

AAIB Bulletin

8/2017



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AAIB Field Investigation Reports

A Field Investigation is an independent investigation in which AAIB investigators collect, record and analyse evidence.

The process may include, attending the scene of the accident or serious incident; interviewing witnesses; reviewing documents, procedures and practices; examining aircraft wreckage or components; and analysing recorded data.

The investigation, which can take a number of months to complete, will conclude with a published report.

ACCIDENT

Aircraft Type and Registration:	Druine D.31 Turbulent, G-ARNZ
No & Type of Engines:	1 Volkswagen 1600 piston engine
Year of Manufacture:	1961 (Serial no: PFA 579)
Date & Time (UTC):	14 August 2016 at 1430 hrs
Location:	In the intertidal zone, Herne Bay Beach, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Damage to the wing and from salt water immersion
Commander's Licence:	Private Pilot's Licence
Commander's Age:	71 years
Commander's Flying Experience:	922 hours (of which 360 were on type) Last 90 days - 8 hours Last 28 days - 2 hours
Information Source:	AAIB Field Investigation

Synopsis

During the 'balloon bursting' element of a flying display on the coast, the engine lost power and the pilot ditched the aircraft in shallow water. The aircraft flipped inverted and the pilot was trapped in the cockpit by his lifejacket, which had inflated automatically, and his proximity to the sea bed. Two members of the public righted the aircraft and helped the pilot out of the cockpit. The pilot had suffered a minor injury. CAA Safety Sense Leaflet 21d, '*Ditching*', provides advice on the correct type of lifejacket to wear and guidance and information on ditching.

The investigation revealed that a fragment of balloon had become lodged in the carburettor restricting the airflow into the engine. An approved modification has since been developed to fit a screen to the intake of the carburettor.

History of the flight

The aircraft was one of a team of three Turbulent aircraft participating in the 2016 Herne Bay Air Show. The aircraft had assembled at Maypole Farm, where the pilots briefed for their display and walked through the routine they planned to carry out. Consideration was given to the fact that, because the display was taking place just offshore, adjacent to a congested area, the option in the event of an engine failure would probably be to ditch the aircraft in the sea.

The display routine proceeded normally until the 'balloon bursting' segment, for which the aircraft adopted a race-track pattern aligned with the display line. A member of the Turbulent Team ground crew, who had been pre-positioned in a small boat, released a series of balloons so that the team aircraft could burst them by flying into collision with them. The position of the boat was dictated by a light onshore breeze and the need for the aircraft to encounter the balloons at a height of approximately 500 ft asl. This was the usual height used, as the balloons stood out better against the sky at that height.

On his first run at a balloon, the pilot of G-ARNZ did not make contact with the target but on his second he hit a balloon "dead centre" with the propeller. He then continued around the race-track but, when established on the downwind leg, the engine power "much reduced". The pilot checked the instruments and controls but found nothing untoward. Both ignition systems were ON and their associated indicator lights were not flashing to indicate a fault. The throttle was operating normally, the carburettor air was selected to HOT and the fuel was ON. The engine continued running but at low power as the aircraft descended.

From a height of about 500 ft asl, the pilot assessed that it would not be possible to glide as far as open land inland of the seafront. So, he continued on an easterly track towards an area just off the beach, beyond the display area, where there were fewer people than along other parts of the seafront. He flew at a speed of approximately 60 KIAS and planned to stall the aircraft onto the water. His intention was for the aircraft's tail to touch the surface first, followed by the landing gear, so that the aircraft remained upright.

The aircraft's descent continued until it was a few feet above the water, when the pilot flared the aircraft to "hold off". The aircraft's mainwheels touched the water first and the drag they experienced caused the aircraft to pitch forward rapidly onto its back (Figure 1). Although the pilot was able to unfasten his straps, he found himself trapped in the cockpit, with his head close to the sea bed and insufficient space to manoeuvre himself out of the cockpit. Moreover, his automatic lifejacket had inflated and its bulk and buoyancy were pressing him up into the inverted cockpit.

Members of the public ran into the water and the first two to reach the aircraft lifted its tail up and successfully pitched the aircraft the right-way-up. The pilot, whose head had been submerged for about 20 seconds, was assisted out of the cockpit and on to the beach. He was aware of a small cut to his face, from impact with the canopy surround, but was otherwise physically unharmed and had remained conscious throughout his ordeal.

Recorded information

A video of the ditching was provided to the AAIB. The video showed people on the beach, some standing knee deep in the sea a few metres from the water's edge, and no-one swimming.

An indication of the distance of the aircraft from the beach can be gauged from the fact that the person who ran directly out to the aircraft from the water's edge took approximately 18 strides to reach it.



Figure 1

Inverted aircraft just prior to pilot's rescue

Meteorology

The weather was fine, with visibility of 10 km or more and no low cloud. The 1420 hrs METAR from Southend, on the opposite side of the Thames estuary, 20 nm west-north-west of Herne Bay, stated that the surface wind was from 350° at 4 kt, varying between 300° and 040°, and the temperature and dewpoint were 21° and 9° respectively. The light wind was causing ripples on the sea surface, which gave it visible texture.

The pilot

The pilot obtained a PPL(A) in 1988 and then joined the club which operated the Turbulent Team. He subsequently became a member of the team, gaining his first Display Authorisation in June 2007. Over subsequent years he has flown regularly as a member of the display team.

Aircraft description

The Druine Turbulent is a low wing monoplane, of conventional layout, constructed of wood and covered with fabric. This aircraft was originally built in 1961 and is fitted with a modified air-cooled, four-stroke automotive engine with a horizontally opposed four-cylinder arrangement and dual electronic ignition. A single carburettor provides the fuel air mixture. It is provided with a pilot-selectable carburettor heating system which allows hot air to be fed to the carburettor, from a heater muff surrounding an exhaust pipe, instead of its normal cold air supply. No filters were provided to either the cold or the hot air intakes.

The aircraft was operated on a Permit to Fly and its Certificate of Validity was in date.

Engineering examination

The aircraft was recovered from the sea intact but there was some damage to the wing leading edge. It could not be determined whether this was caused by the ditching or the subsequent recovery activity by members of the public. Initial examination did not identify any other anomalies with the aircraft.

Further detailed examination of the engine found a piece of balloon, approximately 50 mm in diameter, lodged in the air path of the carburettor (Figure 2).



Figure 2

Balloon fragment (orange) lodged in the carburettor air path

Survivability

The pilot's lifejacket

The pilot was wearing a 150 Newton (N) life jacket of a design intended for use in boats. He had selected an automatic design as he perceived this to be a desirable feature and wore it whenever flying over water.

CAA Safety Sense Leaflets

The CAA has published General Aviation Safety Sense Leaflet 21d, entitled '*Ditching*', which provides the following advice in the section headed '**Knowledge**':

*'Many automatically inflated lifejackets, used by the sailing community, are activated when a soluble tablet becomes wet. This type is **totally unsuitable** for general aviation use as it will inflate inside a water-filled cabin, thus seriously hindering escape.'*

This publication contains guidance on suitable lifejackets and further advice relating to ditching, covering knowledge, preparation and the practices to employ in the event of a ditching.

Analysis

Operations

The aircraft was involved in a flying display, as part of an air show on the north coast of Kent. Its pilot was a regular member of the display team, having gained his PPL(A) in 1988 and his first Display Authorisation in 2007.

The display proceeded normally until the 'balloon bursting' element. This part of the routine involved flying the aircraft around a racetrack pattern, aligned with the 'display line', and into a balloon which had been released from a boat below by another member of the display team. Having missed a balloon on its first pass along the display line, the aircraft was flown around the racetrack and struck a balloon with its propeller on the second attempt. As the aircraft continued around the racetrack, its engine suffered a loss of power and the pilot was unable to maintain height.

With insufficient range to reach open ground onshore, the pilot elected to ditch the aircraft beyond the display area and just off the beach, where there were fewer people than along other parts of the seafront. He intended to stall the aircraft on to the surface of the sea tail first, so that the aircraft remained upright. In the event, the main wheels touched the surface first and the aircraft pitched forward, coming to rest inverted in shallow water. The pilot, who had remained conscious found that his head was close to the sea bed. He released his harness but his lifejacket inflated automatically, as designed, and he was unable to extricate himself from his position in the cockpit.

Members of the public rapidly made their way to the aircraft and two of them righted the aircraft. The pilot, whose head had been submerged for about 20 seconds, was helped out of the aircraft and escorted ashore.

Survivability

The pilot was wearing a type of lifejacket intended for use in boats. The CAA's Safety Sense Leaflet 21d, entitled '*Ditching*', states:

*'Many automatically inflated lifejackets, used by the sailing community, are activated when a soluble tablet becomes wet. This type is **totally unsuitable** for general aviation use as it will inflate inside a water-filled cabin, thus seriously hindering escape.'*

The leaflet provides guidance on suitable lifejackets, and where to obtain them, and information and advice on the preparation for and practices to employ in the event of having to ditch an aircraft in water.

Engineering

A fragment of balloon was found lodged in the carburettor causing a significant restriction to the airflow through the carburettor, causing the loss of engine power experienced by the pilot.

Safety action

The operators of the aircraft developed a modification to fit a screen to the engine's carburettor intake, with the intention of preventing the ingress of similar debris to the balloon fragment. Should this screen become blocked, air can still be supplied to the carburettor via the alternative hot air supply, thereby allowing the engine to operate normally. After satisfactory testing, the modification was approved by the Light Aircraft Association.

Conclusion

During the 'balloon bursting' element of a flying display on the coast, the engine lost power and the pilot ditched the aircraft in shallow water close to the beach. On touchdown, the aircraft flipped inverted and the pilot was trapped in the cockpit by his lifejacket, which had inflated automatically, and his proximity to the sea bed. Two members of the public righted the aircraft and helped the pilot out of the cockpit. CAA Safety Sense Leaflet 21d, '*Ditching*', provides advice on the correct type of lifejacket to wear and guidance and information on ditching.

