
AAIB Bulletin

1/2014



**TO REPORT AN ACCIDENT OR INCIDENT
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None

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None

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None

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The AAIB Bulletin has changed format this month from two columns to one column. This is to enable easier online reading.

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: | Pilatus Britten-Norman BN2B-21 Islander, G-CIAS |
| No & Type of Engines: | 2 Lycoming IO-540-K1B5 piston engines |
| Year of Manufacture: | 1982 (Serial no: 2162) |
| Location: | Near Devil's Hole, approximately 2.5 nm north of Jersey Airport, Channel Islands |
| Date & Time (UTC): | 3 November 2013 at 1908 hrs |
| Type of Flight: | Private (Search and rescue) |
| Persons on Board: | Crew - 1 Passengers - 4 (Search crew) |
| Injuries: | Crew - None Passengers - None |
| Nature of Damage: | Significant damage to wing, left main landing gear and forward fuselage |
| Commander's Licence: | Airline Transport Pilot's Licence |
| Commander's Age: | 65 years |
| Commander's Flying Experience: | 25,200 hours (of which 60 were on type) Last 90 days - 101 hours Last 24 hours - 2 hours |
| Information Source: | AAIB Field Investigation |

The investigation

The Air Accidents Investigation Branch was notified of the accident by Jersey Air Traffic Control at 1920 hrs on Sunday 3 November 2013 and an investigation was commenced under the provisions of the Civil Aviation (Investigation of Air Accidents and Incidents) (Jersey) Order 2000.

This Special Bulletin is published to provide details of the initial facts surrounding the accident. The investigation is ongoing and a final report will be published in due course.

Background

The aircraft was operated by a charitable organisation staffed by volunteers whose purpose was to carry out search operations in and around the Channel Islands. It was equipped for its role with aviation and maritime communication equipment, search radar, and infra-red

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and video cameras, as well as smoke flares, lights and loudhailers, and an air-droppable dinghy.

History of the flight

At approximately 1820 hrs on 3 November 2013, the organisation was alerted to carry out a search for two fishermen who were in difficulties near Les Écréhous, a group of rocks north-east of Jersey. The pilot, accompanied by the search director, and three observers, gathered at the aircraft's base at Guernsey Airport, and made preparations for flight. There was no moon and the Channel Islands were affected by poor weather, with strong southerly winds, low cloud, and poor visibility. The pilot reported encountering "strong turbulence" during the flight.

The aircraft took off at 1847 hrs and, taking account of the cloud base and visibility, the pilot levelled the aircraft at approximately 700 ft amsl on track towards the search area.

When the aircraft was approximately six miles north of Jersey Airport, the right engine rpm began to vary, repeatedly reducing and then increasing. The observer seated to the right of the pilot, observed the fuel pressure fluctuating but this was not noticed by the pilot. The pilot selected the alternate intake air but the engine then stopped. The pilot feathered the propeller and then completed the engine shutdown checks. Following a brief conversation with the search director, the pilot turned the aircraft towards Jersey Airport and declared a MAYDAY to ATC, while the search director made a similar call on the maritime frequency. The pilot applied full power on the left engine and put the aircraft into a climb.

The aircraft had climbed to approximately 1,100 ft amsl when the left engine rpm began to fluctuate before the engine ceased to produce power. The pilot informed ATC that the aircraft was "going down" and the search crew stowed their equipment. No attempt was made to re-start either engine.

An offshore lifeboat operating nearby changed its course to be in attendance should the aircraft ditch. As the aircraft descended, the radio altimeter issued an alert prompting the pilot to switch on the landing lights and instruct the crew to brace. As it continued its descent the aircraft's landing lights suddenly illuminated ground ahead and the pilot manoeuvred for a touchdown.

The north coast of Jersey is characterised by rocky cliffs and roughly undulating terrain, however, the aircraft's descent brought it towards one of the very few relatively benign areas suitable for a forced landing. Following a ground roll of 140 m, during which the left main landing gear collapsed rearwards, the aircraft's progress was halted when its nose lodged, in a gentle impact, in the base of a tree.

The pilot and search crew were uninjured. After making the aircraft safe they made their way to nearby habitation, where they were met by emergency services personnel who had been dispatched to search for them.

Initial examination of the aircraft

The aircraft was examined at the accident site. Both main fuel tanks were found almost full and the tip tanks were empty. Switches in the cockpit, which select the fuel supply to the engines from either the main or tip tanks, were found in the 'tip tank' position. A further switch, associated with the fuel system, serves two purposes, depending on which tanks are selected to feed the engines. With the main tanks selected, it disables lights which indicate tank selection. With the tip tanks selected, it dims lights which show that the tip tanks are in use. The switch was found in the position that would dim the tip tank indicator lights.

Fuel

The aircraft was routinely refuelled after each flight to leave 18 USG in each tip tank and 55 USG¹ in each main tank. Although calibrated 'dip sticks' were available, they were not routinely used to measure physically the quantities of fuel on board. Initial enquiries indicate that routine calculations were not made to predict fuel uplift and compare predicted and actual values. Further, it was not the custom to record in-flight fuel checks. A placard in the cockpit stated that *'tip tanks are to be filled first - used last'*, and a flight manual restriction required that 13.5 USG of fuel should remain in the tip tanks until the main tanks were empty, to provide wing bending relief.

Previous flight

On 2 November 2013, the day before the accident flight, the aircraft flew a routine search exercise of 55 minutes duration. Interviews with those involved in the operation, and examination of relevant records, established that prior to this flight the tip tanks were selected ON.

Fuel consumed on this flight therefore came from the tip tanks. The amount consumed was probably of the order of 12-13 USG per side. Although fuel checks were made in the course of the flight, these checks simply established that the main tank quantities were sufficient for continued flight; the absence of a change in the main tank quantities, and the reducing quantities in the tip tanks, were not noticed.

No reconfiguration of the fuel system selections was made before the aircraft departed on the accident flight on 3 November 2013. At the commencement of the accident flight, each tip tank therefore contained approximately 5-6 USG.

Analysis

AAIB investigation to date indicates that the fuel supply to the right engine, and then the left engine, became exhausted and the engines ceased producing power approximately 15 minutes after the aircraft became airborne on the accident flight. The selection of alternate intake air had no effect and no action was taken to select an alternative fuel source for the engines after their power loss.

Footnote

¹ The main tanks were usually replenished after flight so that the fuel filled the tank to just below the neck of the fuel filler; this allowed for expansion of the fuel when the aircraft was parked outside in warm weather.

Further investigation

The AAIB investigation continues, focussing on operational procedures, training, safety management, and fuel quantity alerting.

Published 14 November 2013

AAIB investigations in Jersey are conducted in accordance with Annex 13 to the ICAO Convention on International Civil Aviation, and The Civil Aviation (Investigation of Air Accidents and Incidents) (Jersey) Order 2000.

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ACCIDENT

| | | |
|--|---|---|
| Aircraft Type and Registration: | Eurocopter EC135 T2+, G-SPAO | |
| No & Type of Engines: | 2 Turbomeca Arrius 2B2 turboshaft engines | |
| Year of Manufacture: | 2007 (Serial No: 0546) | |
| Location | Glasgow City Centre, Scotland | |
| Date & Time (UTC): | 29 November 2013 at 2222 hrs | |
| Type of Flight: | Commercial Air Transport | |
| Persons on Board: | Crew - 1 | Passengers - 2 |
| Injuries: | Crew - 1 (Fatal) | Passengers - 2 (Fatal) Other - 6 (Fatal) - 12 (Serious) |
| Nature of Damage: | Helicopter destroyed | |
| Commander's Licence: | Commercial Pilot's Licence | |
| Commander's Age: | 51 years | |
| Commander's Flying Experience | 5,592 hours (of which 646 ¹ were on type) Last 90 days - 38 hours Last 28 days - 19 ² hours | |
| Information Source: | AAIB Field Investigation | |

Notification

The Air Accidents Investigation Branch (AAIB) was notified at 2259 hrs on 29 November 2013 that a helicopter had crashed through the roof of a bar, The Clutha Bar, in the centre of Glasgow. A team of AAIB Inspectors and support staff arrived in Glasgow at 0915 hrs the following morning to commence an investigation.

In accordance with established international arrangements, the Bundesstelle für Flugunfalluntersuchung (BFU) of Germany, representing the State of Design and Manufacture of the helicopter, and the Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA) of France, representing the State of Design and Manufacture

Footnote

¹ 646 hrs are the hours on type the pilot had accumulated since 2010.

² Hours up to and including 26 November 2013.

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of the engines, appointed Accredited Representatives to participate in the investigation. They are supported by advisors from the BEA, the helicopter manufacturer and the engine manufacturer. The European Aviation Safety Agency (EASA), the UK Civil Aviation Authority (CAA) and the helicopter operator are also assisting the AAIB. Contact has been established with the National Transportation Safety Board (NTSB) of the USA, pending assistance from equipment manufacturers.

The investigation is being conducted under the provisions of *Regulation EU 996/2010* and the UK *Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996*.

This Special Bulletin provides initial information on the investigation. No analysis of the facts has been attempted.

History of the flight

At 2045 hrs on 29 November 2013, the helicopter departed Glasgow City Heliport (GCH), where it was based, to support police operations. On board were the pilot and two police observers. The pilot had been informed that there were no technical issues with the helicopter, which contained 400 kg of fuel.

Initially, the helicopter routed towards a location on the south side of Glasgow city centre, about 2 nm south-east of GCH. It remained in that area, at an altitude of approximately 1,000 ft amsl, for about 30 minutes. It then transited to Dalkeith, Midlothian, about 38 nm east of GCH, where it remained for a further 10 minutes, at various altitudes, before returning to Glasgow via Bothwell, South Lanarkshire and Bargeddie, North Lanarkshire. At 2218 hrs, the pilot requested clearance from ATC to re-enter the Glasgow Control Zone and return to GCH; this was approved. No further radio transmissions from the pilot were received.

Radar contact with the helicopter was lost at 2222 hrs. Around this time, the helicopter was seen and heard by a witness who described hearing a noise like a loud “misfiring car”, followed by silence. He then saw the helicopter descend rapidly. It crashed through the roof of The Clutha Bar, a single storey building on Stockwell Street in central Glasgow. The three occupants of the helicopter and six people in or adjacent to the bar were fatally injured. Thirty-two other people suffered injuries, twelve seriously³.

Weather

At 2150 hrs, about 5 minutes after the helicopter took off from GCH, the weather at Glasgow International Airport (GIA), 4.5 nm west of GCH, was CAVOK with the wind from 300° at 8 kt, temperature 6°C, dew point 2°C and the QNH was 1025 hPa.

At 2220 hrs the weather at GIA was CAVOK with the wind from 300° at 7 kt, temperature 5°C, dew point 2°C and the QNH was 1025 hPa.

Footnote

³ As defined by ICAO Annex 13 and the Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996, which are accessible from the AAIB website.

Helicopter information

The Eurocopter EC135 T2+ is a multi-purpose light helicopter, powered by two Turbomeca Arrius 2B2 turboshaft engines. These full-authority digital electronic control (FADEC) equipped engines, drive a four-bladed main rotor and fenestron tail rotor. In this case, G-SPAO was fitted for police air support operations.

Preliminary engineering investigation

The initial evidence indicated that the helicopter struck the flat roof of the single story building with a high rate of descent and low/negligible forward speed. Preliminary examination showed that all main rotor blades were attached at the time of the impact but that neither the main rotor nor the fenestron tail rotor were rotating.

The impact forces caused the roof of the bar to collapse and the helicopter entered the building; its forward section coming to rest on and amongst building debris. Very extensive damage and disruption of the helicopter structure and components resulted from the impact forces and from contact with the collapsing building. The helicopter did, however, remain approximately upright.

Working closely with the emergency services and the authorities in Glasgow, the AAIB conducted a preliminary examination of the helicopter, within the collapsed area of the building. Thereafter, the damaged sections of building structure were shored up and made safe, enabling closer examination to be carried out. Building debris was then progressively removed allowing additional access to be gained. However, the state of the building limited the extent to which examination of the helicopter was possible in situ.

After further debris removal and cutting off the main rotor blades, it was determined that the helicopter structure remained sufficiently robust for it to be lifted clear of the building by means of a crane, using strops attached to the main rotor head.

Once removed from the building, approximately 95 litres of fuel were drained from the fuel tank system.

Initial examination was carried out at the site, before the helicopter was transported to the AAIB's headquarters. Examination continued on its arrival at Farnborough, Hampshire, where it was confirmed that all significant components were present at the time of impact. Initial assessment provided no evidence of major mechanical disruption of either engine and indicated that the main rotor gearbox was capable of providing drive from the No 2 engine power turbine to the main rotor and to the fenestron drive shaft. Clear impact distortion of the structure had caused a splined shaft on the drive train from the No 1 engine to disengage, preventing a similar continuity check.

Detailed examination of the helicopter continues.

