

AAIB Bulletin

3/2015



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(ALL TIMES IN THIS BULLETIN ARE UTC)

AAIB Field Investigation reports

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

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

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

ACCIDENT

Aircraft Type and Registration:	Yak-52, G-YAKR	
No & Type of Engines:	1 Ivchenko Vedeneyev M-14P piston engine	
Year of Manufacture:	1989 (Serial no: 899803)	
Date & Time (UTC):	29 March 2014 at 1453 hrs	
Location:	Near Highwood, Chelmsford, Essex	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - 1 (Fatal)	Passengers - 1 (Fatal)
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	50	
Commander's Flying Experience:	in excess of 15,000 hours ¹ (of which approximately 40 hours ² were on type) Last 90 days - 1 hour Last 28 days - 1 hour	
Information Source:	AAIB Field Investigation	

Synopsis

The aircraft was carrying out a local flight when, five minutes into the flight, it was observed flying at low level. Having carried out a level turn, the aircraft climbed sharply and entered a stall or spin, from which it did not recover before striking the ground. Both occupants received fatal injuries and there was a fire. The reason the aircraft was flying at low level and the cause of the final manoeuvre could not be determined.

History of the flight

The pilot, who was one of three co-owners of the aircraft, arrived at North Weald mid-morning and prepared for a short local flight. He had not made an arrangement to take anyone with him, until he met someone at the airfield and offered him the opportunity to fly as a passenger.

Following pre-flight preparations, some of which were witnessed by onlookers at the flying club, the aircraft's engine was started and at 1439 hrs the pilot booked out by radio for a "TWENTY MINUTE LOCAL FLIGHT". The aircraft taxied for departure from Runway 02 and took off

Footnote

¹ No up-to-date log books were available; the total hours stated is taken from the pilot's medical declaration in October 2013.

² Flight records for G-YAKR were audited but did not match records kept of movements at North Weald; time on type is derived from information on an insurance application in March 2013 adjusted to reflect some recent flying.

at 1447 hrs. Following an apparently normal takeoff run, the aircraft lifted off and climbed before turning on course towards the east. The AFISO last saw the aircraft climbing away from the airfield, above 1,000 ft aal. In the pilot's final communication to the AFISO, at 1448 hrs, he reported that he was "VACATING TO THE EAST". No further transmissions from the pilot were heard.

Primary radar returns show that the aircraft then flew a predominantly easterly track. Although the aircraft was fitted with a transponder which, according to the other co-owners, was serviceable, no secondary radar responses from the aircraft were recorded. Therefore, there was no height information. The aircraft's track included a left and then right turn, which were co-incident with the position of a small airfield. However, aside from the radar recordings, no other information was found concerning the course of the flight until over twenty eye-witnesses observed the aircraft flying near Highwood, Essex.

Although some of their accounts differed in detail, there was general consensus about the aircraft's flight profile. The aircraft was first seen flying slowly, or at a "normal speed", more-or-less straight and level, in a south-easterly direction, and at low height; estimated to be between 100 and 200 ft agl. The aircraft then executed a level turn. Some witnesses recalled that this was through only a few tens of degrees, while others perceived it to be more significant and a small number believed the aircraft had turned onto an approximately westerly track.

The aircraft then climbed relatively abruptly to approximately twice its earlier height, to 200 to 400 ft agl. Some witnesses then described it entering an incipient spin, before descending into the ground. A few others stated that the aircraft pitched dramatically nose-down, descended and struck the ground. Witness accounts of the sound made by the aircraft varied. Some said the aircraft made no unusual sounds, while others mentioned "sputtering" sounds from the engine.

Although a number of people reached the crash site very soon after impact, they were unable to approach the aircraft because of the severe post-crash fire that developed.

Both occupants were fatally injured in the impact.

The pilot

The pilot was employed by a commercial airline as a co-pilot flying wide-body aircraft, although in recent months he had been engaged in office duties, rather than flying. Prior to his civil flying career, he had been commissioned in the Royal Air Force, mostly as a pilot flying transport aircraft; he had also instructed navigation in single-engined piston aircraft.

The pilot's light aircraft flying involved tutoring civilian pilots in formation flying, and flying G-YAKR, usually carrying out aerobatics. The pilot held a Class One medical certificate, which equated to a Class Two medical certificate for private flying. He was diabetic and managed his condition by a regime of testing and injections of insulin, in accordance with the CAA's protocols.

The pilot had passed a Single Pilot Aircraft skills test, in G-YAKR, on 1 December 2013. This flight included incipient spin recoveries and aerobatic manoeuvres, which the examiner reported were “carried out with a high degree of competence”.