The investigation revealed that a fragment of balloon had become lodged in the carburettor restricting the airflow into the engine. An approved modification has since been developed to fit a screen to the intake of the carburettor, to prevent ingress of debris similar to the balloon fragment.

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.

INCIDENT

Aircraft Type and Registration:	Airbus A320-214, G-EZTK
No & Type of Engines:	2 CFM56-5B4/3 turbofan engines
Year of Manufacture:	2009
Date & Time (UTC):	20 January 2017 at 1430hrs
Location:	In cruise, between Paphos and Athens
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 169
Injuries:	Crew - None Passengers - None
Nature of Damage:	Avionics cooling fan bearing degradation
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	31 years
Commander's Flying Experience:	5,036 hours (of which 4,811 were on type) Last 90 days - 124 hours Last 28 days - 46 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and enquiries made by the AAIB

Synopsis

The aircraft was in the cruise at FL340 when the crew became aware of a sudden "whirring" noise emanating from beneath the cockpit and forward galley area. This was accompanied by a distinct electrical burning smell in the cockpit. After a discussion with the Senior Cabin Crew (SCC) member the commander decided to divert. The commander and co-pilot donned oxygen masks, declared a PAN and initiated a descent and diversion with ATC clearance. The aircraft landed without further incident and there were no injuries to the passengers or crew. The cause of the noise and source of the burning smell was found to be a bearing failure within the avionics bay cooling extractor fan.

History of the flight

The aircraft was on a scheduled flight from Paphos to London Gatwick. It was approximately 1.5 hours into the flight, cruising at FL340, when there was a sudden "whirring" noise and vibration emanating from the beneath the cockpit and forward galley area. The cabin crew were also aware of the noise. Approximately one minute later, the flight crew noticed a distinct electrical burning smell in the cockpit and this was confirmed by the SCC member. The decision was made to divert to Athens and the commander and co-pilot donned oxygen masks and declared a PAN. They then initiated a descent and diversion with clearance from ATC. The passengers were informed of the situation and the crew's intentions over the passenger address. During the descent the crew consulted the Quick Reference Handbook (QRH) smoke and fumes checklist and initial actions were carried out. In the

absence of other indications or Electronic Centralised Aircraft Monitor (ECAM) cautions, the crew decided not to put the aircraft into an emergency electrical configuration. The aircraft landed without further incident, although it was 1.5 tonnes overweight at 67.5 tonnes. There were no injuries to the passengers or crew and a normal disembarkation was carried out.

Engineering investigation

Engineering fault diagnosis found the avionics bay cooling extractor fan to have seized as a result of bearing failure. The component was replaced and the aircraft returned to service after completion of the overweight landing checks.

Fan bearing history

There are two fans within the avionics bay conditioning system, an extractor fan and a blower fan, both fans are of the same type.

In this type of avionic bay fan, a bearing failure leads to damage to the stator, rotor and body of the fan with rubbing and friction. This manifests itself as a rumbling noise, with vibration and a frictional burning smell as experienced during this incident.

A small number of premature avionic bay conditioning fan bearing failures within the A319/320 family of aircraft had previously been identified by the manufacturer. This resulted in the introduction of ceramic bearings, which significantly improve reliability. The aircraft in this case was fitted with fans running on ceramic bearings.

However, despite the change to ceramic bearings, although better than the conventional bearings, they remain the parts in the fan assembly which tend to wear first and are the main failure mode. Accordingly, a Vendor Service Information Letter (VSIL) was issued by the manufacturer with additional steps to introduce an advisory time between overhaul (TBO) of 10,000 flying hours on the fans. Overhaul kits were also been made available which enable operators to replace bearings during a C check or other convenient scheduled maintenance package.

Action taken

Failure of these fans is not considered to be a high-risk event and is unlikely to lead to additional system degradation provided simple actions are taken by the crew. However, of the two fans, failure of the blower fan was considered the least desirable scenario. Notwithstanding the VSIL, it was not immediately possible to overhaul all of the operator's 131 fans identified as being at risk and so a two phase mitigation policy was initiated in May 2016. Phase 1 was information gathering and the following criteria were applied to identify which fans were the priority for overhaul:

1. *Aircraft with both fans TBI > 20 000 FH (TBI time between inspection)*
2. *Blower fan TBI > 20 000 FH*
3. *Any unit repaired at least two times > 10 000 FH'*

The priority fans identified during Phase 1 determined the schedule for the Phase 2 overhaul programme with a planned throughput of 15 units per month.

G-EZTK extractor fan

The avionics bay cooling extractor fan (P/N EVT3454HC, S/N 164900827) fitted to G-EZTK at the time of its failure, on 20 January 2017, had accumulated 25,181 hrs time since new (TSN) and 14,181 cycles since new (CSN). However, because the blower fan it was paired with had only been fitted to G-EZTK in April 2016, the fans fitted to EZTK were not a priority, as determined in Phase 1. Therefore, this relatively high life extractor fan remained in service.

Further action

The aircraft operator continues to monitor fan life with an ongoing campaign targeting fans perceived as high risk, using criteria set by an analysis of in-service experience accompanied by manufacturer recommendations. To date, 82 of the 131 fans identified have been removed and overhauled. In addition, the operator will be participating in an in-service evaluation of a fan health monitoring unit. This equipment is designed to monitor vibration levels to give an early warning of possible bearing failure and to shut the fan down automatically when very high vibration is sensed to avoid critical failure that leads to smoke or burning smell events.

AAIB note

This incident and the fleet-wide actions taken to address this issue by the operator, based on the recommendations by the manufacturer, are consistent with those detailed in an AAIB report in the February 2016 Bulletin regarding a similar incident to Airbus 320-232, G-EUYE, on 27 July 2015 reference EW/C2015/07/03 .

SERIOUS INCIDENT

Aircraft Type and Registration:	Airbus A320-214, G-EZTM
No & Type of Engines:	2 CFM56-5B4/3 turbofan engines
Year of Manufacture:	2009 (Serial no: 4014)
Date & Time (UTC):	26 March 2017 at 1400 hrs
Location:	Stand 559, London Gatwick Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 7 Passengers - 161
Injuries:	Crew - None Passengers - None
Nature of Damage:	Fuselage and Door 1L damaged
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	26 years
Commander's Flying Experience:	4,100 hours (of which 3,834 were on type) Last 90 days - 79 hours Last 28 days - 31 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Whilst parked on stand and following maintenance action to resolve a brake system indication fault, the aircraft moved backwards and struck ground equipment, damaging the fuselage and Door 1L.

History of the flight

The aircraft was parked on stand and a brake system defect, which had occurred on the previous sector, was being investigated. As part of this process, Aircraft Maintenance Manual (AMM) Task 32-42-00-710-001-A Rev.55 was being actioned. This required the parking brake to be selected OFF. On completion of the task it remained in the OFF position, as there was no requirement in the task to select the parking brake ON again.

The flight crew had arrived at the aircraft prior to the maintenance activity and had completed their cockpit preparation checks, which included confirming the parking brake was ON. The flight crew were therefore unaware that the parking brake had been set to OFF as part of the later maintenance activity.

Prior to departure, with the forward steps still in position, the ground handling staff arrived and connected a tug, before removing the chocks as part of their pre-departure checks. The operator's procedures required the chocks to remain in place until all ground equipment is clear of the aircraft. The tug driver then realised the tug radio was not working and

disconnected the tug to replace it with a fully serviceable one. There was no communication with the flight crew at this point. When the tug was disconnected the aircraft moved backwards and struck the steps, causing damage to the aircraft fuselage and Door 1L. The flight crew noticed the aircraft was moving and applied the footbrakes to bring it to a halt.

There were no injuries and the occupants disembarked the aircraft via a rear door.

Conclusions

The aircraft was able to move as a result of:

1. Maintenance activity which had left the parking brake OFF after the flight crew had previously confirmed it as being ON as part of their cockpit preparation checks, and
2. Ground handling staff had removed the chocks before the ground equipment was clear of the aircraft, contrary to the operator's procedures.

When the tug was disconnected from the aircraft, there was nothing to prevent the aircraft from moving and colliding with the steps.

Safety actions

The operator's engineering department is reviewing the AMM task (32-42-00-710-001-A Rev.55) and will make recommendations to the aircraft manufacturer to amend the AMM accordingly.

The ground handling company has undertaken the following actions to prevent a recurrence:

1. Raised awareness of the event;
2. Retrained the staff involved concerning the correct chocking procedures;
3. The defective equipment local operating procedure has been re-issued to all staff to prevent inoperative equipment being available for use.

SERIOUS INCIDENT

Aircraft Type and Registration:	DHC-6 Series 310 Twin Otter, G-BVVK	
No & Type of Engines:	2 Pratt & Whitney Canada PT6A-27 turboprop engines	
Year of Manufacture:	1980 (Serial no: 666)	
Date & Time (UTC):	7 March 2017 at 1745 hrs	
Location:	Tiree Airport, Isle of Tiree	
Type of Flight:	Commercial Air Transport (Passenger)	
Persons on Board:	Crew - 2	Passengers - 7
Injuries:	Crew - None	Passengers - None
Nature of Damage:	No damage	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	55 years	
Commander's Flying Experience:	10,680 hours (of which 634 were on type) Last 90 days - 152 hours Last 28 days - 60 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The aircraft was conducting a scheduled flight from Glasgow to Tiree. After landing in marginal weather, the aircraft veered off the left side of the runway, crossed a short section of grass and came to rest on the cross runway.

