraft then entered a series of divergent pitch excursions, resulting in collapse of the nose landing gear. The propeller dug into the grass runway surface and the aircraft inverted.

The pilot and his passenger were both wearing full harnesses. The passenger vacated the aircraft and assisted the pilot, who needed help to extricate an arm from his harness. The pilot was taken to Salisbury Hospital and found to have suffered slight damage to a vertebra, while his passenger escaped with a minor cut.

ACCIDENT

Aircraft Type and Registration:	Mainair Sports Blade 912 (G-BZDD)
No & Type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2000
Date & Time (UTC):	20 April 2013 at 0920 hrs
Location:	Scone Airfield, Perth
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to pod, front and rear struts and propeller
Commander's Licence:	Student Pilot
Commander's Age:	55 years
Commander's Flying Experience:	44 hours (of which 3 were on type) Last 90 days - 0 hours Last 28 days - 0 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

At a late stage of the approach to Runway 27 at Scone Airfield, the student pilot encountered a significant change in wind, which was reported as being from 250° at 8 kt. The aircraft was pushed left then right, and the pilot applied full power in an attempt to go around. However, the aircraft sank and struck the runway before veering off to the right. The pilot, who was wearing a lap harness and protective helmet, was uninjured.

ACCIDENT

Aircraft Type and Registration:	Pegasus Quik GT450, G-GTJD
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2006 (Serial no: 8183)
Date & Time (UTC):	8 February 2013 at 1418 hrs
Location:	Perth Airport, Scotland
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Nosewheel damaged and tyre deflated
Commander's Licence:	Student
Commander's Age:	51 years
Commander's Flying Experience:	33 hours (of which 16 were on type) Last 90 days - 8 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft touched down heavily on its nose landing gear deflating the nose gear tyre. The aircraft became airborne again and the pilot initiated a go-around. The aircraft subsequently landed without incident. The pilot attributed the event to a failure to flare the aircraft during the final stages of the approach to land.

ACCIDENT

Aircraft Type and Registration:	Skyranger Swift 912S(1), G-CGKZ
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2010 (Serial no: BMAA/HB/596)
Date & Time (UTC):	2 April 2013 at 1500 hrs
Location:	Tarn Farm, Cockerham, Lancashire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to propeller, nosewheel, lower engine cowl and windscreen
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	68 years
Commander's Flying Experience:	277 hours (of which 28 were on type) Last 90 days - 6 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft made a normal approach to the runway but as the pilot flared for touchdown, he experienced a strong gust of wind from the right. The right wing lifted and the nosewheel and left mainwheel struck the ground heavily. The nose landing gear collapsed and, after a short distance, the aircraft nosed over onto its back. Both occupants were able to exit the aircraft without difficulty.

History of the flight

Two pilots were carrying out a series of flights in order to maintain their recency. The accident flight was the fourth flight of the day and the commander's second; the preceding three flights were uneventful.

Tarn Farm airfield has two grass runways orientated 02/20 (310 m) and 10/28 (260 m). The weather was good, the surface wind generally 050° at 10 kt with occasional gusts, visibility in excess of 10 km, some broken clouds, temperature +7°C and a dew point of -4°C, QNH 1019 hPa. The Bowland Fells are some 5 nm to the east of the airfield and, when the wind has an easterly element, significant gusts and turbulence can be experienced. The windsock had indicated brief periods where the wind direction was from the east.

The aircraft departed from Runway 02 and climbed to the north before returning some 30 minutes later. The pilot decided to land on Runway 02 and joined the right-hand circuit downwind, configuring with two stages of flap and aft trim. The circuit was normal with a slight drift to the left on the final approach.

The pilot flared the aircraft at the normal height and was positioned for the correct touchdown point. As the aircraft was about to touch down, a gust of considerable force from an easterly direction lifted the right wing, causing the nosewheel and left mainwheel to contact the surface of the runway heavily. The nose landing gear collapsed and folded under, causing the aircraft nose to slide along the grass surface. The aircraft gradually slowed and, as it was about to stop, the nose dug in and the aircraft slowly nosed over onto its back and came to rest inverted. The pilot selected the fuel and electrical systems off and both occupants were able to exit the aircraft through the normal doors without difficulty.

The pilot assessed the cause of the accident as a sudden gust of wind, of considerable strength from the right, immediately before touchdown when the aircraft was at a very low height. The lifting of the right wing was sudden and the pilot was unable to correct the roll before the wheels struck the runway. Had there been more height, the pilot stated that he would have been able to correct the roll and initiate a go-around.