Recorded data

The helicopter was not required to have and was not fitted with flight recorders, nor did its systems provide a continuous recording of helicopter parameters. However, some systems record fault codes, as they occur, in memory that is not crash-protected. Those, and systems that can record camera images and audio, will be examined and analysed.

Radar data covering the helicopter flight has been recovered. That and radio communications are also being analysed, and closed-circuit television recordings will be reviewed.

Ongoing investigation

The AAIB investigation will continue to examine all the operational aspects of this accident and conduct a detailed engineering investigation of the helicopter. The AAIB will report any significant developments as the investigation progresses.

Published on 9 December 2013

Special Bulletin Correction

The following correction to the Special Bulletin was issued on 9 December 2013.

The section on **Weather** originally stated:

At 2150 hrs, about 5 minutes after the helicopter took off from GCH, the weather at Glasgow International Airport (GIA), 4.5 nm west of GCH, was CAVOK with the wind from 300° at 8 kt, temperature 6°C, dew point 2°C and the QNH was 1025 hPa.

It should have read:

At **2050 hrs**, about 5 minutes after the helicopter took off from GCH, the weather at Glasgow International Airport (GIA), 4.5 nm west of GCH, was: **visibility greater than 10 km**, with the wind from **280° at 9 kt**, **FEW clouds at 4,000 ft**, temperature 6°C, dew point 2°C and the **QNH was 1024 hPa**.

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AAIB Field Investigation reports

ACCIDENT

| | |
|--|--|
| Aircraft Type and Registration: | North American Rockwell OV-10B Bronco, G-BZGK |
| No & Type of Engines: | 1 Garrett Airesearch T76-G-418 turboprop engine 1 Garrett Airesearch T76-G-419 turboprop engine |
| Year of Manufacture: | 1971 (Serial no: 338-17) |
| Date & Time (UTC): | 10 July 2012 at 1350 hrs |
| Location: | Cotswold (Kemble) Airport, Gloucestershire |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - None |
| Injuries: | Crew - 1 (Serious) Passengers - N/A |
| Nature of Damage: | Aircraft destroyed |
| Commander's Licence: | Commercial Pilot's Licence |
| Commander's Age: | 47 years |
| Commander's Flying Experience: | 4,096 hours (of which 179 were on type) Last 90 days - 41 hours Last 28 days - 18 hours |
| Information Source: | AAIB Field Investigation |

Synopsis

The pilot was performing a display practice during which he attempted a barrel roll. Approaching the inverted position, at the top of the manoeuvre, the nose of the aircraft dropped below the horizon and the aircraft entered a steep descent. The pilot had reduced the rate of roll, thinking that it was too fast, but the aircraft continued to pitch through the vertical. The aircraft struck the ground in an approximately wings level, upright attitude with a high rate of descent. There was an immediate post-impact fire but the RFFS were on standby and reached the aircraft rapidly. The pilot was assisted from the aircraft having suffered serious injuries.

The investigation identified areas of concern in the granting of regulatory approvals and authorisations, and subsequent related audits. Four Safety Recommendations are made.

History of the flight

Previous flights

On 5 July 2012, the aircraft was flown from Kortrijk-Wevelgem International Airport (EBKT), Belgium to RAF Fairford (EGVA), Gloucestershire, where it was displayed at an airshow, as a static exhibit, on 7 and 8 July 2012. While at Fairford, the aircraft was refuelled.

On the morning of 9 July 2012, the aircraft departed RAF Fairford and flew to nearby Cotswold (Kemble) Airport (EGBP). The flight time was 5 minutes and the total engine running time was 19 minutes. On departure, the pilot recorded that the fuel in the internal tanks was indicating 1,760 lbs and that the centreline (external) drop tank was full (1,488 lbs). That afternoon the pilot flew the aircraft on two air-to-air photographic flights. The quality of the photographs was degraded and it was suspected that this was the result of fuel, in the form of a mist, being released from the centreline drop tank. A further flight was planned for the morning of 10 July 2012 but this was cancelled due to unfavourable atmospheric conditions.

Accident flight

On the afternoon of 10 July 2012 the pilot decided to carry out two display practices. He had not carried out a display practice for several months, so added 300 ft to his minimum authorised (base) height, for aerobatic manoeuvres, of 500 ft. He notified ATC of his intended practice by radio prior to departure. The RFFS were advised and were at 'Local Standby' status (fire appliance manned with the engine running) and, on this occasion, were in a position guarding the perimeter track that crosses the Runway 08 threshold.

The aircraft took off from Runway 26 and the pilot initiated his first manoeuvre. This was a steep climbing left turn, away from the display line. Further on in the sequence he commenced a barrel roll. This was entered on a westerly track, parallel to and south of Runway 26. The pilot recalled that the manoeuvre began with a positive pitch up into a climb, 45° nose-up, followed by a roll to the left. After the aircraft had rolled through 90°, he sensed that the roll rate was too high and reduced it. Witnesses observed that, as the aircraft approached the inverted position, the nose started to drop below the horizon and a steep nose-down attitude developed. The aircraft continued to pitch through the vertical until it was upright but in a nose-down attitude, with insufficient height to recover before striking the ground.

The pilot later recalled that, by the time he realised the aircraft was departing from the normal flight path for a barrel roll, he was in an upright, approximately 45° nose-down, wings level attitude. As he tried to pull the nose up to the horizon, the rudder pedal shaker activated, indicating he was approaching the stall. He continued pulling but eased the back pressure on the control column to avoid stalling. He also recalled turning through 20 to 30°, to head towards an area which was relatively free from obstructions.

The aircraft struck the ground in an approximately level, upright attitude with a high rate of descent. The fuel centreline drop tank disrupted on impact and a fire began immediately. The aircraft slid forwards along the surface and through a fence, before rotating about its right wing and travelling backwards across the runway in the direction of the ATC Tower.

The aircraft came to rest upright, with a significant fire burning aft of the cockpit. The RFFS and several bystanders were rapidly on the scene and the fire was suppressed. Meanwhile, the pilot released himself from his harness and tried to escape from the aircraft but, at first was trapped. Several people attempted to pull him out but were also unsuccessful. Eventually, the pilot freed himself and was assisted from the aircraft. He had suffered spinal injuries and burns and was flown to hospital by Air Ambulance.

Aircraft information

Aircraft description

The OV-10A aircraft was designed for and operated by the American military as a light, close support, ground observation and attack aircraft. It features a large, side access, multiple Perspex panel canopy over a tandem cockpit, with dual ejector seats. The aircraft is powered by two turboprop engines which are located under the wing, on each side of the fuselage. Twin tail booms extend continuously from the



Figure 1

engine nacelles, with vertical tail fins and rudders on each boom. The tops of the vertical fins are joined by a large horizontal stabiliser and single, full length elevator. The tall, retractable main landing gear legs extend from bays in the tail booms, directly behind the engines. The nose landing gear leg is located in the nose cone forward of the cockpit (see Figure 1).

At the rear of the fuselage is a small load bay, accessed via the tail cone. During military operations, the tail cone can be replaced by a transparent one, or removed completely, for reconnaissance and parachuting missions. The high straight wing, located behind the cockpit, has five integral fuel tanks. A large capacity drop tank can also be fitted to a belly centreline hard point.

The stall warning system consists of a stall detector installed on the leading edge of the right wing and a pedal shaker on the right rudder pedal. During the most recent Permit to Fly renewal flight test, carried out in October 2010, it was noted that the stall warning activated at approximately 10 kt above the actual stall speed in the clean configuration. The Flight Manual for the aircraft indicates that, at a weight of 10,000 lbs, the stall speed in the clean configuration and power on is 70 kt IAS and with power off it is 84 kt IAS.

Aircraft history and configuration

A number of OV-10 aircraft were exported to the German Air Force for use as target-towing aircraft. Although effectively identical to the OV-10A, the export version was designated

the OV-10B. Whilst the aircraft were owned by the German Air Force and used for military training, they were flown by civilian pilots and the ejector seats were disabled. As part of this process, the pilot's seat was modified. The twin shoulder straps of the harness clip onto a T-shaped bracket at the top of a steel cable which runs vertically up the forward face of the seat back, the other end of which is secured to the seat pan. The rear face of this bracket forms the jaws of a clamp, which fasten around a horizontal, solid plastic cylinder. This is secured by a 1/16 inch split pin through the clamp and cylinder. The plastic cylinder is moulded onto a nylon strap which is wound around an inertia reel located at the top of the seat back. A lever on the side of the seat pan either locks or releases the inertia reel.

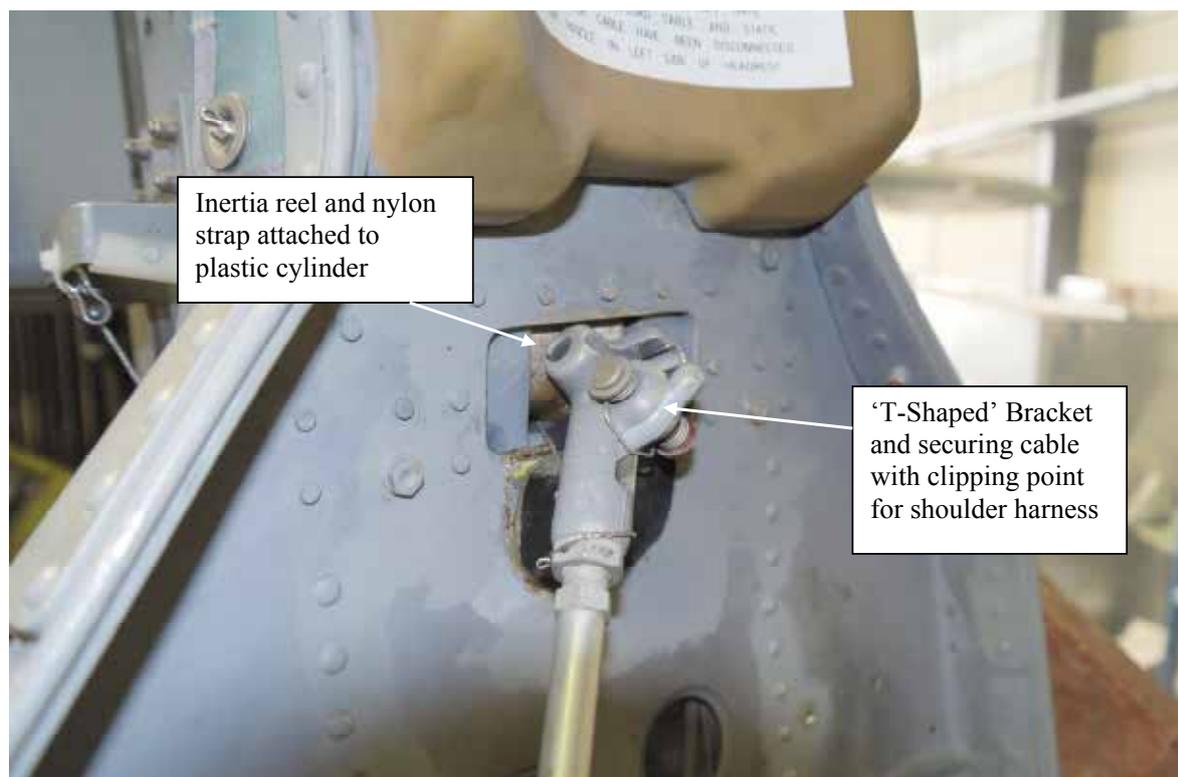


Figure 2

Seat shoulder harness attachment

Other role specific changes included the removal of the rear observer's seat from the cockpit and the installation of an aft-facing operator's seat in the load bay, for target towing.

After retirement from flying duties with the German Air Force, the aircraft were used as static airframes for battle damage repair training, before being sold off following a period of long-term storage. The pilot bought three of these aircraft for restoration. G-BZGK was the first to be restored to flying condition and was ferried to the United Kingdom in 2001. It then underwent extensive restoration and was issued with a Permit to Fly in 2007.

The aircraft was originally restored with a single pilot's seat in the cockpit, no role-specific equipment in the load bay and an opaque tail cone. The observer's seat in the cockpit had recently been replaced to facilitate carriage of a passenger. However, at the time of the

accident the Organisational Control Manual (OCM) had not been updated to reflect this and, as such, passengers were not permitted.