History of the flight

The aircraft departed Glasgow at 1635 hrs on a scheduled passenger flight to Tiree, with two crew and seven passengers on board. The weather forecast indicated strong southerly winds at Tiree, with a cloudbase at about 500 ft and visibility between 2,000 and 4,000 m. The crew briefed for and executed a VOR/DME approach to Runway 23. While Runway 17 would have been more into the prevailing wind, it has no direct instrument approach and the cloudbase was below the minimum for a circling approach. The co-pilot was the PF for the approach, in accordance with the operator's Standard Operating Procedures(SOPS), with the commander taking control for the landing when visual with the runway.

On first contact with the Tiree AFISO, the crew were advised that the surface wind was from 160° at 24 kt, gusting to 35 kt. When the crew called established inbound, approximately five minutes prior to touchdown, the Tiree AFISO advised them the wind was 160°/27 kt. During the approach, the crew asked for two more wind checks. Two minutes before touchdown, the wind was given as 170°/25 kt and a wind check just before landing gave a wind of 170°/23 kt. These wind checks did not include any gust information.

The approach was uneventful and the commander took control when the runway became visual at an altitude of approximately 450 ft amsl (the Minimum Descent Altitude (MDA) was 410 ft). The crew described the landing as normal and the captain felt that the required control inputs were consistent with the crosswind. After touchdown, the left wing suddenly lifted as the aircraft decelerated and the aircraft veered to the left. Despite the application of full right rudder and left aileron, the aircraft continued to veer left for two or three seconds, before resuming a more normal attitude. The aircraft was then brought to a stop using normal braking, the crew believing that there had been a sudden strong gust of wind.

The airport crash alarms were sounded and the RFFS responded immediately but were quickly stood down. The crew recognised that they had departed the left side of the runway but considered they had remained on the asphalt area at the side of runway. They taxied the aircraft to the apron, with the RFFS in attendance, and shut down normally.

After shutdown, the captain accompanied airfield operations personnel while they checked the incident site. It became apparent that the aircraft had departed the paved area and crossed the grass (Figure 1). Consequently, the aircraft was taken out of service and remained at Tiree until an engineering inspection confirmed that there was no damage.

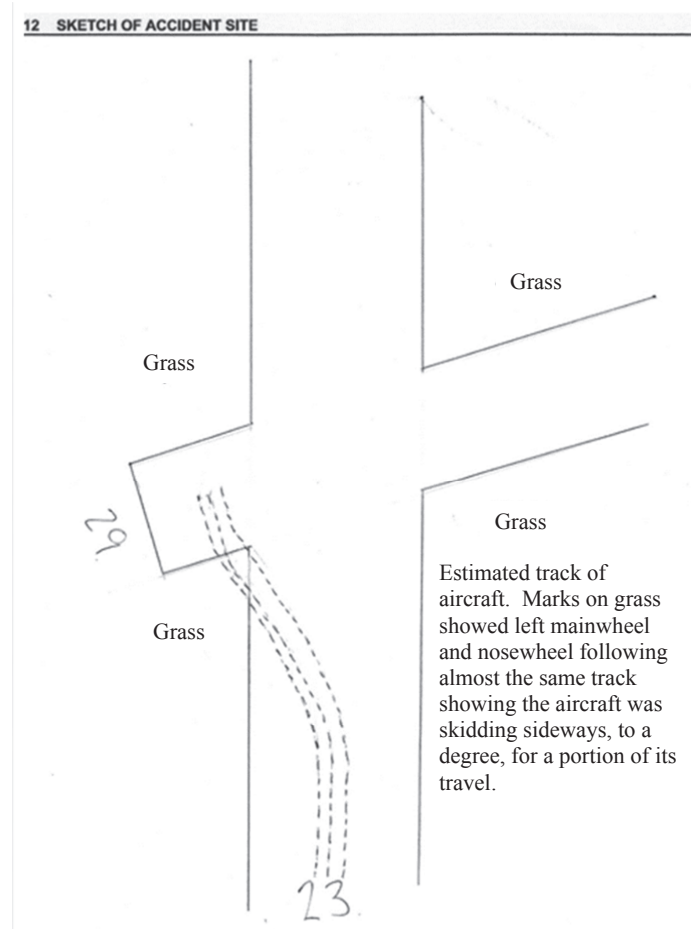


Figure 1
Commander's sketch of incident site

Aircraft performance

The manufacturer's Pilot Operating Handbook and Aircraft Flight Manual state that:

'Adequate controllability during landing has been demonstrated using full flap extension (37.5° flap) in crosswind components up to 25 KIAS measured at a tower height of 33 feet. This demonstration was made with both engines operating, on a dry runway. This is the maximum crosswind experienced during crosswind trials and is not considered limiting. Operators are encouraged to establish their own crosswind landing policies.'

The operator's policy is to consider 25 kt, including gusts, as a limit.

Meteorology

The meteorological records around the time of the incident were obtained from Tiree Airport. During the period leading up to the landing, there were regular gusts up to approximately 30 kt (Table 1), though this was not communicated to the crew after their first contact with the Tiree AFISO. The wind figures passed by radio to the aircraft were taken from the Runway 23 touchdown zone indicator, the output of which was not recorded. These may have differed from the recorded values, shown in Table 1, which were recorded by the Tiree Met Office sensor located near the threshold of Runway 11.

With regard to the reporting of wind speed by ATC, Civil Aviation Publication (CAP) 746, 'Requirements for Meteorology' states:

'4.10 The maximum wind (gust) within the last 10 minutes (or since the marked discontinuity) shall be reported only if it exceeds the mean speed by 10 knots or more.'

Date/time	Mean wind direction (°)	Mean wind speed (kt)	Max gust direction (°)	Max gust speed (kt)
07/03/2017 17:35	169.30	25.37	172.50	28.76
07/03/2017 17:36	170.00	25.69	169.60	29.44
07/03/2017 17:37	165.00	27.19	164.70	30.68
07/03/2017 17:38	164.30	27.70	161.20	30.88
07/03/2017 17:39	167.10	28.49	167.30	32.35
07/03/2017 17:40	165.20	28.14	160.30	31.03

Date/time	Mean wind direction (°)	Mean wind speed (kt)	Max gust direction (°)	Max gust speed (kt)
07/03/2017 17:41	167.20	24.71	164.80	29.79
07/03/2017 17:42	169.80	25.05	168.10	31.19
07/03/2017 17:43	167.10	21.04	168.60	25.42
07/03/2017 17:44	166.70	23.62	168.00	29.34
07/03/2017 17:45	167.20	24.67	167.40	30.62
07/03/2017 17:46	168.60	24.43	168.00	28.82
07/03/2017 17:47	167.10	21.85	166.00	27.22
07/03/2017 17:48	171.90	24.02	175.90	28.69

Table 1

Recorded wind information (approximate time of landing in red)

Analysis

Given the low cloudbase at Tiree Airport, there was no viable approach to a more into-wind runway than a VOR/DME approach to Runway 23. The flight crew were aware of a strong southerly wind from the forecast and from information passed to them by the Tiree AFISO, in accordance with CAP 746, including the possibility of gusts to 35 kt. During the approach, they requested two additional wind checks. These indicated that the wind was within their 25 kt crosswind limit, so the commander decided to land.

The crew considered that the aircraft response during the approach and landing was as they would expect for a crosswind of around 25 kt and they described the landing as normal. However, meteorological records showed that the surface wind at Tiree Airport was gusting to approximately 32 kt.

During the rollout, as the aircraft decelerated, it appeared to weathercock as the flight controls lost their authority.

Conclusion

Given the information they received, the crew believed the wind was within their limitations for landing. However, it is highly likely that the aircraft was affected by a strong gust of wind from the left during the landing roll. The event was sudden and briefly overcame

the controls, which were reduced in effectiveness due to the low airspeed. As a result, the aircraft veered sharply left and departed the paved surface. There were no injuries and no damage to the aircraft or the airfield infrastructure.

Tiree Airport has a policy of increasing the RFFS readiness state in marginal weather conditions. With the low cloudbase, strong crosswind and poor visibility they had done so for this incident flight.

ACCIDENT

Aircraft Type and Registration:	Aerotechnik EV-97 Eurostar SI, G-CHMW	
No & Type of Engines:	1 Rotax 914-UL piston engine	
Year of Manufacture:	2013 (Serial no: LAA 315B-15158)	
Date & Time (UTC):	7 May 2017 at 1125 hrs	
Location:	Brown Shutters Farm Airfield, Somerset	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Right and nose landing gear collapsed and propeller broken	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	54 years	
Commander's Flying Experience:	263 hours (of which 43 were on type) Last 90 days - 8 hours Last 28 days - 4 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

On finals, about 10 ft above the runway, the pilot stated that he flared "too sharply and too high" resulting in the aircraft stalling, right wing down, onto the upward slope of Runway 33 about 20 m short of the displaced threshold. The right undercarriage strut collapsed causing the aircraft to veer right onto the softer ground to the side of the grass runway. The nosewheel strut then collapsed; the propeller blades contacted the ground, sheared off and the engine stopped. The pilot and passenger exited the aircraft uninjured.

INCIDENT

Aircraft Type and Registration:	Bell 206B Jet Ranger III, G-BTHY	
No & Type of Engines:	1 Allison 250-C20 turboshaft engine	
Year of Manufacture:	1977 (Serial no: 2290)	
Date & Time (UTC):	19 February 2017 at 1045 hrs	
Location:	Sandwich Bay Estate, Kent	
Type of Flight:	Commercial Air Transport (Passenger)	
Persons on Board:	Crew - 1	Passengers - 4
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to front and side windscreens, main rotor pitch change links, vertical fin and a main rotor blade	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	45 years	
Commander's Flying Experience:	6,800 hours (of which 350 were on type) Last 90 days - 118 hours Last 28 days - 17 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB	

Synopsis

The helicopter was flying at 700 ft agl when it encountered and severed a recreational kite line. The pilot was not aware of the contact and continued the flight. Subsequently, damage to several parts of the helicopter was discovered after shutdown. The kite flying activity had not been notified to the CAA, so no NOTAM had been issued.