Meteorology

The Met Office provided an aftercast of conditions affecting the area around the accident site. Their report stated:

‘...the accident occurred in a fairly stable environment with a moderate southeasterly airflow. METARs and observations in the area show that there was a fair amount of haze around with most places reporting visibilities between 6 KM and 10 KM. The further inland the visibilities improved up to 19 KM in places. There was no significant cloud reported during this period. Looking again at the METARs and observations in the area we can see a moderate east to southeasterly airflow at the surface between 10 and 15 Knots, with a few isolated gusts in the area between 25 and 30 Knots, these mainly to the south and west of the incident area.’

Around the time of the accident, meteorological observations at Stansted, approximately 11 nm north-north-west of the accident site, were:

291450Z 12015KT CAVOK 17/03 Q1014
291520Z 10011KT CAVOK 17/04 Q1014

Those at Southend-on-Sea, approximately 15 nm south-east of the accident site, were:

291450Z 09014KT 8000 NSC 14/07 Q1014
291520Z 10014KT 9000 NSC 14/08 Q1014

Recorded information

Radar data for the accident flight was available from the Debden and Stansted radar heads, 16 nm and 10 nm north of the track respectively (Figure 1).

The radar returns were primary only, so no altitude information was available. However, both recorded radar tracks were intermittent, suggesting that the aircraft was flying at an altitude on or near the lower line-of-sight height limit of both radar heads. The lower limit for both radar heads, in the region of the aircraft’s track, was about 200 ft agl, and in places it was down to ground level. The average groundspeed for the accident flight was 86 kt.

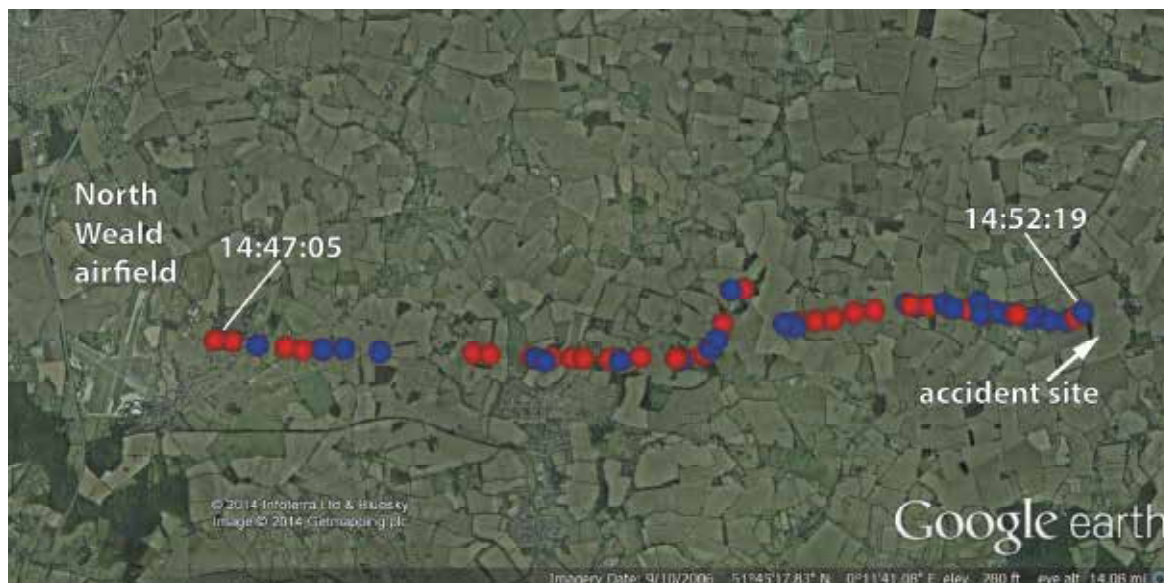


Figure 1

Debben (red) and Stansted (blue) radar ground tracks for the accident flight

Pathology

A specialist aviation pathologist carried out post-mortem examinations of the pilot and passenger. He noted that both '*died of multiple injuries which were sustained in the non-survivable crash of their aircraft*'. Toxicological investigation revealed nothing that could have contributed to the accident.

Toxicological evidence indicated that the pilot was not hypoglycaemic at the time of the accident and there was nothing to suggest that his diabetes had played any role in the accident.

Yak-52 description

The aircraft is an all metal two-seat, tandem, single-engine low-wing monoplane, originally designed and manufactured as a military basic training aircraft in the Eastern bloc. Yak-52 aircraft are now relatively commonplace in the UK and are often used for aerobatic flying and training.

The never-exceed speed (V_{NE}) of the Yak-52 is 420 kph (227 kt) and its design manoeuvring speed (V_A) is 360 kph (194 kt). Its published stalling speed, with power off in 1g normal flight, is 105 kph (57 kt). The aircraft is cleared to operate to load factors of +7g and -5g.

The aircraft is powered by a nine-cylinder, single-row, air-cooled radial engine driving a two-bladed, variable pitch propeller via an epicyclic reduction gear. Mounted on the rear of the engine are a carburettor and an accessory gearbox. The latter drives a single stage supercharger together with a compressor, magnetos and generator.