Fuel on board

The Flight Manual states that the aircraft's fuel capacity is 1,677 lbs in the internal tanks and 1,488 lbs in the centreline drop tank, giving a total of 3,165 lbs. The pilot noted that, with full internal fuel tanks, the relevant gauge indicated 1,750 lbs on departure from Fairford. The operating times and the fuel states between leaving Kortrijk-Wevelgem International Airport and the time of the accident are shown at Table 1.

| ROUTE/DATE | TAXI time/mins | FLIGHT time/mins | FUEL ON BOARD (lbs) | FUEL BURN (lbs) |
|--------------------------|---------------------------|-----------------------------|---|----------------------------|
| EBKT-EGVA 5 July 2012 | 15 | 60 | Start 1150 End 600 | 550 |
| EGVA-EGBP 9 July 2012 | 14 | 5 | Start 1750 End 1650 (Belly Full 1500) | 100 |
| EGBP-EGBP 9 July 2012 | 16 | 48 | Start 1650 End 1250 (Belly Full 1500) | 400 |
| EGBP 10 July 2012 | 12 | 4 | Start 1250 (Belly Full 1500) | 100 (Estimated) |

Table 1

Recorded flight and taxi times with fuel status

Consequently, on these flights the aircraft consumed 500 lb/hr to 550 lb/hr of fuel. From the known fuel quantities and flight times, it was estimated that the fuel load at the time of the accident was 2,650 lbs and that the aircraft weight was 10,700 lbs (4,853 kg). The Maximum Takeoff Weight (MTOW) for the aircraft is 12,500 lb (5,682 kg).

Airport information

There are a limited number of locations in the UK where pilots can practise flying displays at their normal display height. Cotswold Airport permits such display practices by pilots with a CAA Display Authorisation (DA). Display practices are normally to be carried out to the south of the runway, using the hard runway as the display line. All practices are required to be pre-booked with Aerodrome Operations. When an aircraft is carrying out a display practice the RFFS is brought to 'Local Standby'. A plan of the layout of the airport is at Figure 3.

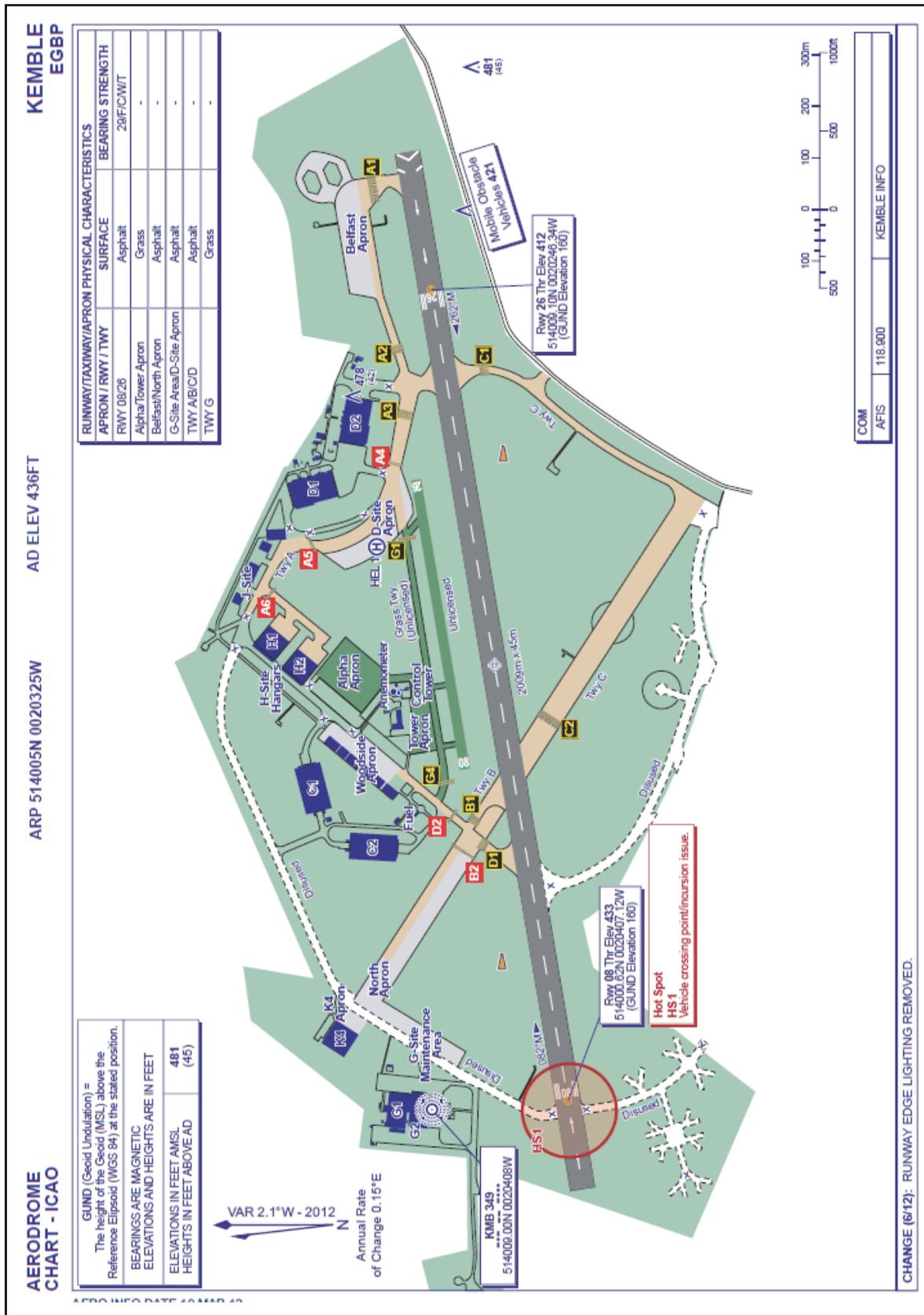


Figure 3

Aerodrome Chart from the UK AIP for Cotswold (Kemble) Airport

Accident site and wreckage

The initial impact marks were located on the grass area to the south of the runway, approximately in line with the ATC Tower and adjacent to the intersection between the runway and Taxiway C. The impact with the surface created large ground marks and there were a number of 'chop' marks where the rotating propeller blades of the left engine had contacted the ground. There was a significant amount of scorched grass around the initial point of contact, and soot and scorch marks extended through the adjacent section of boundary fence, which had been destroyed, on to the surface of Taxiway C. The ground marks continued for some 340 m, on a heading of 018°, across the runway to the location of the main wreckage, on grass, approximately 40 m to the southeast of the ATC Tower. Debris from the aircraft had been released, in a continuous trail, from the initial impact with the ground to the location of the main wreckage. A component from the rotating assembly of one of the propellers was found between the maintenance hangars to the northwest of the ATC Tower.

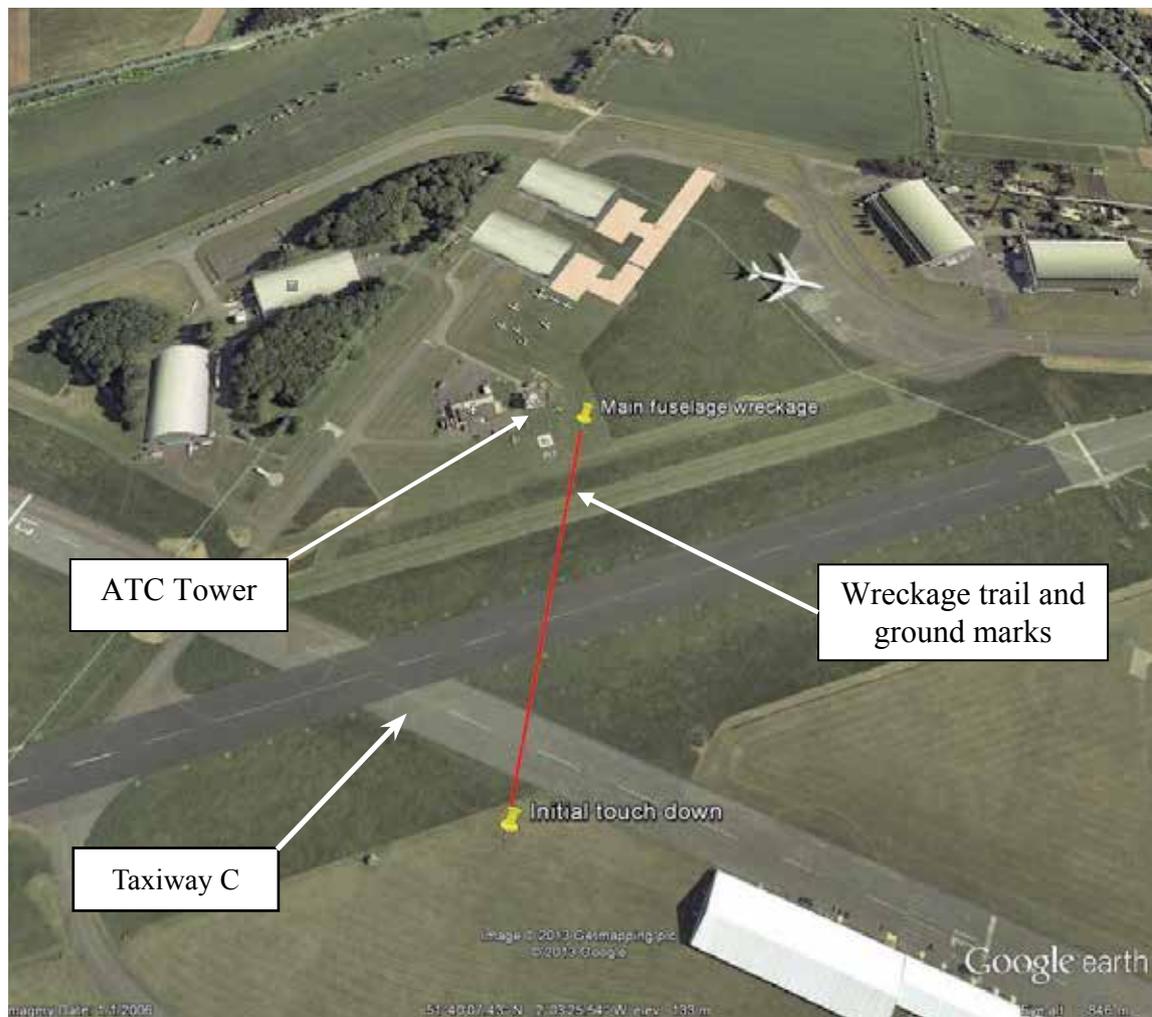


Figure 4
Accident site, looking north

The aircraft had been significantly damaged during the impact with the ground and the subsequent slide to its final position. The centreline-mounted drop tank, which was full of fuel, was destroyed and the fuel within it ignited. Various burnt components from the tank were scattered across the airfield. The right main landing gear leg had completely detached from the aircraft, as had the right engine and propeller blades. The left main landing gear leg was down and supporting the wing structure and left engine, which had rotated 90° vertically down from its normal orientation but remained attached by the service couplings. All but one of the propeller blades remained in the hub on the left engine but were significantly distorted, consistent with being under power at impact.

The right side of the wing was in contact with the ground. The right tail boom was intact but almost completely detached from the right engine nacelle and the horizontal stabiliser. The left tail boom remained attached but had fractured between the landing gear bay and the vertical fin, such that it leaned over at a 90° angle relative to the left engine nacelle. It was fully detached from the horizontal stabiliser. The entire fuselage had suffered significant fire damage, with the rear fuselage almost completely consumed. The wing had structurally detached from the fuselage and the five wing tanks contained a significant amount of fuel, which continued to leak from the aircraft after the fire had been extinguished. The forward fuselage, containing the two seats, remained intact but was severely damaged by the fire.

Wreckage inspection

The wreckage was inspected in situ and then in more detail after recovery to the AAIB's facilities. No pre-impact defect or damage which could have contributed to the accident was identified. This was supported by evidence from photographs of the aircraft taken immediately prior to impact and as it struck the ground.

The photographs of the aircraft during the initial impact showed that the pilot had not been restrained by the seat shoulder harness, causing him to be thrown forward and receive a head injury, despite wearing a helmet. Inspection of the pilot's seat identified that the plastic cylinder on the end of the inertia reel strap was intact and the strap had wound back onto the reel. However, the cylinder was no longer located within the clamp of the shoulder harness bracket. The plastic cylinder appeared to have pulled out sideways from the open end of the bracket clamp. Its retaining split pin was not present and there was no evidence that it had been in place at the time of the accident.

Maintenance review

A review of the maintenance records identified that the daily pre-flight inspection, required by the OCM and maintenance schedule, had not been signed off in the aircraft's Technical Log by the pilot during the days prior to the accident. With the exception of an unserviceable transponder, which was noted on his kneepad, the pilot stated he had not identified any defects and no additional maintenance had been carried out on the aircraft during this period. There was no record of fuel being released from the centreline drop tank, which had been identified in the photographic flights.

Pilot information

The pilot gained a Belgian Private Pilot's Licence (PPL) in 1999 and was issued with a UK JAR PPL in 2001. In 2003 he gained a Belgian Commercial Pilot's Licence (CPL) and in 2008 he was issued with a UK JAR CPL with a Shorts SC7 Skyvan type rating.

The pilot first flew G-BZGK in 2001 when he ferried the aircraft from Belgium to the UK. For ex-military types, where no civil type rating exists, a Civil Aviation Publication (CAP) 632 Aircraft Type Rating Exemption is required. Prior to the start of training on the type, a pilot is required to agree with the CAA a training syllabus appropriate to his or her level of experience. The CAA will then issue an exemption, specifying a period of training and the name of the person responsible for the conduct of that training. An initial short-term exemption was issued in 2001, for a ferry flight. A further exemption was issued in January 2008, when the pilot started flying G-BZGK regularly. Thereafter, annual exemptions were issued.