History of the flight

The pilot was carrying out a series of sightseeing flights, operating from a helicopter base at Manston disused airfield, Kent. The first flight departed to the south of Manston, along the coast at Sandwich Bay to Dover, before turning inland towards Canterbury and then back to Manston. For the first part of the flight the pilot flew at altitudes of between 700 ft and 1,000 ft amsl, before climbing to 1,500 ft amsl approaching Deal. As he was flying along the coast at around 700 ft, he noticed a kite very close by and took avoiding action. He was not aware of any contact and continued the flight, landing back at Manston after approximately 25 minutes.

The pilot then carried out a second flight in the same area. As he was flying along the coast north of Deal, towards Manston, at 1,500 ft amsl he noticed a number of kites in the sky at levels which he estimated to be above 1,000 amsl.

Finally there was a short (third) flight in a different direction, after which a person assisting with the loading and unloading of the helicopter noticed a scuff mark on the windscreen. He pointed it out to the pilot and the helicopter was shut down for investigation. Further damage was discovered to the right forward door screen, the main rotor pitch change links, one rotor blade and the vertical fin. As a result, the helicopter was grounded for a maintenance inspection.

Location

The location where contact with the kite line most likely occurred was on the coast in Sandwich Bay, to the north of Deal. Inland, the terrain consists of low lying coastal plain and sand dunes. There is public road access to the beach and high level kite flying activity has been observed in the location, both on the day of the incident and on previous occasions. Online footage of activity at the same location shows a number of people flying kites with 700 m line spools. Adapted power drills and winches are used to wind in the lines after flying.

Aircraft examination

A damage report for the helicopter was obtained from the maintenance organisation. One main rotor blade showed abrasion damage and a small incision to the leading edge. The blade was removed and repaired at a maintenance facility. Two main rotor pitch links required overhaul, and scratches and an incision to the tailfin, which were within limits, were repaired and repainted. Windscreen and side window scratches were also within limits and were polished out.

No kite line was recovered so it was not possible to test the material's substance or breaking strength.

Meteorology

The weather conditions were clear, with a westerly wind of 8 kt, good visibility and few clouds at 4,000 ft.

Organisational information

The operator of the helicopter carries out charter flights and organised sightseeing tours in the local area around Manston and NOTAMs are routinely checked before flight. None were applicable to the area on the date of the incident flight.

The pilot had flown sightseeing tours on behalf of the operator on a number of occasions and was familiar with the routes. He had not previously observed kite flying activity. After landing and inspecting the damage, he reported the incident and notified the local Coastguard SAR helicopter facility at Lydd Airport of the hazard. Later that day, two of the operator's personnel visited the beach location where the kites were being flown and advised the people flying them that they were causing a risk to aircraft.

Other information

Air Navigation Order 2016 Article 92 (c), which is applicable to kites, states:

'A relevant aircraft which is launched, moored, tethered or towed must not be operated—

(a) in such a manner as to—

(i) represent a hazard to other airspace users; or

(ii) without the permission of the CAA, result in any part of the relevant aircraft whilst it is being launched or towed, or its tether, mooring or towing equipment, extending more than 60 metres above ground level'

Permissions for exceptions to Article 92 of the ANO can be obtained through the CAA. On receipt of an application, the location of the activity is checked with regards to the surrounding airspace and the activity's impact on that airspace. Special conditions may be imposed for a permission to be granted, such as attaching streamers to the line to aid conspicuity, and a NOTAM will be issued.

Evidence from the nature of the damage to the helicopter and photographs taken at the probable kite flying location suggest that the kite string was coated with an abrasive substance. In a number of other countries, kite fighting is a competitive sport where the objective is to cut the string of an opponent's kite. To facilitate the cutting action, the upper parts of the kite string may be coated with an abrasive substance.

There is evidence that a number of different coastal locations in the United Kingdom are used for kite flying at heights above 60 m but the activity is not being notified. The AAIB reported on another incident in June 2016, in which a light aircraft was also damaged when it came into contact with kite string¹.

Discussion

The evidence indicated that the helicopter encountered a kite at high level. The kite was not being flown in accordance with Article 92 of the ANO and the activity had not been notified. It was subsequently discovered that the helicopter had suffered damage to its airframe and components, although the damage was repairable. However, the potential exists for the result of such an encounter, on aircraft and/or its occupants, to be more severe.

Footnote

¹ AAIB Bulletin 11/2016 - available at: <https://www.gov.uk/aaib-reports/aaib-investigation-to-zenair-ch-601xl-zodiac-g-exxl> [accessed 20 March 2017]

Safety actions

The operator has advised its pilots of the potential hazard of high flying kites and the need to avoid areas where they suspect the activity is taking place.

The CAA has been advised of the activity and an investigation is being conducted. The incident has also been reviewed by the CAA Safety Risk Panel.

ACCIDENT

Aircraft Type and Registration:	Denney Kitfox Mk 3, G-DJNH	
No & Type of Engines:	1 Rotax 582 piston engine	
Year of Manufacture:	1991 (Serial no: PFA 172-11896)	
Date & Time (UTC):	14 April 2017 at 1250 hrs	
Location:	Eshott Airfield, Northumberland	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Impact damage to airframe	
Commander's Licence:	Commercial Pilot's Licence	
Commander's Age:	68 years	
Commander's Flying Experience:	15,500 hours (of which 60 were on type) Last 90 days - 80 hours Last 28 days - 45 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

The accident occurred during a training flight to practise go-arounds. As the student applied full power after touching down on the fourth go-around, the aircraft began to drift to the right. The instructor allowed the takeoff to continue, but the aircraft left the side of the runway, became airborne and then collided with trees. The weather was fine with a light headwind.

ACCIDENT

Aircraft Type and Registration:	DH82A Tiger Moth, G-ANSM	
No & Type of Engines:	1 De Havilland Gipsy Major I piston engine	
Year of Manufacture:	1942 (Serial no: 82909)	
Date & Time (UTC):	4 February 2017 at 1645 hrs	
Location:	Near Peterborough Sibson Airport, Cambridgeshire	
Type of Flight:	Private	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Significant	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	73 years	
Commander's Flying Experience:	5,000 hours (of which 19 were on type) Last 90 days - 35 hours Last 28 days - 8 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Shortly after takeoff from Runway 06 at Peterborough Sibson Airport, the radio operator on the ground informed the pilot that the aircraft's baggage locker appeared unlatched. The pilot reported that he decided to return to land, but as he attempted to recover from a left turn he found he could not move the rudder to the right. He added, the best flight path he could achieve was a flat left turn as any addition of power made the situation worse due to the effect of the propeller slipstream. He descended the aircraft in a left turn and made a forced landing in a field. The aircraft sustained significant damage, but neither occupant was injured and they were able to vacate the aircraft without assistance.

The pilot reported that the rudder operated normally when tested later and that nothing was missing from the baggage locker. No reason for the rudder jam could be identified.

SERIOUS INCIDENT

Aircraft Type and Registration:	Grumman AA-5 Traveller, G-BBSA
No & Type of Engines:	1 Lycoming O-320-E2G piston engine
Year of Manufacture:	1974 (Serial no: AA5-0472)
Date & Time (UTC):	22 May 2017 at 1420 hrs
Location:	Durham Tees Valley Airport
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Left engine cowling attachments
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	53 years
Commander's Flying Experience:	536 hours (of which 73 were on type) Last 90 days - 6 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot was flying a revalidation flight accompanied by another pilot, who was an instructor. A pre-flight inspection of the aircraft was carried out by the pilot, who reported that the left engine cowl was known to be difficult to open, and after having disengaged the cowl's latches, the cowl could not be opened so he closed the latches again. The inspection of the engine bay and oil level was completed by opening the right cowl, which was then closed.

The taxi and power checks were uneventful and the aircraft lined up on Runway 23, which is 2,291 m in length. The takeoff run was normal, but just after the aircraft took off, at about 50 ft, there was a bang and the left cowl was seen to open and then "flap" back and forth over the right engine cowl. The instructor briefly took control and closed the throttle before passing control back to the pilot, who landed back onto the runway with about 700 m of runway remaining.

A subsequent inspection of the aircraft found that the left cowl's latches were still in place and undamaged. The pilot stated that it most likely that the latches were not correctly secured after having tried to open the cowl.

ACCIDENT

Aircraft Type and Registration:	Hughes 500 Model 369E, G-MRRR	
No & Type of Engines:	1 Allison 250-C20R/2 turboshaft engine	
Year of Manufacture:	1991 (Serial no: 0473E)	
Date & Time (UTC):	24 March 2017 at 1740 hrs	
Location:	Reading, Berkshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Right-hand skid collapsed, aircraft rolled over resulting in serious damage to the main rotors and tail rotor	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	33 years	
Commander's Flying Experience:	61 hours (of which 11 were on type) Last 90 days - 11 hours Last 28 days - 3 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The helicopter was slowing to land at a private site, and to avoid overflying bystanders, the pilot modified his track and made his approach from the north-west corner of the site, over fields. As the helicopter entered the site, translational lift was lost and the pilot reacted by raising the collective and simultaneously applying left pedal. The helicopter started to spin in a clockwise direction whilst descending, but the pilot was unable to regain control and the aircraft landed heavily, damaging the skids and rolling over on to its side. The pilot and passenger vacated the aircraft unaided.