ACCIDENT

Aircraft Type and Registration:	Skyranger 582(1), G-CGMK
No & Type of Engines:	1 Rotax 582/48-2V piston engine
Year of Manufacture:	2009 (Serial no: BMAA/HB/491)
Date & Time (UTC):	6 April 2013 at 1450 hrs
Location:	Sackville Farm Airfield, Bedfordshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to nose landing gear and propeller
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	66 years
Commander's Flying Experience:	746 hours (of which 35 were on type) Last 90 days - 5 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The grass runway at Sackville Farm had been unusable for most of the previous three months due to snow and heavy rain. On the day before the accident, the pilot inspected the runway and was satisfied that, although the ground was still soft, it was suitable for microlight operations. The following day, several other aircraft were flying from the airfield. The wind was from 020° at about 7 kt and variable, giving a slight tailwind on occasions on Runway 31.

The flight was uneventful until final approach, when the pilot encountered a rising thermal. This necessitated a slipped approach, with the pilot recovering from the slip shortly before landing. Mindful of the soft ground, the pilot 'held off' to reduce airspeed to as low as possible, before making a normal touchdown. As he relaxed pressure on the controls, the aircraft decelerated rapidly as the nose leg dug into the surface and folded underneath the aircraft. At very slow speed, the aircraft continued to pitch nose down and inverted. The pilot was uninjured and vacated the aircraft without difficulty.

Miscellaneous

This section contains Addenda, Corrections and a list of the ten most recent Aircraft Accident ('Formal') Reports published by the AAIB.

The complete reports can be downloaded from the AAIB website (www.aaib.gov.uk).

BULLETIN CORRECTION

Aircraft Type and Registration:	Britten-Norman BN2B-20 Islander, G-SICA
Date & Time (UTC):	16 January 2013 at 1007 hrs
Location:	Lerwick/Tingwall Airport
Information Source:	Aircraft Accident Report Form

AAIB Bulletin No 6/2013, page 35 refers

The report in AAIB Bulletin 6/2013 stated in the first sentence in the **Synopsis**:

At the beginning of the takeoff roll, on an untreated runway surface contaminated with ice, the aircraft started an uncontrollable drift to the **left**.

This should have read:

> At the beginning of the takeoff roll, on an untreated runway surface contaminated with ice, the aircraft started an uncontrollable drift to the **right**.

Also, in the first sentence of the second paragraph in the **History of the flight**, it stated:

As the takeoff roll began, the aircraft started to veer to the **left**.

This should have read:

> As the takeoff roll began, the aircraft started to veer to the **right**.

TEN MOST RECENTLY PUBLISHED FORMAL REPORTS ISSUED BY THE AIR ACCIDENTS INVESTIGATION BRANCH

1/2010 Boeing 777-236ER, G-YMMM
at London Heathrow Airport
on 17 January 2008.

Published February 2010.

2/2010 Beech 200C Super King Air, VQ-TIU
at 1 nm south-east of North Caicos Airport, Turks and Caicos Islands, British West Indies
on 6 February 2007.

Published May 2010.

3/2010 Cessna Citation 500, VP-BGE
2 nm NNE of Biggin Hill Airport
on 30 March 2008.

Published May 2010.

4/2010 Boeing 777-236, G-VIIR
at Robert L Bradshaw Int Airport
St Kitts, West Indies
on 26 September 2009.

Published September 2010.

5/2010 Grob G115E (Tutor), G-BYXR
and Standard Cirrus Glider, G-CKHT
Drayton, Oxfordshire
on 14 June 2009.

Published September 2010.

6/2010 Grob G115E Tutor, G-BYUT
and Grob G115E Tutor, G-BYVN
near Porthcawl, South Wales
on 11 February 2009.

Published November 2010.

7/2010 Aerospatiale (Eurocopter) AS 332L Super Puma, G-PUMI
at Aberdeen Airport, Scotland
on 13 October 2006.

Published November 2010.

8/2010 Cessna 402C, G-EYES and
Rand KR-2, G-BOLZ
near Coventry Airport
on 17 August 2008.

Published December 2010.

1/2011 Eurocopter EC225 LP Super Puma, G-REDU
near the Eastern Trough Area Project Central Production Facility Platform in the North Sea
on 18 February 2009.

Published September 2011.

2/2011 Aerospatiale (Eurocopter) AS332 L2 Super Puma, G-REDL
11 nm NE of Peterhead, Scotland
on 1 April 2009.

Published November 2011.

Unabridged versions of all AAIB Formal Reports, published back to and including 1971, are available in full on the AAIB Website

http://www.aaib.gov.uk