The pilot advised that he had received basic training in aerobatics in 2000, and additional training in aerobatics as part of his qualification for his Belgian CPL. In February 2009, he undertook a further course of aerobatic training in the United States, consisting of 7.5 flying hours in an Extra 300L aircraft.

The pilot was first granted a DA by the CAA in June 2010. It was issued for the OV-10B aircraft and was restricted to flypast displays, with a minimum height of 200 ft agl. In June 2011, following a DA evaluation, he was granted an upgrade to Standard Category aerobatics, restricted to aileron and barrel rolls only, with a minimum height of 500 ft agl. In July 2011, he completed a further evaluation, after which his DA was upgraded to allow him to fly as a member of a formation display. His most recent DA renewal was in April 2012, when his DA was upgraded again, to reduce the minimum height during a flypast to 100 ft agl.

The pilot's flying logbook recorded his display practices and aerobatics. The most recent practices were on 5 May 2012, when he recorded three display practice flights, each of ten minutes duration. The pilot planned to carry out two practice displays at Kemble and a further practice at a show venue on 27 July, prior to his scheduled display at the same location on 28 July. Recency requirements stipulate that three full display routines must be carried out in the 90-day period prior to a display. There was no evidence that any of these practices had been mentored by a Display Authorisation Evaluator (DAE) and there was no requirement that they should be.

The pilot stated that he always conducted the same display sequence. For the accident flight he had added a further 300 ft to his approved base height of 500 ft, for aerobatics, because he considered he was not sufficiently current.

Meteorological conditions

The meteorological observation recorded at Kemble at 1353 hrs was: surface wind from 280° at 9 kt, visibility greater than 10 km, few cloud at 900 ft, scattered cloud at 1,300 ft and QNH 1010 hPa. Photographs of the aircraft in flight, taken during the accident manoeuvre, showed clear sky conditions and good visibility. In CAP 632, the recommended

meteorological minima for a solo aircraft carrying out a full aerobatic display, is a cloud ceiling of 1,000 ft and visibility 5 km.

An aftercast obtained from the Met Office estimated that, at 1350 hrs, the wind at 1,000 ft agl was from 300° to 320° at 15 kt and the wind at 2,000 ft agl was from 310° to 330° at 20 kt.

Recorded information

Introduction

Recorded information was contained in GPS equipment¹ recovered from the aircraft. The data included a track log of the accident flight, with aircraft GPS-derived position, track, altitude and groundspeed recorded. During the final manoeuvre, data points were recorded at an average rate of just greater than once every three seconds.

The GPS track log commenced at 1331 hrs, with the aircraft positioned on the taxiway at Holding Point B2. It ended at 1350:12 hrs, shortly before the aircraft struck the ground.

Interpretation

At 1345 hrs the aircraft commenced its takeoff run and, once airborne, performed a series of manoeuvres to the south of Runway 08/26.

The maximum recorded ground and calculated airspeed during the flight (based on an estimated wind at 1,000 ft of 310°/15 kt) was 195 kt (Figure 5 - Point A). At 1347:22 hrs, the aircraft was photographed² with the landing gear and flaps extended, following which the aircraft made a slow speed pass, parallel to Runway 26, at a height of about 200 ft agl. As the aircraft approached the end of Runway 26, the landing gear was retracted. A photograph taken about 40 seconds later showed that the flaps had also been retracted.

At 1349:50 hrs, the aircraft was positioned about 130 m to the south of the Runway 26 threshold, at a height of approximately 440 ft. Two seconds later, having established an almost parallel track with the runway, the aircraft's groundspeed was 146 kt (calculated airspeed 156 kt) (Figure 5 – Point B). The next data point was recorded six seconds later, by which time the aircraft had climbed to 700 ft agl and the groundspeed had reduced to 142 kt (calculated airspeed 154 kt). During the next seven seconds, the aircraft proceeded to alter track by nearly 35° to the left, whilst climbing to a height of about 1,240 ft agl and reducing to a groundspeed of 93 kt (calculated airspeed 90 kt). The aircraft then descended rapidly whilst also altering track towards Runway 08/26. The final data point was recorded at 1350:12 hrs, with the aircraft at a height of about 120 ft agl, on a track of 012° and at a recorded groundspeed of 164 kt. The aircraft struck the ground shortly afterwards.

Footnote

¹ Garmin manufactured unit, model 495.

² A witness positioned on the control tower balcony had taken a series of photographs of G-BZGK during the accident flight.

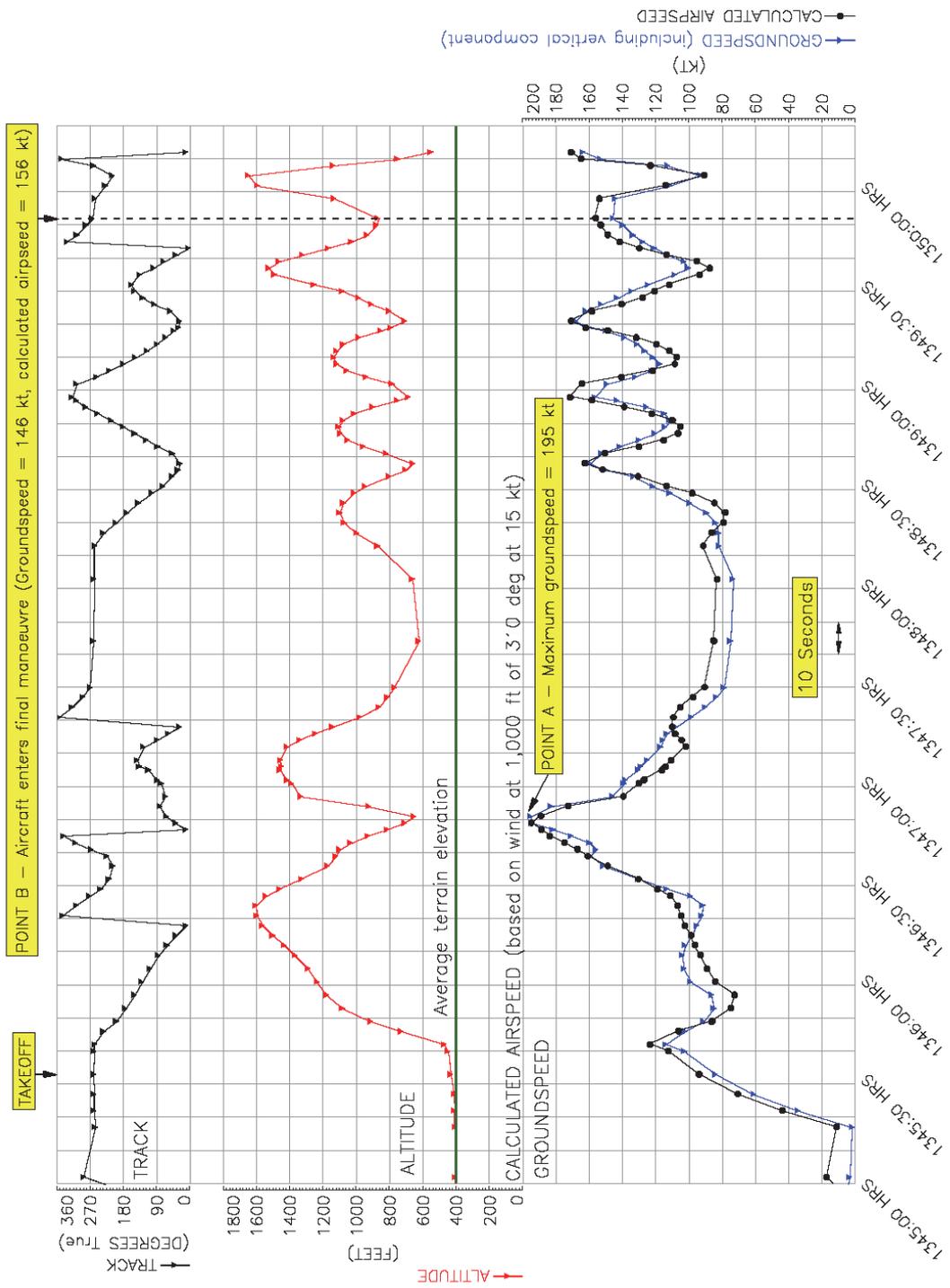


Figure 5
GPS track, altitude, groundspeed and calculated airspeed profile

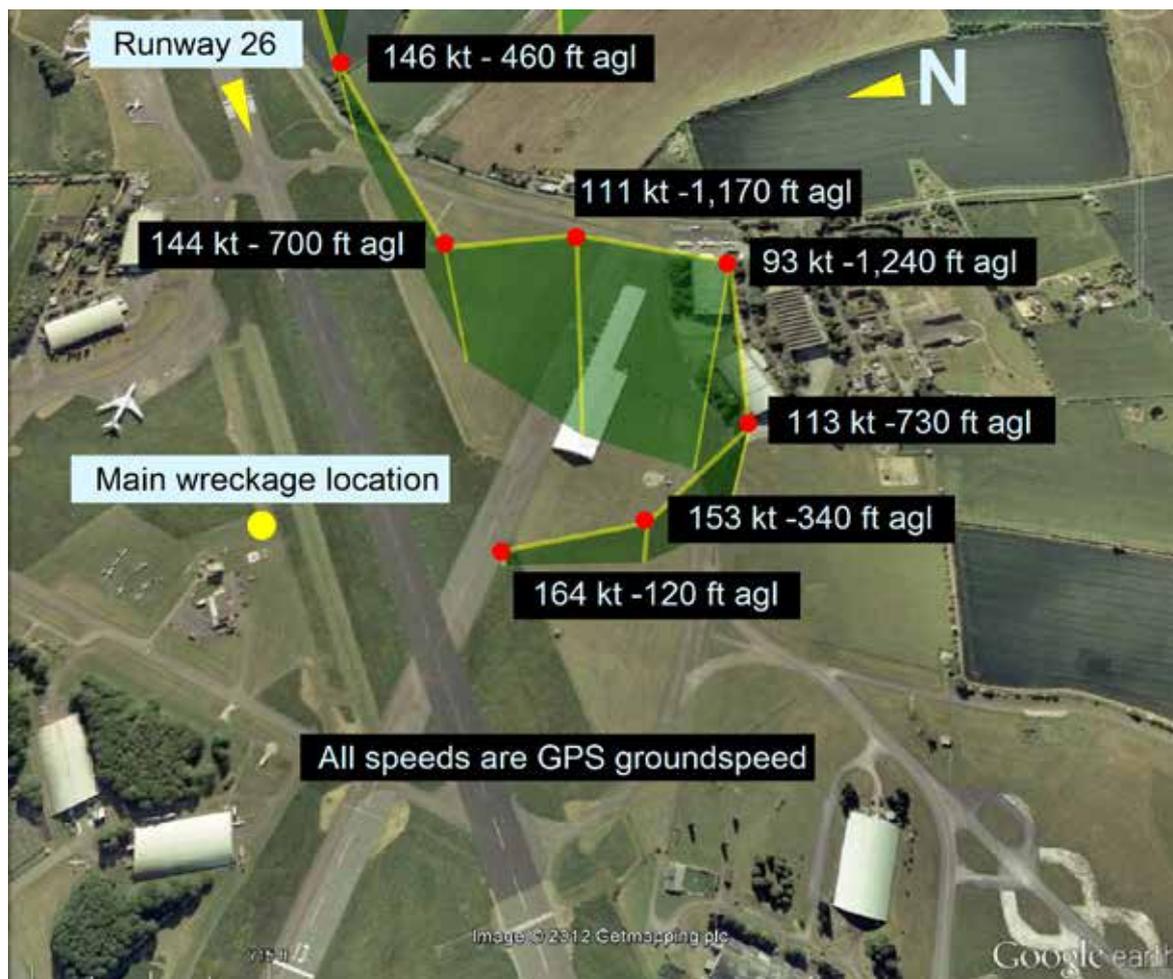


Figure 6

G-BZGK – Final manoeuvre

Organisational and management information

The operator owned three OV-10B Bronco aircraft listed on the UK register. The aircraft were being operated in accordance with CAP 632, Operation of 'Permit to Fly' Ex-Military Aircraft on the UK Register, a publication which specifies the operational requirements for the issue of a Permit to Fly. An operator is required to provide an OCM to demonstrate how it complies with the provisions of CAP 632. The operator may be an organisation or individual but a minimum operational and technical framework must be in place. In this case, the pilot was the Accountable Manager and the Chief Pilot.