History of the flight

The pilot was concluding a short flight from the Cotswolds to a private site near Reading. As the aircraft approached the landing site from the west, at about 500 ft agl, the pilot turned the helicopter onto a northerly heading but noticed people on the river bank alongside so modified his track to fly across fields towards the north-west corner of the site. The wind at the time was assessed as 050° at 20 kt. As the helicopter entered the landing site it "appeared to lose translational lift" and the pilot reacted by "pulling power", that is, by raising the collective lever whilst applying left yaw pedal. The helicopter started to spin clockwise whilst descending and the pilot was unable to regain control. The helicopter spun several times, the pilot closed the throttle and the helicopter landed heavily on its skids. The right skid collapsed and the

helicopter rolled onto its side, causing damage to the main and tail rotor systems. The pilot and passenger were uninjured and vacated the helicopter unaided.

Discussion

In the pilot's own analysis, the most probable cause was that he pulled too much power to counter the loss of translational lift, as the helicopter slowed, with insufficient left yaw pedal input, resulting in the helicopter rotating out of control. He was unable to stop or reduce the rotation but also considers that the 20 kt wind from 050° "did not help the situation".

The helicopter was independently examined after the accident and the damage was consistent with the collapse of the right skid and rolling on to its side. There was no evidence of a pre-accident malfunction.

ACCIDENT

Aircraft Type and Registration:	Isaacs Fury II, G-BBVO	
No & Type of Engines:	1 Lycoming O-320-E2A piston engine	
Year of Manufacture:	1987 (Serial no: PFA 011-10091)	
Date & Time (UTC):	25 March 2017 at 1600 hrs	
Location:	Near Langham Airstrip, Norfolk	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Tail skid displaced causing damage to rear fuselage	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	61 years	
Commander's Flying Experience:	1,114 hours (of which 19 were on type) Last 90 days - 11 hours Last 28 days - 8 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

The pilot was making a return flight to Felthorpe Airfield from Fenland Airfield. He was flying in formation and both flights were flown faster than the aircraft's optimum cruise speed. He expected to land at Felthorpe with 30 min of fuel in reserve, using a simple calculation based on elapsed time because the reserve tank did not have a quantity gauge.

While passing the former RAF station at Langham, at 800 ft agl, the engine surged and then stopped. The pilot turned towards the former airfield and commenced his forced landing checks before spotting Langham Airstrip south of the old airfield. Initially, he aimed towards this airstrip, but on realising he could not reach it he elected to land in a nearby paddock. He touched down with an estimated tailwind of 10 kt, and the aircraft had almost stopped when the left wing contacted a fence, slewing the aircraft through approximately 75° on rough grass. This created a side load which displaced the trunnion for the tail skid pintle.

The pilot observed that he had underestimated the fuel consumption during relatively fast formation flight and that his use of elapsed time to estimate the remaining fuel was unsatisfactory. He has now fitted a gauge which indicates fuel remaining in the reserve tank.

ACCIDENT

Aircraft Type and Registration:	Jodel D112, G-BIAH
No & Type of Engines:	1 Continental Motors Corp A65-8F piston engine
Year of Manufacture:	1964 (Serial no: 1218)
Date & Time (UTC):	7 May 2017 at 1200 hrs
Location:	Barton Ashes Airstrip, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Engine cowling, canopy and frame
Commander's Licence:	Private Pilot's Licence
Commander's Age:	71 years
Commander's Flying Experience:	1,621 hours (of which 10 were on type) Last 90 days - 4 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot reported that he was on a local flight from Barton Ashes, during which the weather was fine with a light and variable wind.

After an uneventful landing, as the aircraft came to a stop, its tail lifted slowly and continued to do so until the aircraft came to rest inverted. The pilot, who suffered minor injuries, vacated the aircraft through a broken side window with the assistance of a bystander.

The pilot attributed the accident to the strength of brake action. The aircraft sustained severe damage predominately to its cockpit structure and its engine was shock-loaded.

ACCIDENT

Aircraft Type and Registration:	Jodel DR100A Ambassadeur, G-BFBA	
No & Type of Engines:	1 Continental Motors Corp C90-14F piston engine	
Year of Manufacture:	1959 (Serial no: 88)	
Date & Time (UTC):	23 January 2017 at 1600 hrs	
Location:	Dunkeswell Aerodrome, Devon	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Landing gear and propeller	
Commander's Licence:	Light Aircraft Pilot's Licence	
Commander's Age:	68 years	
Commander's Flying Experience:	1,950 hours (of which 155 were on type) Last 90 days - 11 hours Last 28 days - 5 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

During a tailwheel familiarisation flight with an LAA inspector (the 'inspector'), the pilot handling the aircraft (the 'handling pilot') lost control of the aircraft during a touch-and-go landing, which resulted in the aircraft ground looping.

History of the flight

During the seventh touch-and-go landing of a familiarisation flight, the handling pilot lost control as power was applied during the landing/takeoff roll, which resulted in the aircraft ground looping on the paved runway at Dunkeswell. The landing gear collapsed, which allowed the propeller to strike the ground, and the aircraft came to a stop.

The handling pilot, who had no previous experience of tailwheel/dragger aircraft, had recently purchased the aircraft and this was his third flight with an LAA inspector who was experienced on type. The inspector had previously inspected the aircraft and, prior to the handling pilot taking time with an instructor, offered some familiarisation flights to the handling pilot of which the accident flight was the third. The handling pilot sat in the right seat for the first flight (general handling), and in the left seat for the other two during which circuits were flown. Some of these circuits were flown by the handling pilot.

The inspector stated that, prior to these flights, the handling pilot was fully aware that he was not an instructor (such as an LAA Coach), and the handling pilot was under the impression

that the inspector would be PIC. The handling pilot was also aware that he would have an opportunity to handle the aircraft during the flights. However, as PIC but not an instructor, the inspector would have been unable to offer any instruction to the handling pilot during these flights. Consequently, as the handling pilot was not being trained nor PIC (so was effectively a passenger for these flights), he would have been unable to log hours for any of these flights.

EASA LAPL(A) licence and non-EASA (Annex II) aircraft

Both pilots held an EASA LAPL(A) licence; however, the UK's Air Navigation Order (ANO) 2016 Article 150 deems a non-UK flight crew licence valid for non-EASA (Annex II) aircraft (such as the Jodel DR100A) that are registered in the UK.

Differences and familiarisation training

EASA Part-FCL states in *FCL.135.A LAPL(A) - Extension of privileges to another class or variant of aeroplanes* that:

'(b) Before the holder of an LAPL can exercise the privileges of the licence on another variant of aeroplane than the one used for the skill test, the pilot shall undertake differences or familiarisation training. The differences training shall be entered in the pilot's logbook or equivalent document and signed by the instructor.'

Note that variants within the SEP (land) Class of aircraft, such as SEP (land) with tailwheels, are listed in GM1 FCL.700 of EASA Part-FCL (SUBPART H – CLASS AND TYPE RATINGS SECTION 1 – Common requirements).

EASA Part-FCL Guidance Material (GM) defines differences and familiarisation training in GM1 FCL.710 and GM1 FCL.135.A as:

'(a) Differences training requires the acquisition of additional knowledge and training on an appropriate training device or an aircraft.
(b) Familiarisation training requires the acquisition of additional knowledge.'

These regulations do not specify what type of training (differences or familiarisation) is required to extend the privileges of a licence to another variant; however, it is noted that there is no requirement for familiarisation training to be recorded.

The CAA publication CAP 804 specified the need for differences training for tailwheel variants in Part H, Subpart 1 Section 4 Acceptable Means of Compliance and Guidance Material (AMC and GM), Paragraph 4.3.5. This document is now labelled as 'REFERENCE ONLY' and has, in part, been superseded by CAP 1535 - 'The Skyway Code' (published May 2017), which in the Requirements for the PIC section refers to the EASA website for information on the requirements for differences or familiarisation training. It does, however, state that '*Differences training requires practical training on the aircraft, whereas familiarisation can just be gaining additional theoretical knowledge.*' The Winter 2016

edition of the CAA's GA safety publication '*Clued Up*' discusses the importance of differences training for tailwheel (and other) conversions in an article entitled '*What's the difference?*'

Conclusion

The handling pilot had no previous experience of tailwheel/dragger aircraft and the accident occurred whilst carrying out familiarisation training, but this was not with an instructor. This event has highlighted that, when converting to another variant of an aircraft than the one used for the skill test, pilots must undertake appropriate training with an instructor, guidance for which can be found in the Winter 2016 edition of the CAA's GA safety publication '*Clued Up*'.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-161 Cherokee Warrior II, G-BNSZ	
No & Type of Engines:	1 Lycoming O-320-D3G piston engine	
Year of Manufacture:	1981 (Serial no: 28-8116315)	
Date & Time (UTC):	9 April 2017 at 0810 hrs	
Location:	Halfpenny Green Airfield, Staffordshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 2
Injuries:	Crew - 1 (Minor)	Passengers - None
Nature of Damage:	None reported	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	23 years	
Commander's Flying Experience:	56 hours (of which 42 were on type) Last 90 days - 5 hours Last 28 days - 3 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

Whilst the pilot was turning the propeller by hand, it suddenly spun over approximately five revolutions, striking him on his right elbow and causing a small injury.

History of the flight

The pilot and passengers boarded the aircraft with the intention of carrying out a local flight. After following the checklist to start the engine, including priming the fuel system, the engine did not turn over when the key was rotated to the start position. Two further attempts were made, with the same result. The pilot secured the aircraft by closing the throttle, turning the fuel and electrics off and removing the keys. He then exited the aircraft and attempted to turn the propeller by hand in order check if the engine had seized. He noticed that it was indeed stiff; he applied more force and the propeller suddenly started to spin, with the engine turning over a maximum of five revolutions. He jumped backwards, instinctively raising his arm above his head, but the propeller struck his right elbow, causing a small (5 mm) puncture wound, with associated swelling and bruising. There was no long term damage.

Comment

The pilot subsequently stated that the engine had already been primed with fuel from a previously failed start attempt and that he considered that fuel in the cylinders may have detonated when he turned the propeller, causing the engine to 'run' for a few revolutions.

The pilot recalled that he had removed the ignition key prior to leaving the aircraft. As with most aircraft, the key had to be in the 'both magnetos OFF' position before it could be removed. However there remains the possibility that one, or both, of the magnetos was not properly earthed when the ignition switch was in the OFF position. The pilot stated that a check of the magnetos would definitely be conducted prior to the next flight.

This event emphasises the importance of always treating magnetos as 'live' even when they appear to be switched off. Elsewhere in this Bulletin is another account of an incident involving an injury inflicted by a propeller - see the report on G-MYUB in this issue.

ACCIDENT

Aircraft Type and Registration:	Pitts S-2A Pitts Special, G-SKNT	
No & Type of Engines:	1 Lycoming AEIO-360-A1E piston engine	
Year of Manufacture:	1973 (Serial no: 2048)	
Date & Time (UTC):	17 March 2017 at 1415 hrs	
Location:	Cockshutt, Ellesmere, Shropshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers – None
Injuries:	Crew - 1 (Minor)	Passengers - N/A
Nature of Damage:	Engine failure and extensive airframe damage	
Commander's Licence:	Commercial Pilot's Licence	
Commander's Age:	60 years	
Commander's Flying Experience:	2,622 hours (of which 494 were on type) Last 90 days - 0 hours Last 28 days - 0 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

The pilot intended to make a short flight from Rednal to Sleaf as part of the aircraft's annual maintenance check. He reported that engine operation on the ground was normal but "oil pressure was slow to increase, and was giving a fluctuating indication".

The fluctuations continued when airborne but, with temperature indicating normal, he requested a Basic Service from RAF Shawbury and set off towards Sleaf. Almost immediately thereafter the indicated oil pressure decayed to zero, but the temperature was "still in the middle of the green arc". He advised Shawbury of his intention to return to Rednal with a possible engine failure. As he initiated a turn the engine began to lose power and vibrate and on rolling wings level at approximately 1,200 ft agl, it ceased producing power.

Unable to make the runway, the pilot carried out a forced landing in a wheat field. During the landing the left wingtip and aileron spade caught an undulation and the aircraft came to rest inverted. The pilot opened the canopy and exited without assistance.

It was reported that preliminary examination of the engine confirmed a mechanical failure associated with the No 4 cylinder connecting rod bearing.

ACCIDENT

Aircraft Type and Registration:	Socata TB9 Tampico, G-JUFS	
No & Type of Engines:	1 Lycoming O-320-D2A piston engine	
Year of Manufacture:	1989 (Serial no: 928)	
Date & Time (UTC):	9 April 2017 at 1315 hrs	
Location:	Thrupton Airfield, Hampshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Damage to propeller and possible engine shock-loading	
Commander's Licence:	Light Aircraft Pilot's Licence	
Commander's Age:	60 years	
Commander's Flying Experience:	241 hours (of which 64 were on type) Last 90 days - 7 hours Last 28 days - 6 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

Following an uneventful flight from Popham Airfield, the pilot made an approach to Runway 25 at Thrupton, in good visibility and with a light and variable wind. After the landing flare, the aircraft bounced and the pilot later assessed that he might have reacted incorrectly by moving the control column forwards. He believes the aircraft then bounced a second time before coming to rest near the end of the runway. The propeller blades were damaged because they contacted the runway surface, and it was suspected that this shock-loaded the engine.

In hindsight, the pilot noted that he should have initiated a go-around when the aircraft first bounced, and then made another approach.

ACCIDENT

Aircraft Type and Registration:	Zenair CH 701SP, G-TORI
No & Type of Engines:	1 Rotax 912 ULS piston engine
Year of Manufacture:	2004 (Serial no: PFA 187-14188)
Date & Time (UTC):	26 May 2017 at 1115 hrs
Location:	Old Sarum Airfield, Wiltshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to wings, fuselage, landing gear, propeller and engine shock-loaded
Commander's Licence:	Private Pilot's Licence
Commander's Age:	81 years
Commander's Flying Experience:	750 hours (of which 200 were on type) Last 90 days - 5 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and Old Sarum Airfield Incident Report by A/G operator

On the approach to grass Runway 06, the wind was reported as 120° at 14 kt. As the high-winged aircraft was about to touchdown, a gust of wind lifted the right wing causing the aircraft to turn left. The pilot's corrective inputs were ineffective and the aircraft stalled onto the ground. The propeller, nose and left wingtip struck the ground first followed by the right wingtip. The crew and passenger, who had both been wearing full harnesses, exited the aircraft uninjured.

ACCIDENT

Aircraft Type and Registration:	Denney Kitfox Mk 2, G-TWTW	
No & Type of Engines:	1 Rotax 582 piston engine	
Year of Manufacture:	2006 (Serial no: PFA 172-11730)	
Date & Time (UTC):	25 March 2017 at 1300 hrs	
Location:	Redlands Airfield, Wiltshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to landing gear, fuselage, engine and propeller	
Commander's Licence:	National Private Pilot's Licence	
Commander's Age:	64 years	
Commander's Flying Experience:	395 hours (of which 120 were on type) Last 90 days - 4 hours Last 28 days - 2 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

Following an engine failure when crosswind after takeoff, the pilot turned downwind and made a forced landing on the runway of departure. As it touched down the aircraft skidded sideways, and both main landing gear legs collapsed before the aircraft stopped. Both the pilot and passenger were uninjured.

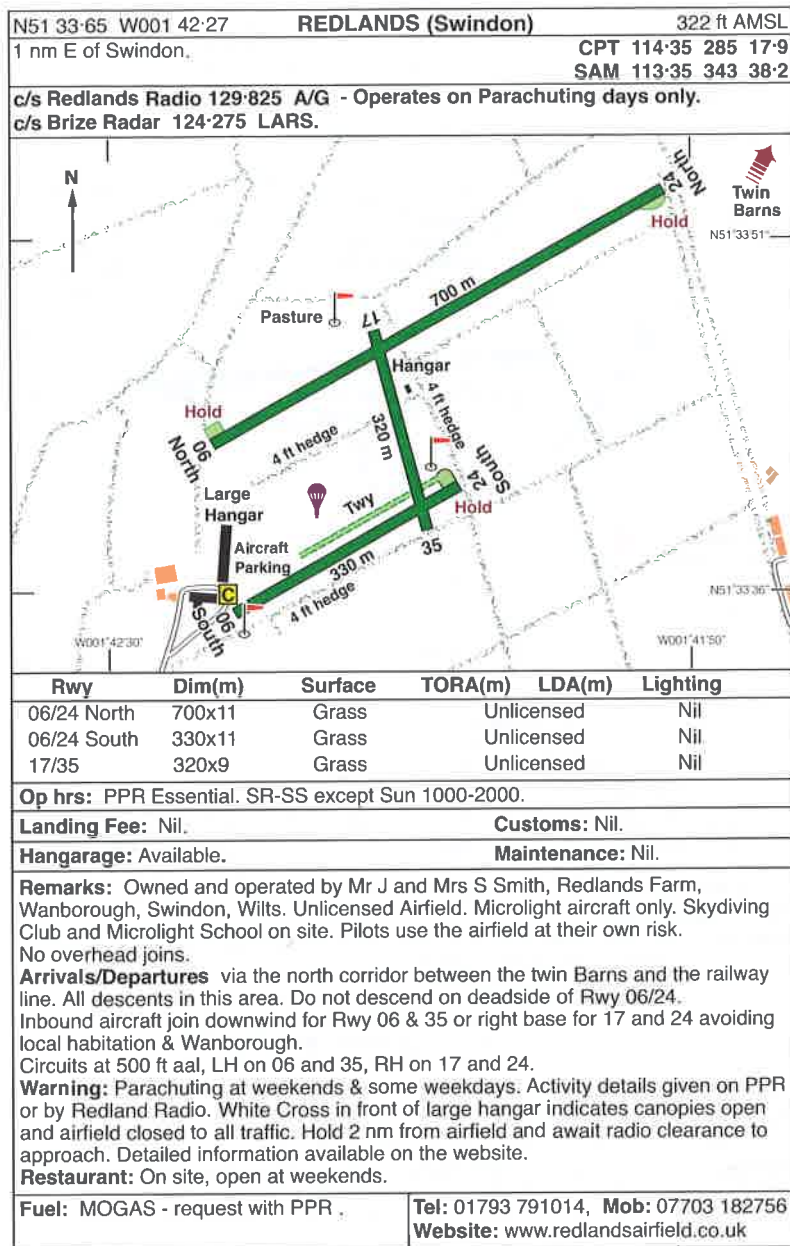
History of the flight

The pilot took off from Runway 06 North at Redlands Airfield with a north-easterly wind of approximately 15 kt and with good visibility. At 350 ft agl, he turned left onto a crosswind leg and shortly after this the engine failed. Believing he had insufficient time to select an alternative landing site, the pilot decided to land back on the runway and he turned left onto a downwind heading.

Once he had determined that he had proceeded far enough downwind to have sufficient landing distance available, the pilot lowered the nose, to maintain a safe speed, and turned steeply towards his chosen landing point. Although the aircraft touched down on the runway, there was insufficient height to complete the turn and the aircraft skidded sideways, causing both main landing gear legs to collapse.

The aircraft stopped close to a hedge, which has a gap through which the runway passes at approximately its mid-point, see Figure 1 for a layout of the airfield. There was some

distortion of the airframe which prevented the doors from opening easily, but the occupants were able to apply sufficient force to exit the aircraft un-assisted.