In order for the aircraft to be operated at a flying display, a further publication, CAP 403, *Flying Displays and Special Events: A Guide to Safety and Administrative Arrangements*, provides information on the requirements to be met. The following text is included in the introduction:

'Air Displays and Aerial Special Events form a significant part of the UK leisure industry today and participation, together with their organisation and administration, needs careful consideration if the highest safety standards are to be achieved and maintained. This publication is intended as a code of practice and an indicator of best practice to provide guidance to ensure that the safety of both the participants and the spectators is not compromised.

They (the standards quoted) should be treated as applying equally to practice for, as well as participation in, Air Displays and Special Events.'

In an air display, or a practice, the minimum distance between the Display Line and the Crowd Line is related to the actual speed of the aircraft and the type of display. For an aircraft flying at a maximum speed of 200 kt, this is 100 metres for a flypast and 150 metres for aerobatics.

There are no specific minimum experience requirements before a pilot can apply for a DA but there are guidelines which suggest the pilot of a fixed wing aircraft should have at least 200 hours experience. For an initial DA, Form SRG 1301 is completed. This form includes comprehensive background information about a pilot's previous experience and preparedness for display flying, in addition to an evaluation of a demonstration flight. The evaluator completes a review of the applicant's documentation, plus previous aerobatic experience and training, if applicable, and relevant knowledge and display planning.

When a pilot seeks to renew or extend the privileges of his or her DA, Form SRG 1302 is used. This form requires the applicant to provide a record of displays and practices carried out and the evaluator to assess a demonstration flight. However, it does not include a review of documentation, knowledge and display planning.

A paragraph in CAP 403, concerning mentoring, was introduced in the 12th Edition, dated June 2012. It states:

'Part of the application process is a degree of mentoring. All initial DAs will be mentored by an appropriate DAE throughout their process of workup. It is highly recommended that the mentoring continues after the DA is initially issued.'

There is no similar requirement for mentoring when a pilot seeks to extend the privileges of his or her DA.

Another publication, CAA leaflet, Doc 743 '*Civil Air Displays, a guide for pilots*', contains information for display pilots on all elements of planning and carrying out a flying display, and includes the following:

'It is important that you have constructive and critical comment during your display planning and workup from an experienced display pilot who is preferably a Display Authorisation Evaluator experienced on your type of aircraft. Choose someone with whom you have a good rapport, mutual trust and respect. Then heed the advice given.'

Approvals for restoration, airworthiness control and maintenance of ex-military aircraft

Ex-military aircraft which are subsequently operated by private owners and placed on the UK register are required to gain an aircraft-specific Permit to Fly from the CAA, in order to comply with the Air Navigation Order. Granting of a Permit is subject to the owner or operator satisfactorily demonstrating that the aircraft has been restored and will be maintained to an appropriate standard by an approved organisation. As the Permit is issued and administered by the CAA, CAP 553, *BCAR Section A - Airworthiness Procedures where the CAA has Primary Responsibility for Type Approval of the Product*, is applicable. Chapter A8-20 of this document relates to approval of organisations responsible for the restoration, airworthiness control and maintenance of aeroplanes and rotorcraft of military origin (Group E4 and M5)³.

The granting of A8-20 (E4/M5) approvals and subsequent oversight auditing is conducted within the CAA by the Survey department of the Safety Regulation Group (SRG)⁴. The internal procedure against which this work is carried out details the organisational requirements for applicants and the appropriate paperwork, including a company exposition, which must be submitted to demonstrate compliance. Initial assessment of the application is carried out centrally, against the submitted paperwork, prior to a confirmation visit and assessment by a surveyor from one of the regional offices. If the application is considered satisfactory, a further surveillance plan is created, typically scheduling an audit every 12 months. If the organisation is considered to be in compliance, the approvals are not time limited. The CAA advised that this process does not consider whether the applicant also operates the aircraft under CAP 632 and, as a consequence, no review of a related OCM takes place when assessing an A8-20 application.

Initial approval and continued surveillance against the requirements of CAP 632 is conducted by a separate Flight Operations department within SRG, now the SARG. The CAA confirmed that no coordinated assessments take place between the Flight Operations and Survey departments, either during initial approval or continued surveillance against CAP 632 and CAP 553 compliance.

Maintenance arrangements and approvals

The pilot had contracted a third party with the appropriate E4 and M5 approvals to conduct the restoration of G-BZGK and to provide ongoing maintenance and continuing airworthiness control. At the time of the accident, this organisation was listed in the OCM as being the sole provider of such services.

In 2011, the pilot applied for and was granted E4 and M5 approval for a maintenance company which was a subsidiary of his parent company, which operated the accident

Footnote

³ E4 is the approval to undertake assessments and report to the CAA relating to the initial granting of a Permit to Fly. M5 is the approval to undertake assessments and make recommendations relating to the annual reissue of permits and to conduct and certify maintenance on aircraft of military origin.

⁴ These department names were subsequently amended in a reorganisation of the CAA. The Safety Regulation Group became the Safety and Airspace Regulation Group (SARG).

aircraft. The company exposition, submitted as part of the approval process, listed the pilot as the nominated post holder for most of the senior roles, including Chief Executive, M5 coordinator, E4 signatory and Check Pilot. The pilot confirmed that the annual Permit inspection, due in November 2012, was likely to have been done by his company.

Although they had granted the appropriate approvals, the CAA considered that the pilot's subsidiary company and its approvals were dormant⁵ at the time of the accident. As such, no audits had been scheduled or completed by the CAA. They advised that the original arrangement with the third party provider was considered to be still in force for the accident aircraft, as detailed in the operating company's OCM. This meant that any maintenance or modification of the aircraft had to be carried out under the third party supplier's approval and any deviations, such as operating with an unserviceable component, required their approval.

Other information

Survivability

The pilot was wearing a flying suit and gloves made of flame resistant material which, together with his helmet, undoubtedly contributed to his survival. He remained conscious following the accident and was able to free himself from his initial trapped position before being assisted from the aircraft.

The barrel roll

A barrel roll is an aerobatic manoeuvre in which the aircraft describes a corkscrew path, along the inside of an imaginary cylinder. Pitch and roll rates should be co-ordinated so that the wings reach the level inverted position before the nose falls through the horizon. If the roll is too slow the nose drops through the horizon before the wings are level inverted and, without corrective action from the pilot, the aircraft enters a spiral descent, with an associated increase in speed and considerable loss of height.

In a loop, the height gained and lost by an aircraft is predictable and repeatable, leading to height and speed 'gates' at the entry and highest points of the manoeuvre. If met, these gates provide a measure of assurance that, correctly performed, the manoeuvre can be completed successfully. However, in a barrel roll, the combination of roll with pitch means that the predictability and repeatability of the manoeuvre is less easy to achieve and that the height required is likely to be variable. Thus, it is not possible to establish similar height and speed 'gates' for the barrel roll.

If the attitude of an aircraft is unusual during a barrel roll, the recognised recovery technique, to minimise height loss, is to roll the aircraft wings level to the nearest horizon, then pitch to achieve level flight. In a nose-low, inverted attitude the quickest way of rolling to the nearest

Footnote

⁵ The term 'dormant' is not used by CAA procedures and there is no formal process or definition for categorising approvals in this way. Additionally there is no process for identifying when an approval is no longer 'dormant' and no formal requirement for a company to report to the CAA when an approval is actively being used or otherwise.

horizon may be to continue the roll at an increased rate or reverse the direction of roll. However, if instead the aircraft is flown through the vertical, towards the opposite horizon, the aircraft will develop an increasing nose-down attitude, the speed will increase and there may be insufficient height to recover to level flight. Additionally, the trajectory of the aircraft is likely to deviate from the display line.

There is no guidance in the OV-10B Flight Manual as to how a barrel roll should be carried out. However, a US Naval Aviation Manual included some limited information (see Table 2).

AEROBATIC MANEUVER PARAMETERS

| MANEUVER | COND LEVER | RPM | ENTRY AIRSPEED | MINIMUM MANEUVER SPEED |
|-------------|---------------|----------|----------------|------------------------|
| AILERON | NORMAL FLIGHT | 95 - 98% | 150 - 200 | — |
| WINGOVER | | | 200 | 100 - 110 |
| BARREL ROLL | | | 200 | 100 - 110 |
| LOOP | | | 250 | 100 - 110 |

Table 2

Extract from US Naval Aviation Manual

Witnesses

Some of the witnesses, who were professional display pilots, commented that the roll rate appeared slow but that if the rolling manoeuvre had continued then the situation would probably have been recoverable. They observed that, in conjunction with the slow roll rate, there was an unusually rapid pitch down from the inverted attitude and that there was insufficient height for the aircraft to pull through the vertical.

Analysis

Conduct of the flight

The pilot was carrying out a display practice. The airport operator was notified, as was required, and the RFFS were on standby. The meteorological conditions were suitable and met the CAP 403 recommended minima for an aerobatic display to be carried out.

The centreline drop tank had recently been filled with fuel and was still full of fuel, an unusual configuration for performing a display. The extra weight may have affected the performance and feel of the aircraft but it does not appear to have been a predominant factor in the accident.

The documentation regarding recommended speeds and techniques for flying aerobatic manoeuvres in this aircraft type was limited but one reference suggested that a suitable entry airspeed for a barrel roll would be 200 kt. The actual entry airspeed was calculated to be 156 kt. Although the entry speed was lower than recommended, the pilot reported that he had intentionally reduced the roll rate, which would account for the observed slow

rate of roll. However, the lower than recommended speed would have had an effect on the performance of the aircraft, especially with the unusual fuel load.

The pilot's display was one which he practised on a regular basis. Witnesses observed that the aircraft deviated from the intended barrel roll manoeuvre when it was in an inverted attitude and pitched down unusually rapidly. At this stage, they considered that a successful recovery could have been made. However, the aircraft continued to pitch down, with insufficient roll, and a steep nose-down attitude developed. The pilot recognised the problem after the aircraft had pulled through the vertical into an upright, nose down attitude, by which time, however, there was insufficient height to recover. An additional effect of continuing to pitch 'up', in the aircraft's normal axis, with insufficient roll, was to alter the trajectory of the aircraft, taking it towards and subsequently through the notional crowd line.

Display authorisation

The pilot met the recommended guidelines for minimum experience for the initial issue of a DA. The most recent editions of CAA publications CAP 403 and Doc 743 refer to the value of mentoring during the time that a pilot is working towards both gaining a DA and after initial issue. The pilot had demonstrated his flying display to a DAE as part of the evaluation and renewal process but there was no evidence that his display had been evaluated separately, or that there had been any mentoring, other than on those occasions. Thus, if a problem had developed with the way a particular manoeuvre or display was being conducted, it may not have been detected and an opportunity to address it may have been missed.

The pilot was initially issued with a DA for Flypast, with a minimum base height of 200 ft. When he applied to extend the DA privileges to aerobatic flying, the process was less rigorous than for an initial application. Form SRG 1302 is used for the evaluation of an application to extend DA privileges and does not require an assessment of previous aerobatic experience. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2014-001

It is recommended that the Civil Aviation Authority revise Civil Aviation Publication 403, *Flying Displays and Special Events: A Guide to Safety and Administrative Arrangements*, to ensure that the requirements in Form SRG 1301, *Display Pilot Authorisation Application*, for an initial application for a display authorisation, also apply to an application to extend the privileges of a display authorisation.

Secondly, there is no requirement for mentoring during the process to extend the privileges of a display authorisation, as required for an initial Display Authorisation. The accident pilot was the only person flying this aircraft regularly and was not part of a larger organisation. Consequently, the opportunity for mentoring may have been limited. Within a larger organisation there tends to be a natural and, in some cases, required element of oversight by other pilots. This suggests that the element of mentoring, which is recommended by the CAA, is particularly relevant where pilots are operating outside a larger organisational environment. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2014-002

It is recommended that the Civil Aviation Authority extend the requirement in Civil Aviation Publication 403, *Flying Displays and Special Events: A Guide to Safety and Administrative Arrangements*, for mentoring, as required during the application process for an initial Display Authorisation, to apply to the application process to extend those privileges.

Maintenance and operational approvals

Although not directly causal to the accident, a number of issues were identified during the investigation regarding airworthiness control and the operation of the aircraft. These highlighted potential safety management issues where a single individual is the nominated post holder for multiple roles, covering both the operational and maintenance sections of an organisation.

The pilot's subsidiary maintenance organisation had been granted the necessary maintenance and airworthiness approvals for the aircraft from the CAA, although these were not yet active. This process did not take into consideration the arrangements for the operation of the aircraft. A review of the OCM identified that a single individual had been granted approval to manage the operation and maintenance of the aircraft as Chief Pilot and Maintenance Coordinator.

The absence of the cross-checking and independent assessment that comes from separating aircraft operation and maintenance responsibilities can result in a valuable safety benefit being lost. Discussion with the CAA highlighted that such issues may not be detected during the initial CAA approval process for CAP 632 or CAP 553 (Chapter A8- 20) applications, where an organisation both operates and maintains an aircraft. This is particularly relevant if individual applications are not concurrent, as the processes are administered by separate departments within the CAA which do not consult with each other during the approval process. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2014-003

It is recommended that the Civil Aviation Authority revises its procedures for granting or amending approvals under Civil Aviation Publication 632 and Civil Aviation Publication 553, Chapter A8-20, to ensure consultation takes place between the Flight Operations and Airworthiness capability teams of the Safety and Airspace Regulation Group.

Once approvals have been granted under CAP 632 and CAP 553, the relevant organisation is subject to a routine ongoing CAA audit process, to ensure that the standards demonstrated in theory, to gain the approvals, are being maintained in practice. As with the initial approval process, audits against the two different CAP requirements are currently carried out separately and without consultation between the Survey and Flight Operations departments, despite there being a crossover in the subject matter being assessed. This has the potential for airworthiness concerns to be missed or underestimated in importance,

as the operation (combined engineering and flight operations) is never assessed as a whole by an individual or team with the appropriate combination of skills and experience in both disciplines. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2014-004

It is recommended that the Civil Aviation Authority revises its procedures for auditing approvals which have been granted under Civil Aviation Publication 632 and Civil Aviation Publication 553, Chapter A8-20, to ensure that the audits completed by the Flight Operations and Airworthiness capability teams of the Safety and Airspace Regulation Group are conducted in a coordinated manner, so that all aspects of the operation and maintenance are adequately assessed.

INCIDENT

| | | |
|--|---|-------------------|
| Aircraft Type and Registration: | Sikorsky S-76C, G-XXEB | |
| No & Type of Engines: | 2 Turbomeca Arriel 2S2 turboshaft engines | |
| Year of Manufacture: | 2009 (Serial no: 760753) | |
| Date & Time (UTC): | 23 May 2013 at 0930 hrs | |
| Location: | Denham Aerodrome, Buckinghamshire | |
| Type of Flight: | Private | |
| Persons on Board: | Crew - 2 | Passengers - 6 |
| Injuries: | Crew - None | Passengers - None |
| Nature of Damage: | None | |
| Commander's Licence: | Airline Transport Pilot's Licence | |
| Commander's Age: | 53 years | |
| Commander's Flying Experience: | 7,262 hours (of which 2,850 were on type) Last 90 days - 44 hours Last 28 days - 28 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot and AAIB/NTSB enquiries | |

Synopsis

During approach and descent to Denham Aerodrome, with autopilot disengaged, the pilot became aware of the aircraft yawing right. The pilot made a corrective pedal input and felt a restriction in the left pedal which also appeared to have an effect on the neutral yaw pedal position. The pilot declared a PAN and conducted an uneventful running landing. The yaw control system abnormality remained until the aircraft was shut down. The fault was later traced to the Pedal Damper Trim Actuator (PDTA). A detailed examination of the PDTA found that a small metal sealing ball had split within the solenoid valve. This caused an internal leakage of hydraulic pressure resulting in a PDTA trim runaway input and restriction within the helicopter yaw control system.

History of the flight

The aircraft was on approach to Denham Aerodrome with the autopilot disengaged. During the descent the pilot noticed the aircraft to be "out of balance, with the ball out to the left"; as the pilot made a corrective yaw input with the left pedal he felt a "heaviness" and restriction in the yaw control system. In addition to the restriction, the pilot detected that the range

of his yaw control to the left was now limited. He also noticed that the right pedal moved to almost its full forward travel, without pilot input, when pressure on the left pedal was relaxed. The co-pilot confirmed the problem was also apparent with his yaw pedals.

The crew conducted system checks and further diagnosis. Selection of the yaw trim switched to the IN and OUT positions had no effect. It was also confirmed that when the helicopter was flown into wind at 80 kt with full available left pedal applied, the right yaw remained. The pilot declared a PAN and decided to carry out a running landing and briefed the co-pilot to carry out an immediate engine torque reduction should directional control be lost. The passengers were also briefed on the situation and pilot's intention. The crew performed an uneventful running landing and ground-taxied to dispersal with the yaw control abnormality still apparent. The aircraft was shut down and the crew and passengers vacated the aircraft.

Pedal Damper Trim Actuator

The PDTA is fitted within the helicopter mechanical yaw control system to provide yaw trim, a damping function and to respond to inputs from the Automatic Flight Control System (AFCS). Damping control uses hydraulic fluid restriction through an internal orifice and valve to retard excessively rapid pilot movement of the pedals. Trim and AFCS control is by the servo-controlled motion of a hydraulic piston to make yaw system inputs automatically or manually.

PDTA technical investigation

Initial fault diagnosis found that the cause of the yaw control system anomalies was the PDTA. This was replaced and the helicopter flown without further incident. The faulty PDTA had been overhauled and issued by the manufacturer on 27 February 2013 and was fitted in G-XXEB having accrued approximately 73 flying hours since installation. The faulty PDTA was returned to the manufacturer in the United States in order to determine the nature of the fault. The National Transportation Safety Board (NTSB) assisted the AAIB to co-ordinate the component examination.

A Computerised Tomography (CT) scan was carried out on the PDTA and it was found that a small steel ball, part of the trim solenoid valve, had split in half. PDTA functional checks by the manufacturer on a hydraulic test bench demonstrated that the broken ball produced identical symptoms to those experienced by the pilot. Figure 1 shows the PDTA in position and the CT scan of the servo valve ball.

Analysis and testing of the PDTA indicated that the split ball was allowing hydraulic pressure to leak internally past the solenoid valve to act on the trim-on control valve, thus placing the PDTA in trim mode continuously. In addition, the leakage acted within the PDTA against the damping circuit, which, with the actuator moving constantly, needed a significant force to overcome.

The new steel ball had been fitted at overhaul prior to the PDTA release to service and is most likely to have fractured during the flight from London to Denham. A detailed metallurgical

analysis of the ball by the NTSB on behalf of the AAIB is continuing. However, the most likely cause of the ball fracture was an anomaly in its heat treatment process during manufacture.

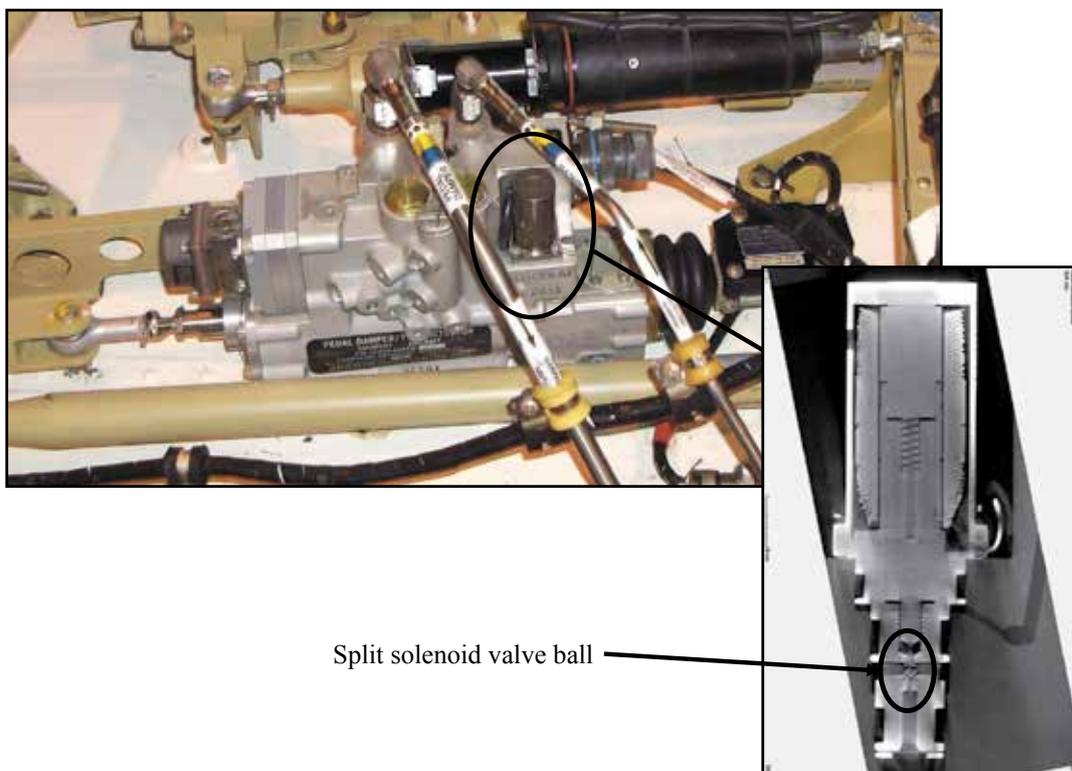


Figure 1

PDTA and servo valve CT scan

Safety action

The helicopter manufacturer is in the process of issuing a Sikorsky Safety Advisory, and a Rotorcraft Flight Manual revision, to inform operators of the symptoms of a PDTA fault and actions to be taken by the crew.

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: | Beech A36TP Bonanza, N7205T | |
| No & Type of Engines: | 1 Rolls-Royce/Allison 250B-17F2 turboprop engine | |
| Year of Manufacture: | 1984 (Serial no: E-2182) | |
| Date & Time (UTC): | 30 August 2013 at 1630 hrs | |
| Location: | Near Tatenhill Airfield, Staffordshire | |
| Type of Flight: | Private | |
| Persons on Board: | Crew - 1 | Passengers - 4 |
| Injuries: | Crew - None | Passengers - None |
| Nature of Damage: | Damaged beyond economic repair | |
| Commander's Licence: | Private Pilot's Licence | |
| Commander's Age: | 53 years | |
| Commander's Flying Experience: | 2,766 hours (of which 1,635 were on type) Last 90 days - 23 hours Last 28 days - 9 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot | |

Synopsis

The aircraft was taking off when the pilot reportedly saw birds on the runway ahead. Shortly after takeoff he saw that the engine torque gauge was reading zero. He performed a forced landing in a field with the landing gear retracted which resulted in major damage to the aircraft but without injury to the occupants. No physical evidence of bird impact was found either on the airframe or the engine.

Description of the aircraft

The A36TP model is a turboprop conversion of the original, piston-engined Beech A36 Bonanza aircraft. The US Supplemental Type Certificate (STC), which introduced the conversion, also added wingtip tanks to increase the fuel capacity from 74 USG to 114 USG.

Performance figures supplied by the pilot showed that the aircraft had a Maximum Take Off Weight (MTOW) of 3833 lbs and a basic weight of 2630 lbs. He had allowed 544 lbs for 81 USG of fuel and 596 lbs for himself and his four passengers. With 10 lbs allowed for baggage, this gave a weight at takeoff of 3,780 lbs

History of the flight

The pilot and five passengers were taking off from Tatenhill Airfield for a destination in North Yorkshire. Witnesses on the ground said they saw the aircraft lift off after an unusually long takeoff roll. It then levelled off at about 100 ft and flew level for a short time before pitching

nose-up into a climbing attitude, following which they observed what appeared to them to be the right wing dropping before the aircraft descended out of sight.

The pilot has stated that after performing the normal pre-takeoff checks, he started the takeoff roll and, shortly afterwards, he was aware of birds on the runway ahead. He throttled back as the birds passed either side of the aircraft and then increased power and rotated to a climbing attitude. He initially levelled out at about 100 ft whilst the landing gear was retracted. However, having resumed a climbing attitude again, at a height of 300-400 ft he noticed that the torque gauge was reading zero.

The pilot attempted to turn the aircraft back towards the airfield but realised that he had insufficient height and airspeed to achieve this. Instead, he prepared for a wheels-up forced landing in what appeared to be the nearest and most appropriate field, although it contained a crop of tall maize. The subsequent impact was described as “heavy” but there was no fire and both he and his passengers were able to exit the aircraft normally and without injury.

At the time of preparation of this Bulletin, the engine had not been subjected to a detailed examination, although the maintenance company reports that a visual examination of the airframe and the engine intake and compressor did not reveal any evidence of birdstrike or ingestion. The pilot’s opinion is that the engine lost power during the climb, that the sequence of events as reported by the eyewitnesses was consistent with his recollection and was as a result of the presence of birds.

SERIOUS INCIDENT

| | | |
|--|--|-------------------|
| Aircraft Type and Registration: | Boeing 747-436, G-CIVA | |
| No & Type of Engines: | 4 Rolls-Royce RB211-524G2-T-19 turbofan engines | |
| Year of Manufacture: | 1993 (Serial no: 27092) | |
| Date & Time (UTC): | 9 June 2013 at 0710 hrs | |
| Location: | London Heathrow Airport | |
| Type of Flight: | Commercial Air Transport (Passenger) | |
| Persons on Board: | Crew - 16 | Passengers - 312 |
| Injuries: | Crew - None | Passengers - None |
| Nature of Damage: | Galley 4 trash compactor defect | |
| Commander's Licence: | Airline Transport Pilot's Licence | |
| Commander's Age: | 46 years | |
| Commander's Flying Experience: | 14,407 hours (of which 2,085 were on type) Last 90 days - 250 hours Last 28 days - 7 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot and additional information provided by the operator | |

The aircraft had started its initial descent into Heathrow Airport and was about to enter the Ockham hold. A member of the cabin crew noticed that the trash compactor in Galley 4 (near Door 2 Left) was emitting acrid smoke, but she was unable to isolate its electrical supply. The commander sent the co-pilot to pull the circuit breaker. He could not locate the circuit breaker but was able to isolate the galley using the galley power emergency switch.