Robert Pooley ©

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Figure 1

Layout of Redlands Airfield

Pilot's assessment

Inspection of the engine indicated that the clip holding the supply pipe to the oil filter had failed and oil had escaped, leading to the seizure of one piston. The pilot reflected that he benefitted from having considered his response to an engine failure many times in the past. He noted that he remained calm and flew the aircraft, but had insufficient time to complete

the forced landing checks or transmit a MAYDAY call. He believes he could have achieved these actions if he had prepared better by thinking more about these drills before flying.

He also noted this runway is unusual because there is a hedge running across the upwind end, as well as the one with the gap through which the runway passes near the mid-point. His unfamiliarity with the airfield led him to believe the hedge near the midpoint was the hedge at the end of the runway so, if he had appreciated the layout better, he could have turned earlier and had sufficient landing distance beyond the first hedgerow. This would have meant he had more height in hand and therefore more time to complete the turn and stabilise the final approach.

AAIB comment

Although the pilot of this aircraft assessed that his best course of action was to turn downwind and aim to land back on the runway, pilots are usually advised against attempting such action from a low height. The CAA's 'Skyway Code'¹ refers to engine failures on page 133 stating,

'If a failure happens shortly after take-off, landing ahead is safer than attempting to turn back. Assess the area immediately in front of you and pick the place that is likely to cause the least damage.'

Footnote

¹ <http://caa.co.uk/General-aviation/Safety-information/The-Skyway-Code/>

ACCIDENT

Aircraft Type and Registration:	Mainair Blade, G-CCXR	
No & Type of Engines:	1 Rotax 582-2V piston engine	
Year of Manufacture:	2004 (Serial no: 1367-0604-7-W1162)	
Date & Time (UTC):	9 March 2017 at 1730 hrs	
Location:	Near Pembroke Dock, Pembrokeshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Destroyed due immersion in salt water	
Commander's Licence:	National Private Pilot's Licence	
Commander's Age:	51 years	
Commander's Flying Experience:	369 hours (of which 138 were on type) Last 90 days - 6 hours Last 28 days - 1 hour	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

During an evening flight, the pilot's forward vision was restricted when he flew towards the low sun. He reduced power unintentionally and descended below 500 ft amsl before taking avoiding action when he unexpectedly saw a power line in front of him. He believes the evasive manoeuvre caused the wing to stall and the aircraft then fell out of control into the river below. The pilot remained conscious and extricated himself from the aircraft before swimming ashore.

History of the flight

The pilot took off from Haverfordwest Airfield approximately one hour before sunset for a local flight to the south, in good visibility and with a light westerly wind. Flying in a southerly direction and aiming to fly at 60 mph and at 500 ft amsl, he followed the River Cleddau until he was approximately 8 nm from the airfield, before turning to follow the river in a westerly direction. As he turned towards the low sun his forward visibility became limited, so he tried to shield his eyes by placing his left hand against his helmet visor. At the same time he believes he relaxed his pressure on the foot throttle, which he had been using in preference to the hand throttle, causing engine power to reduce and the aircraft to descend unintentionally.

Suddenly the pilot saw that he was heading towards a set of power lines and supporting steel pylons, and he took evasive action by pushing the control bar forwards and left to

initiate a climbing right turn. He believes he may also have reduced power further and that the combined effect of this low level manoeuvre was for the speed to reduce quickly and the wing to stall. His next recollection was that he was deluged with water when the aircraft hit the river.

As the aircraft settled on its right side, the pilot had to bend his head left to keep it above the water. He was wearing a lap strap which he was unable to undo with his gloved hand so he had to use his teeth to take one glove off before he could operate the harness release. After approximately 10 minutes the aircraft began to sink and the pilot swam to the shore and was later treated for the effects of hypothermia.

Discussion

The power lines cross the river approximately two nautical miles northeast of Pembroke Dock. The height of the pylon on the south side of the river is reported to be 170 ft agl, giving it an elevation of 285 ft amsl, and the wires are suspended 147 ft above the river at their lowest point. These power lines are shown on the CAA's 1:250,000 Topographical Air Chart, but not on the ICAO 1:500,000 Aeronautical Chart, as this does not generally include obstructions with a height of less than 300 ft agl.

The pilot's ability to see the wires appears to have been impaired by the glare from the low sun, with the aircraft flying at low altitude towards an unexpected obstruction. The pilot noted that that in future he will aim to use the hand throttle to control the aircraft when airborne.

ACCIDENT

Aircraft Type and Registration:	Mercury, G-MYUB
No & Type of Engines:	1 Rotax 503 piston engine
Year of Manufacture:	1995 (Serial no: 1014-1194-7-W812)
Date & Time (UTC):	26 March 2017 at 1450 hrs
Location:	Otherton Airport, Staffordshire
Type of Flight:	Ground Run only
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Serious) Passengers - N/A
Nature of Damage:	Damage to propeller
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	42 years
Commander's Flying Experience:	33 hours Last 90 days - N/A Last 28 days - N/A
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Whilst running the engine for the purpose of investigating a misfire, the aircraft jumped over a chock that had been placed in front of the nosewheel. Whilst retrieving the chock from close to the rear of the aircraft, the pilot was struck on his face by the still-turning propeller.

Circumstances of the accident

The pilot-owner was sitting in his aircraft, running the engine in order to investigate a misfire that had occurred in flight on the previous day. There was no intention to go flying and the wings had been removed from the trike. A chock had been placed in front of the nosewheel and the pilot had applied the footbrake. Although the pilot's recollection of the sequence of events is hazy, he believes he may have relaxed pressure on the brake pedal, causing the aircraft to move forward by about 10 feet. He immediately applied full brake pressure, reduced the engine to idle power and the aircraft stopped moving.

In his statement, the pilot admitted to a moment of "lack of focus", and became preoccupied with the fact that the nosewheel had jumped over the chock; he convinced himself that it was necessary to retrieve and put it back in position. He stepped out of the aircraft and, seeing the chock behind the aircraft, reached down to pick it up, at which point he was struck in the face by the propeller, sustaining a serious injury. The blow was severe enough to cause damage to the propeller. A person working on an aircraft parked nearby rendered first aid and the pilot was subsequently taken to hospital by air ambulance.

The pilot recognised that this was an avoidable accident, which could have been averted simply by turning the engine off or not being distracted by his perceived urgency to retrieve the chock. He additionally commented that he had not been wearing a helmet as he was not intending to fly; however he was convinced that, had he been wearing one, his injuries may have been less serious or even eliminated. The fact that he was not intending to fly may have contributed to a reduction of vigilance.

Although he was an inexperienced pilot, he had served for 13 years in the Royal Air Force working as groundcrew on airframes and propulsion, both in the hangar and on the dispersal areas. He was thus well aware of the dangers associated with running engines and he considered that, despite this level of experience, he still made a basic error.

This event serves as a stark reminder of the potentially lethal power of a propeller, even when attached to a small engine running at idle. Earlier in this Bulletin is a report of another propeller-inflicted injury, involving a Piper PA-28, G-BNSZ, which also underlines the need to treat propellers with respect at all times.

ACCIDENT

Aircraft Type and Registration:	Rotorsport UK MTOsport, G-RMTO	
No & Type of Engines:	1 Rotax 912 ULS piston engine	
Year of Manufacture:	2010 (Serial no: RSUK/MTOS/027)	
Date & Time (UTC):	29 April 2017 at 1430 hrs	
Location:	Great Knoutberry Hill, Cumbria	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - 1 (Minor)	Passengers - 1 (Minor)
Nature of Damage:	Rotors and upper assembly, propeller, nacelle, nosewheel detached	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	75 years	
Commander's Flying Experience:	79 hours (of which 79 were on type) Last 90 days - 4 hours Last 28 days - 3 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional enquiries made by the AAIB	

The pilot and passenger took off from Oxenho pe Airfield, West Yorkshire, at 1330 hrs with the intention of flying to the north to watch some fell running races. At the time of departure, the pilot reported that the weather was good, with a light breeze which he estimated at 7 to 12 mph from the south-west and an overcast layer of high level cloud.

He approached, at 1,700 ft amsl and over lower ground, the general area of Great Knoutberry Hill, which has an elevation 2,205 ft, before he changed direction to fly towards the hill. The pilot then realised that his airspeed had decayed from 70 mph to approximately 55 to 60 mph and that he was below the summit of the hill. He applied full power and climbed, but the aircraft failed to clear a fence on top of the summit and impacted the ground. The uninjured pilot and passenger, who were wearing full harnesses and helmets, were able to vacate the wreckage without assistance. The recently qualified pilot attributed the accident to his lack of experience in hill flying and failure to adequately monitor his airspeed.

ACCIDENT

Aircraft Type and Registration:	Savannah VG Jabiru(1), G-WHYS	
No & Type of Engines:	1 Jabiru 2200 piston engine	
Year of Manufacture:	2010 (Serial no: BMAA/HB/404)	
Date & Time (UTC):	13 March 2017 at 1250 hrs	
Location:	In flight from Swanwick, Derbyshire to Swansea Airport, Wales	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Distorted lift strut attachment and wing rib	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	54 years	
Commander's Flying Experience:	624 hours (of which 6 were on type) Last 90 days - 15 hours Last 28 days - 8 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional enquiries by the AAIB	

Synopsis

Whilst moving the aircraft out of the hangar, the pilot noted that the right rear lift strut attachment was distorted. He had curtailed his last flight two days previously because of "violent turbulence" and was concerned that this might have caused the damage. Subsequent examination, however, concluded that the damage was pre-existing and unrelated to the flight.

History of the flight

The pilot was flying from Swanwick, Derbyshire to Swansea and had been airborne for approximately 90 minutes. As he approached Abergavenny, the cloud cover increased significantly but he was able to maintain 2,000 ft. Shortly thereafter, he encountered turbulence and reported: "I was lifted out of my seat hitting my head on the cabin roof". He slowed the aircraft, turned to the south and was eventually able to regain his track after the turbulence reduced.