The cabin crew monitored the situation, and a few minutes later the smell had worsened, so the commander was informed. The crew declared a MAYDAY and carried out an expeditious approach and landing at Heathrow. They elected to vacate the runway and, after discussions with both the fire services and the cabin crew, taxied to stand. The fire services removed the compactor and the passengers were then disembarked normally.

The compactor unit was sent to the manufacturer for further investigation but no conclusive evidence for the cause of the acrid smoke was found.

The operator has included the findings from this event in its review of cabin crew training and fire safety drills.

ACCIDENT

| | | |
|--|--|-------------------|
| Aircraft Type and Registration: | Beagle Auster D5 Series 180 Husky, G-ATMH | |
| No & Type of Engines: | 1 Lycoming O-360-A2A piston engine | |
| Year of Manufacture: | 1965 (Serial no: 3684) | |
| Date & Time (UTC): | 29 September 2013 at 1000 hrs | |
| Location: | Bovington Camp, Dorset | |
| Type of Flight: | Private | |
| Persons on Board: | Crew - 1 | Passengers - None |
| Injuries: | Crew - None | Passengers - N/A |
| Nature of Damage: | Right main landing gear collapsed, damage to cowling, propeller and right wing | |
| Commander's Licence: | National Private Pilot's Licence | |
| Commander's Age: | 83 years | |
| Commander's Flying Experience: | 1,005 hours (of which 600 were on type) Last 90 days - 18 hours Last 28 days - 5 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot | |

Synopsis

The aircraft had just taken off whilst towing a glider. As the pilot attempted to climb away, he felt that the engine was not delivering enough power to continue; the glider released and the pilot searched for a suitable place to make a forced landing. A concrete road cut through a spruce forest was selected but, on landing, the right wing clipped a tree, spinning the aircraft round through 180° before it came to a halt. No reason for the loss of power has been found but carburettor icing remains a possibility.

History of the flight

The aircraft was engaged on a glider towing sortie and had been flown by a different pilot without incident an hour or so before the accident flight. The pilot had done his pre-flight checks and started the engine normally before taxiing to the launch point where he performed the power assurance checks, noting that the magneto drop checks were normal. The glider, a Schleicher AS-K 13, was attached and takeoff to the south was commenced. After liftoff, the pilot banked to the right as normal, crossed the field boundary hedge at a height of about 25 ft and started to pull up into the climb with full power selected. However,

he would have expected and he lowered the nose to regain level flight. Again, speed did not increase, although there were no symptoms such as engine misfiring and the aircraft started, in the pilot's words, to "mush down".

The glider released and made a successful landing in open ground. The pilot of G-ATMH tried to lower the nose even further to increase airspeed which had dropped, he recalls, to about 40 kt. He initially considered trying to land back at the gliding field but realised that he was below the treeline between himself and the field and therefore would have to carry out a forced landing. He selected a concrete road cutting through the trees and attempted to land on it, but his right wing caught a tree. The aircraft spun through 180° before it came to rest with the right main landing gear collapsed. Throughout, the pilot believes that the engine continued to run but was not producing enough power to maintain level flight.

A limited examination of the engine did not reveal any obvious reasons for the power loss but it was noted that the weather conditions were conducive to carburettor icing

BULLETIN CORRECTION

The following correction to this report was issued on 9 January 2014.

The original report stated '*The aircraft was engaged on a glider towing sortie and had been flown by a different pilot without incident an hour or so before the accident flight*'. The pilot has advised that this was a misunderstanding and that the accident flight was, in fact, **the first flight of the day**.

ACCIDENT

| | |
|--|--|
| Aircraft Type and Registration: | Cessna 182P Skylane, G-EEZS |
| No & Type of Engines: | 1 Continental Motors Corp O-470-R piston engine |
| Year of Manufacture: | 1972 (Serial no: 182-61338) |
| Date & Time (UTC): | 23 August 2013 at 1100 hrs |
| Location: | Rochester Airport, Kent |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - 1 |
| Injuries: | Crew - None Passengers - None |
| Nature of Damage: | Nose gear detached, propeller, exhaust and lower cowl damaged |
| Commander's Licence: | Private Pilot's Licence |
| Commander's Age: | 72 years |
| Commander's Flying Experience: | 253 hours (of which 105 were on type) Last 90 days - 16 hours Last 28 days - 2 hours |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

The pilot flew from Popham to Rochester in poorer visibility than he was accustomed to and, as a consequence, had become "rather stressed" upon arrival. The wind at Biggin Hill (18 miles west of Rochester) was forecast to be 130°/14 kt so the pilot was expecting to use either Runway 16 or 20 at Rochester. However, on being given Runway 02, the pilot initially confused this for Runway 20 before realising his error and repositioning the aircraft to join what he described as a "busy circuit". On reporting final, he heard no acknowledgement. He continued his approach but realised he was too high over the threshold and "dived at the runway". He was then distracted by a radio call requesting his position and failed to notice how much his speed had increased. With a rapidly approaching runway, the pilot became fixated on landing the aircraft. Following several bounces, the nose landing gear collapsed and broke away, before the aircraft came to a stop. Neither occupant was injured. In a frank and honest report the pilot stated that his poor decision making and failure even to consider going around was a result of stress and distraction at a critical moment.

ACCIDENT

| | |
|--|---|
| Aircraft Type and Registration: | Luscombe 8A Silvaire, G-BSNT |
| No & Type of Engines: | 1 Continental Motors Corp A65-8 piston engine |
| Year of Manufacture: | 1941 (Serial no: 1679) |
| Date & Time (UTC): | 22 July 2013 at 1715 hrs |
| Location: | Farthing Corner Airfield, Kent |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - 1 |
| Injuries: | Crew - None Passengers - None |
| Nature of Damage: | Damage to left landing gear, left wing tips and engine cowling |
| Commander's Licence: | Private Pilot's Licence |
| Commander's Age: | 65 years |
| Commander's Flying Experience: | 185 hours (of which 96 were on type) Last 90 days - 4 hours Last 28 days - 1 hour |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

The pilot carried out the pre-flight power checks and commenced his takeoff run. He was not happy with the engine performance and after the second bounce he aborted the takeoff. The aircraft landed heavily and the left stub-axle sheared off. The stub axle was found to have failed near the weld. There was evidence of corrosion and a crack that appeared to have been present for some time.

ACCIDENT

| | | |
|--|---|-------------------|
| Aircraft Type and Registration: | Pierre Robin DR400/100 Cadet, G-FTIN | |
| No & Type of Engines: | 1 Lycoming O-235-L2A piston engine | |
| Year of Manufacture: | 1988 (Serial no: 1830) | |
| Date & Time (UTC): | 31 August 2013 at 1710 hrs | |
| Location: | Kirkbride Airfield, Cumbria | |
| Type of Flight: | Private | |
| Persons on Board: | Crew - 1 | Passengers - 1 |
| Injuries: | Crew - None | Passengers - None |
| Nature of Damage: | Damage to right wing outboard leading edge | |
| Commander's Licence: | Private Pilot's Licence | |
| Commander's Age: | 53 years | |
| Commander's Flying Experience: | 791 hours (of which 205 were on type) Last 90 days - 33 hours Last 28 days - 12 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot and additional inquiries by the AAIB | |

The aircraft was backtracking tarmac Runway 10 at Kirkbride, an airfield which the pilot knew well. He intended to perform a 180° turn to take off on Runway 28; the wind was reportedly from 290° at 10 kt. The pilot stated that, as he positioned the aircraft to the right prior to performing this turn, the right brake started to bind and, despite full left rudder and brake application, he could not prevent the right wing from striking a substantial steel fence post at the side of the runway. The roughly 3 ft 6 in high post formed part of a fence dividing farmland from the airfield and was about 6 ft from the edge of the runway, hidden in tall grass. The aircraft's wheels had not left the runway.

The company which recovered and dismantled the aircraft for repair did not see any evidence of brake seizure or binding, but were not able to perform a function check of the brake system.

ACCIDENT

| | |
|--|---|
| Aircraft Type and Registration: | Piper PA-28-181 Cherokee Archer II, G-OODW |
| No & Type of Engines: | 1 Lycoming O-360-A4M piston engine |
| Year of Manufacture: | 1984 (Serial no: 28-8490031) |
| Date & Time (UTC): | 10 October 2013 at 1400 hrs |
| Location: | Turweston Aerodrome, Northamptonshire |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - None |
| Injuries: | Crew - None Passengers - N/A |
| Nature of Damage: | Damage to the left wing |
| Commander's Licence: | Private Pilot's Licence |
| Commander's Age: | 66 years |
| Commander's Flying Experience: | 400 hours (of which 50 were on type) Last 90 days - 10 hours Last 28 days - 4 hours |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

Synopsis

The pilot had backtracked Runway 27 and turned off at Holding Point C to perform an engine power check, before departing for a flight to Fair Oaks. During a right turn to position the aircraft into wind, the leading edge of the left wing struck a metal upright supporting a sign, causing damage to the left wing. The extent of the damage was only discovered after the pilot had landed at Fair Oaks.

History of the flight

The pilot had flown from Fair Oaks Airfield to Turweston Aerodrome. After landing, he was met by his friends and left the airfield. While the aircraft was parked, a local flying instructor went to look at it to see what navigation equipment was fitted. He approached the aircraft from the front left quarter and did not recall seeing any damage to the left wing.

When the pilot returned he carried out a pre-flight inspection, which included checking the fuel tank filler caps. In the case of the left wing, this was done from the leading edge and the pilot did not observe any damage.

He performed his normal checks and taxied for a departure from Runway 27. The weather was good, with dry conditions, no precipitation, good visibility and a gusty wind from the northwest. The pilot backtracked Runway 27 and exited at Holding Point C onto the taxiway, which has a yellow centreline marking. Some 30 m from the holding point and 9.3 m east of the taxiway centreline is a red '*BEWARE – Very low flying aircraft*' warning sign located on the side of the taxiway. This is intended to be visible to vehicle drivers using the adjacent access road (see Figure 1).



Figure 1

Holding Point C, the taxiway and the warning sign

The pilot manoeuvred the aircraft to the left (east) of the centreline to ensure enough room to turn right back to the holding point, to carry out a power check. During the turn, the pilot felt a “small bump” as the left wing contacted the warning sign and passed over it. From his position in the cockpit, he could only see a small dent in the left wing but did not connect it with the bump. Having performed the power check, the pilot took off and returned to Fairoaks.

After landing at Fairoaks, the pilot discovered that the leading edge of the left wing was dented and torn.

Discussion

The pilot had not been aware of the full extent of the damage, which was not visible from the cockpit, before departing from Turweston. He concluded that he had not seen the warning sign due to its end on aspect when he taxied off the runway and possibly because he was looking to the right, into the turn. On reflection, having felt a bump and seen a dent

he considered it would have been beneficial to have shut down the aircraft and checked it before departing.

The warning sign was not subject to a taxiway sign requirement but was erected to warn vehicle drivers on the adjacent access road that they may hear or see low flying aircraft approaching or departing from the runway. Civil Aviation Publication (CAP) 168, *Licensing of Aerodromes*, sets out the requirements for taxiway signs. Had the sign been a requirement, it would have had to be 12.5 m from the taxiway centreline, as opposed to 9.3 m, as measured, and no higher than 0.36 m. The operator has carried out a review of the location of the warning sign and has elected to move it further away from the taxiway.

ACCIDENT

| | | |
|--|--|-------------------|
| Aircraft Type and Registration: | Streak Shadow, G-BVTD | |
| No & Type of Engines: | 1 Rotax 582 piston engine | |
| Year of Manufacture: | 1994 (Serial no: PFA 206-11972) | |
| Date & Time (UTC): | 10 August 2013 at 1452 hrs | |
| Location: | Stoke Golding Airfield, Leicestershire | |
| Type of Flight: | Private | |
| Persons on Board: | Crew - 1 | Passengers - None |
| Injuries: | Crew - None | Passengers - N/A |
| Nature of Damage: | Nosewheel, front underside, lower fuel tank, boom, canopy | |
| Commander's Licence: | Private Pilot's Licence | |
| Commander's Age: | 63 years | |
| Commander's Flying Experience: | 478 hours (of which 1 was on type) Last 90 days - 6 hours Last 28 days - 3 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot | |

The pilot trimmed the aircraft for landing on Runway 26 at Stoke Golding at an indicated airspeed of 60 kt then, at a height of 6 ft, decided to go around. The Shadow has a throttle lever on the left of the cockpit and a 'sidestick' control column on the right, whereas Piper PA-28 aircraft he had flown previously have a throttle operated with the right hand and a control yoke held in the left. Instead of advancing the throttle with his left hand, he pushed the control column forward with his right. Although he realised his mistake, he was unable to prevent the nose landing gear from striking the ground and collapsing. He considered that his lack of experience with the Shadow was the reason for his error.