With the weather continuing to deteriorate, he curtailed the flight and landed at his home airfield. Two days later, when he moved the aircraft out of the hangar, he observed that the right rear lift strut attachment bracket was bent forwards. It was apparent that the uppermost attachment bolt had contacted the lower surface of the wing, leaving a clear indentation (Figure 1).

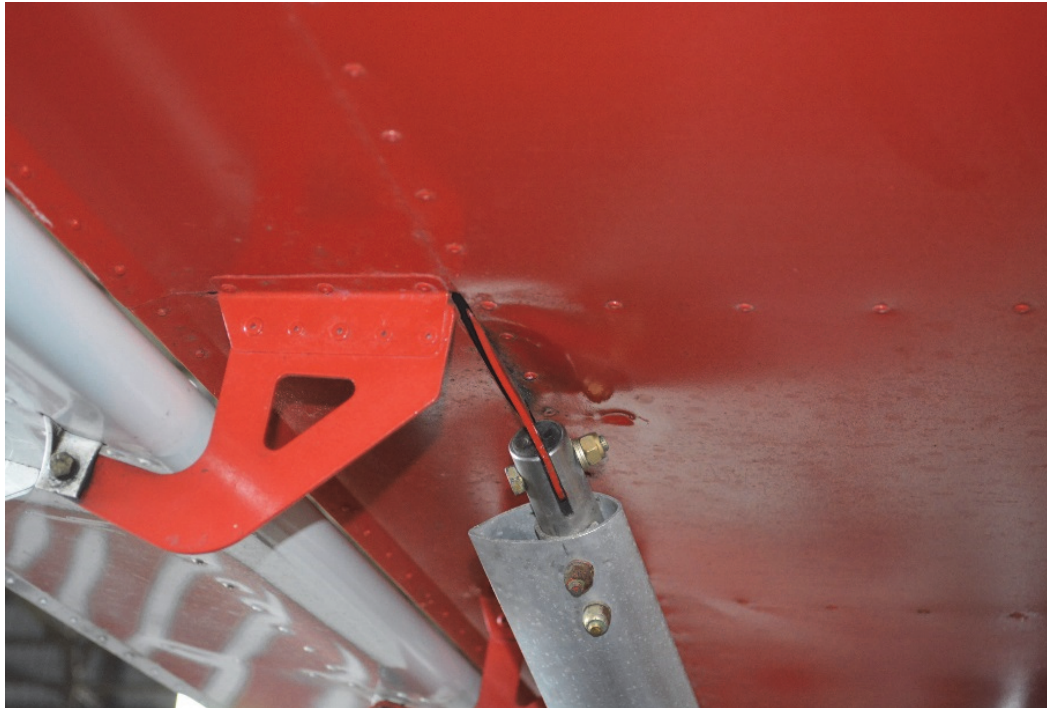


Figure 1

Distorted lift strut attachment

Aircraft examination

The right wing upper skin was removed, revealing damage on the rib adjacent to the lift strut attachment. Two visible cracks in the rib were surrounded by dirt and debris that had accumulated in localised areas of distortion. The evidence indicated that the damage was not recent.

Gust loads and testing

Calculations undertaken by the British Microlight Aircraft Association (BMAA) indicated that the gust loads in flight would have been below the limit loads.

The manufacturer reviewed the approval documentation and concluded that the damage was probably caused by adverse loading whilst on the ground.

Conclusion

The evidence indicated that the damage had existed for some time and was most likely caused by adverse loading on the ground. The cause was not established.

The BMAA intends to publish an article highlighting this occurrence and the possibility of 'hidden' damage, over and above that which may be identified during an external check.

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).

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

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

Published November 2011. | 2/2015 Boeing B787-8, ET-AOP
London Heathrow Airport
on 12 July 2013.

Published August 2015. |
| 1/2014 Airbus A330-343, G-VSXY
at London Gatwick Airport
on 16 April 2012.

Published February 2014. | 3/2015 Eurocopter (Deutschland)
EC135 T2+, G-SPAO
Glasgow City Centre, Scotland
on 29 November 2013.

Published October 2015. |
| 2/2014 Eurocopter EC225 LP Super Puma
G-REDW, 34 nm east of Aberdeen,
Scotland on 10 May 2012
and
G-CHCN, 32 nm south-west of
Sumburgh, Shetland Islands
on 22 October 2012.

Published June 2014. | 1/2016 AS332 L2 Super Puma, G-WNSB
on approach to Sumburgh Airport
on 23 August 2013.

Published March 2016. |
| 3/2014 Agusta A109E, G-CRST
Near Vauxhall Bridge,
Central London
on 16 January 2013.

Published September 2014. | 2/2016 Saab 2000, G-LGNO
approximately 7 nm east of
Sumburgh Airport, Shetland
on 15 December 2014.

Published September 2016. |
| 1/2015 Airbus A319-131, G-EUOE
London Heathrow Airport
on 24 May 2013.

Published July 2015. | 1/2017 Hawker Hunter T7, G-BXFI
near Shoreham Airport
on 22 August 2015.

Published March 2017. |

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>

GLOSSARY OF ABBREVIATIONS

aal	above airfield level	lb	pound(s)
ACAS	Airborne Collision Avoidance System	LP	low pressure
ACARS	Automatic Communications And Reporting System	LAA	Light Aircraft Association
ADF	Automatic Direction Finding equipment	LDA	Landing Distance Available
AFIS(O)	Aerodrome Flight Information Service (Officer)	LPC	Licence Proficiency Check
agl	above ground level	m	metre(s)
AIC	Aeronautical Information Circular	mb	millibar(s)
amsl	above mean sea level	MDA	Minimum Descent Altitude
AOM	Aerodrome Operating Minima	METAR	a timed aerodrome meteorological report
APU	Auxiliary Power Unit	min	minutes
ASI	airspeed indicator	mm	millimetre(s)
ATC(C)(O)	Air Traffic Control (Centre)(Officer)	mph	miles per hour
ATIS	Automatic Terminal Information System	MTWA	Maximum Total Weight Authorised
ATPL	Airline Transport Pilot's Licence	N	Newtons
BMAA	British Microlight Aircraft Association	N_R	Main rotor rotation speed (rotorcraft)
BGA	British Gliding Association	N_g	Gas generator rotation speed (rotorcraft)
BBAC	British Balloon and Airship Club	N_i	engine fan or LP compressor speed
BHPA	British Hang Gliding & Paragliding Association	NDB	Non-Directional radio Beacon
CAA	Civil Aviation Authority	nm	nautical mile(s)
CAVOK	Ceiling And Visibility OK (for VFR flight)	NOTAM	Notice to Airmen
CAS	calibrated airspeed	OAT	Outside Air Temperature
cc	cubic centimetres	OPC	Operator Proficiency Check
CG	Centre of Gravity	PAPI	Precision Approach Path Indicator
cm	centimetre(s)	PF	Pilot Flying
CPL	Commercial Pilot's Licence	PIC	Pilot in Command
°C,F,M,T	Celsius, Fahrenheit, magnetic, true	PNF	Pilot Not Flying
CVR	Cockpit Voice Recorder	POH	Pilot's Operating Handbook
DME	Distance Measuring Equipment	PPL	Private Pilot's Licence
EAS	equivalent airspeed	psi	pounds per square inch
EASA	European Aviation Safety Agency	QFE	altimeter pressure setting to indicate height above aerodrome
ECAM	Electronic Centralised Aircraft Monitoring	QNH	altimeter pressure setting to indicate elevation amsl
EGPWS	Enhanced GPWS	RA	Resolution Advisory
EGT	Exhaust Gas Temperature	RFFS	Rescue and Fire Fighting Service
EICAS	Engine Indication and Crew Alerting System	rpm	revolutions per minute
EPR	Engine Pressure Ratio	RTF	radiotelephony
ETA	Estimated Time of Arrival	RVR	Runway Visual Range
ETD	Estimated Time of Departure	SAR	Search and Rescue
FAA	Federal Aviation Administration (USA)	SB	Service Bulletin
FDR	Flight Data Recorder	SSR	Secondary Surveillance Radar
FIR	Flight Information Region	TA	Traffic Advisory
FL	Flight Level	TAF	Terminal Aerodrome Forecast
ft	feet	TAS	true airspeed
ft/min	feet per minute	TAWS	Terrain Awareness and Warning System
g	acceleration due to Earth's gravity	TCAS	Traffic Collision Avoidance System
GPS	Global Positioning System	TGT	Turbine Gas Temperature
GPWS	Ground Proximity Warning System	TODA	Takeoff Distance Available
hrs	hours (clock time as in 1200 hrs)	UHF	Ultra High Frequency
HP	high pressure	USG	US gallons
hPa	hectopascal (equivalent unit to mb)	UTC	Co-ordinated Universal Time (GMT)
IAS	indicated airspeed	V	Volt(s)
IFR	Instrument Flight Rules	V_1	Takeoff decision speed
ILS	Instrument Landing System	V_2	Takeoff safety speed
IMC	Instrument Meteorological Conditions	V_R	Rotation speed
IP	Intermediate Pressure	V_{REF}	Reference airspeed (approach)
IR	Instrument Rating	V_{NE}	Never Exceed airspeed
ISA	International Standard Atmosphere	VASI	Visual Approach Slope Indicator
kg	kilogram(s)	VFR	Visual Flight Rules
KCAS	knots calibrated airspeed	VHF	Very High Frequency
KIAS	knots indicated airspeed	VMC	Visual Meteorological Conditions
KTAS	knots true airspeed	VOR	VHF Omnidirectional radio Range
km	kilometre(s)		
kt	knot(s)		