SERIOUS INCIDENT

| | |
|--|--|
| Aircraft Type and Registration: | Zenair CH 701SP, G-IMME |
| No & Type of Engines: | 1 Rotax 912 ULS piston engine |
| Year of Manufacture: | 2003 (serial no: PFA 187-14080) |
| Date & Time (UTC): | 8 September 2013 at 1015 hrs |
| Location: | Overhead Pentland Firth, Scotland |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - 1 |
| Injuries: | Crew - None Passengers - None |
| Nature of Damage: | Damage to pilot's door and tailplane |
| Commander's Licence: | National Private Pilot's Licence |
| Commander's Age: | 66 years |
| Commander's Flying Experience: | 2,688 hours (of which 64 were on type) Last 90 days - 49 hours Last 28 days - 11 hours |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

The aircraft was performing "gentle manoeuvres" at an airspeed of about 100 mph when the pilot noted that both cabin doors were bulging into the slipstream and then, almost instantly, the left door fractured and departed the airframe. The left tailplane skin was later found to be damaged.

The pilot is of the opinion that the doors were not rigid enough to resist the aerodynamic forces created by their bubble shape. They were of a later type of door which the manufacturer refers to as 'bubble' doors because they comprise a single transparent panel with a bulge moulded into it; this allows more elbow room and better visibility compared with the standard flat doors. Two types of bubble doors were marketed: the first used the original tubular door frame with the transparency screwed to it and the second used a composite frame. G-IMME was fitted with the later standard during build and had flown some 9 hours since then.

The Light Aircraft Association regards the bubble doors as an unapproved modification and will be writing to CH 701 owners to point this out. They may also highlight the situation in their magazine *Light Aviation*.

ACCIDENT

| | |
|--|--|
| Aircraft Type and Registration: | Cyclone AX2000, G-MZER |
| No & Type of Engines: | 1 Rotax 582-48 piston engine |
| Year of Manufacture: | 1996 (Serial no: 7251) |
| Date & Time (UTC): | 9 August 2013 at 1750 hrs |
| Location: | South of Two Ash Farm, Chard, Somerset |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - 1 |
| Injuries: | Crew - 1 (Minor) Passengers - None |
| Nature of Damage: | Extensive, to pod structure, wing and landing gear |
| Commander's Licence: | National Private Pilot's Licence |
| Commander's Age: | 48 years |
| Commander's Flying Experience: | 163 hours (of which 74 were on type) Last 90 days - 26 hours Last 28 days - 10 hours |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

After takeoff, at a height of about 300 ft, the pilot sensed the engine rpm drop to around 4,000 to 4,500 from its normal maximum rpm of about 6,500. This was insufficient to maintain level flight and so the pilot turned into wind and chose a suitable field. As he approached the field, he realised that he was very close to a hedge which bordered it, so he tried to turn to the right to land parallel to the hedge. The aircraft stalled at a height of about 10 ft and the nose dropped to the left, hitting the ground and collapsing the nose landing gear.

The pilot acknowledged that, in addition to the unfortunate timing of the engine power loss, he had allowed the aircraft to become slow, and he could have chosen a more suitable field to land in. Although he intends to do a thorough investigation of the engine and fuel system, at the time of preparation of this bulletin no obvious reason for the power reduction had been found.

ACCIDENT

| | | |
|--|---|-------------------|
| Aircraft Type and Registration: | Kolb Firefly, G-CEPN | |
| No & Type of Engines: | 1 piston engine, type not specified | |
| Year of Manufacture: | 2007 (Serial no: FF05.4.00048) | |
| Date & Time (UTC): | 26 July 2013 at 0930 hrs | |
| Location: | Westmill, Hertfordshire | |
| Type of Flight: | Private | |
| Persons on Board: | Crew - 1 | Passengers - None |
| Injuries: | Crew - None | Passengers - N/A |
| Nature of Damage: | Loss of propeller | |
| Commander's Licence: | Private Pilot's Licence | |
| Commander's Age: | 68 years | |
| Commander's Flying Experience: | 4,985 hours (of which 172 were on type) Last 90 days - 38 hours Last 28 days - 18 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot | |

While flying in the local area the pilot heard a loud bang from the rear of the aircraft followed by a loss of thrust. After completing an uneventful forced landing, the pilot discovered that the propeller shaft had failed and the propeller had departed from the aircraft. No other damage to the aircraft was reported. The cause of the failure could not be determined due to the loss of the propeller shaft.

ACCIDENT

| | |
|--|--|
| Aircraft Type and Registration: | Mainair Blade 912, G-MZGI |
| No & Type of Engines: | 1 Rotax 912-UL piston engine |
| Year of Manufacture: | 1997 (Serial no: 1117-0397-7-W920) |
| Date & Time (UTC): | 20 August 2013 at 1945 hrs |
| Location: | Private airstrip, Rhoshirwaen, Gwynedd |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - 1 |
| Injuries: | Crew - 1 (Serious) Passengers - None |
| Nature of Damage: | Substantial damage to all parts of the airframe |
| Commander's Licence: | Private Pilot's Licence |
| Commander's Age: | 58 years |
| Commander's Flying Experience: | 122 hours (of which 98 were on type) Last 90 days - 9 hours Last 28 days - 2 hours |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

The aircraft was landing back at the private strip after a pleasure flight of two hours. The pilot states that, when he had taken off, the wind was south-south-westerly at about 10 mph. However, when he returned the wind was gusting to approximately 25 mph and was variable in direction to the extent that he saw the windsock swing through 180° at one point. There were two runways available to him – one oriented NE/SW and 360 ft long and one oriented NW/SE and 555 ft long. He considered that the wind conditions rendered the short runway unsuitable so he made an approach to the longer, south-easterly runway. He aborted this approach and tried again in the opposite direction but this time he states that a sudden change in the wind strength caused the aircraft to sink and strike a barbed wire fence with the nosewheel.

The fence brought the aircraft to a very rapid halt and it struck the ground in a nose-down attitude. The pilot was taken to hospital with a broken arm but the passenger was uninjured.

ACCIDENT

| | |
|--|---|
| Aircraft Type and Registration: | MW5 Sorcerer, G-MWSX |
| No & Type of Engines: | 1 Rotax 447 piston engine |
| Year of Manufacture: | 1995 (Serial no: PFA 163-11549) |
| Date & Time (UTC): | 10 August 2013 at 1314 hrs |
| Location: | Tinnell Farm, Landulph, Saltash, Cornwall |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - None |
| Injuries: | Crew - 1 (Serious) Passengers - N/A |
| Nature of Damage: | Substantial |
| Commander's Licence: | Private Pilot's Licence |
| Commander's Age: | 58 years |
| Commander's Flying Experience: | 378 hours (of which 231 were on type) Last 90 days - 5 hours Last 28 days - 3 hours |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

The pilot was conducting a local flight from Tinnell Farm strip in Cornwall. On the final approach to the strip from the north-east, just before entering the field boundary of the landing strip, he encountered turbulence and lost control. The pilot recalls the aircraft turning left and the ground rushing up but no further detail. The aircraft impacted the ground to the left of the centreline and came to rest a reported 15 m further east, facing to the west. Despite sustaining serious injuries, the pilot managed to call for help on his mobile and was attended by the police and ambulance services. The aircraft sustained substantial damage.

The pilot reported that the wind had increased considerably during his one and a half hour flight. He considered that a rapid loss of airspeed in the lee of the trees situated on the field boundary to the side of the approach path had resulted in a stall and spin.

ACCIDENT

| | |
|--|--|
| Aircraft Type and Registration: | P & M Aviation QuikR, G-CFXZ |
| No & Type of Engines: | 1 Rotax 912S piston engine |
| Year of Manufacture: | 2009 (Serial no: 8444) |
| Date & Time (UTC): | 15 October 2013 at 1500 hrs |
| Location: | East Fortune Airfield, East Lothain |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - 1 |
| Injuries: | Crew - 1 (Minor) Passengers - None |
| Nature of Damage: | Extensive |
| Commander's Licence: | National Private Pilot's Licence |
| Commander's Age: | 65 years |
| Commander's Flying Experience: | 83 hours (of which 14 were on type) Last 90 days - 2 hours Last 28 days - 1 hour |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

Prior to the flight the pilot had briefed his passegner not to put his feet on the steering bar. At the time the weather was good with the wind from 360° at 6 to 8 kt.

After a normal approach and landing on Runway 07 the left main wheel lifted momentarily. The aircraft then started turning right but when the pilot tried to correct this using the steering bar he found he was unable to do so as the passenger had braced his feet on it. The aircraft subsequently left the runway and rolled onto its left wing after hitting a fence. The aircraft was extensively damaged and the pilot suffered minor injuries to his chest. The passenger was uninjured.

The pilot believed the left main wheel lifted due to a combination of the crosswind and hitting a bump on the runway.

ACCIDENT

| | |
|--|--|
| Aircraft Type and Registration: | Team Minimax 91, G-CEDW |
| No & Type of Engines: | 1 Rotax 447 piston engine |
| Year of Manufacture: | 2010 (Serial no: PFA 186-12472) |
| Date & Time (UTC): | 24 October 2013 at 1030 hrs |
| Location: | Easterton Airfield, Moray |
| Type of Flight: | Private |
| Persons on Board: | Crew - 1 Passengers - None |
| Injuries: | Crew - 1 (Minor) Passengers - N/A |
| Nature of Damage: | Damaged beyond economic repair |
| Commander's Licence: | Light Aircraft Pilot's Licence |
| Commander's Age: | 68 years |
| Commander's Flying Experience: | 171 hours (of which 1 was on type) Last 90 days - 8 hours Last 28 days - 3 hours |
| Information Source: | Aircraft Accident Report Form submitted by the pilot |

The pilot was on a local flight from Easterton Airfield, Moray. The weather was good and the wind was from 260° at 10 kt. The pilot commented that after he had flown a normal approach to Runway 26 he performed a "very bad landing." This resulted in the aircraft tipping over onto its nose causing extensive damage. The pilot suffered minor injuries to his face.

The pilot thought it likely that his late flare resulted in a hard landing.



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

- | | |
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| <p>1/2010 Boeing 777-236ER, G-YMMM at London Heathrow Airport on 17 January 2008. Published February 2010.</p> | <p>7/2010 Aerospatiale (Eurocopter) AS 332L Super Puma, G-PUMI at Aberdeen Airport, Scotland on 13 October 2006. Published November 2010.</p> |
| <p>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.</p> | <p>8/2010 Cessna 402C, G-EYES and Rand KR-2, G-BOLZ near Coventry Airport on 17 August 2008. Published December 2010.</p> |
| <p>3/2010 Cessna Citation 500, VP-BGE 2 nm NNE of Biggin Hill Airport on 30 March 2008. Published May 2010.</p> | <p>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.</p> |
| <p>4/2010 Boeing 777-236, G-VIIR at Robert L Bradshaw Int Airport St Kitts, West Indies on 26 September 2009. Published September 2010.</p> | <p>2/2011 Aerospatiale (Eurocopter) AS332 L2 Super Puma, G-REDL 11 nm NE of Peterhead, Scotland on 1 April 2009. Published November 2011.</p> |
| <p>5/2010 Grob G115E (Tutor), G-BYXR and Standard Cirrus Glider, G-CKHT Drayton, Oxfordshire on 14 June 2009. Published September 2010.</p> | |
| <p>6/2010 Grob G115E Tutor, G-BYUT and Grob G115E Tutor, G-BYVN near Porthcawl, South Wales on 11 February 2009. Published November 2010.</p> | |

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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_1 | 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 |
| DFDR | Digital Flight Data Recorder | PPL | Private Pilot's Licence |
| DME | Distance Measuring Equipment | psi | pounds per square inch |
| EAS | equivalent airspeed | QFE | altimeter pressure setting to indicate height above aerodrome |
| EASA | European Aviation Safety Agency | QNH | altimeter pressure setting to indicate elevation amsl |
| ECAM | Electronic Centralised Aircraft Monitoring | RA | Resolution Advisory |
| EGPWS | Enhanced GPWS | RFFS | Rescue and Fire Fighting Service |
| EGT | Exhaust Gas Temperature | rpm | revolutions per minute |
| EICAS | Engine Indication and Crew Alerting System | RTF | radiotelephony |
| EPR | Engine Pressure Ratio | RVR | Runway Visual Range |
| ETA | Estimated Time of Arrival | SAR | Search and Rescue |
| ETD | Estimated Time of Departure | SB | Service Bulletin |
| FAA | Federal Aviation Administration (USA) | 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) | | |