The electrical system is 28 volt DC, supplied by two batteries and a 3KW engine-driven

generator. This is chiefly used to power the aircraft instruments, the radio and intercom. The large capacity generator was originally required to power a rack of avionic equipment located behind the aft cockpit; this is largely redundant when operating the aircraft in the UK. The flaps, landing gear and engine starting are powered by a pneumatic system fed by two pressure vessels which, in turn, are supplied by the engine-driven compressor.

Accident site details

The aircraft had crashed into an oilseed rape crop, on a track of approximately 265°M, approximately 300 m north of the A414 road that runs in an east-west direction between Chelmsford and Stansted. There was no ground slide and it was apparent that the impact had been steeply nose-down. The pitot probe, attached to the left wing leading edge, was found buried in the ground to a depth of around 0.5 m, inclined at an angle of 80° to the horizontal, and was considered to be indicative of the flight path angle. Immediately after the impact the aircraft had fallen back on the ground, such that it had come to rest in an upright, level attitude. There had been extensive disruption to the nose and forward fuselage and an intense fire had destroyed the cockpit area. Despite the steep impact angle, the aircraft structure aft of the wing spar had remained substantially intact, suggesting a low impact speed.

The leading edge of the right wing had made an impression in the ground and the wing had come to rest immediately above it. A similar impression had been made by the left wing, although it was clear that the aircraft and wing had subsequently rotated some 15° anti-clockwise before coming to rest. This suggested that the aircraft was rotating at the time of impact which, together with the steep, low speed impact and witness evidence, was indicative of the aircraft striking the ground following a stall-spin manoeuvre. Additional evidence of rotation in an anti-clockwise direction was provided in the form of some cockpit debris and canopy fragments which had been thrown on the ground to the right-hand side of the aircraft.

It was established that the aircraft was structurally complete at impact, the flaps and landing gear were retracted and the cockpit canopy was closed.

No fuel was found in the aircraft or in the immediate surroundings. There were two fuel tanks in each wing; inboard and outboard. The 80 litre outer tanks were intact but empty, with no fuel odour, and had clearly not held fuel for some time. (Note: aerobatics in this aircraft are prohibited with fuel in the outer tanks and, in the case of G-YAKR, they were seldom used.) The 60 litre inboard tanks had been damaged in the impact, thus releasing their contents into the area of the forward fuselage. The subsequent fire had damaged the inboard end of the left tank; the right tank, together with the forward wing structure in which it was located, had been completely destroyed.

The engine had become buried in the ground at an attitude that reflected the impact angle of the aircraft, and its rear face, including the accessory gearbox, had been severely damaged in the post-impact fire. Excavating the engine revealed the two wooden propeller blades which had failed primarily in bending as the pressure of the earth had folded them in an aft direction. There was otherwise very little chord-wise scuffing or leading edge damage,

which suggested the engine had been developing little power at impact and had been at a low rpm. It was additionally observed that the propeller counterweights were in their forward, ie fine pitch positions, despite the fact that contact with the ground would have tended to push them rearwards, in a coarsening direction.

Following an on-site examination the wreckage was recovered to the AAIB's facility at Farnborough for a detailed analysis.

Detailed examination of the wreckage

Airframe

The forward fuselage, including both cockpits, had been severely damaged by the fire, which had been sufficiently intense to partially melt the wing spar and destroy most of the instruments. The primary flying control system was simple and conventional, consisting of cables, rods and bellcranks. Some of the aluminium components had melted and were thus unavailable for inspection, although the cables had remained connected to the control surfaces. The elevator trim tab was found in the approximately neutral position.

The remains of the throttle lever were identified in the forward cockpit and appeared to be towards the rear of its range of travel, which agreed with the low power indication on the propeller blades. However, the linkage would have been stretched when the aircraft fell back onto the ground after impact, leaving the engine in its crater so little confidence can be placed in the as-found position.

One of the few cockpit items to survive was the warning and caution panel from the rear cockpit. This incorporates a number of amber and red caption segments that light up in the event of a detected failure or hazardous condition. Red segments include warning captions for a generator fault, stall warning, low fuel state and maximum 'g' exceedence. Amber segments include caution captions for compass failure and an engine metallic chip detector, whilst green segments illuminate when the battery, stall warning heater or pitot heater are switched ON. The filaments of all the bulbs in the segments were examined under a microscope for evidence that indicated whether they may have been illuminated at impact.³ There were two bulbs in each segment and it was found that only those in the green BATTERY ON segment featured distended filaments. This caption would normally have been illuminated in flight.

Footnote

³ When bulbs are illuminated, the heated filaments become extremely ductile and an impact can result in extensive filament stretching within the glass envelope. This feature can thus provide evidence that the bulb was lit at impact.

Engine

The engine was taken to an overhaul organisation with experience on this engine type and subjected to a strip examination under AAIB supervision.

Firstly, the propeller hub was removed and was found to be full of oil and in good condition internally. Similarly, the reduction gearbox components, together with the propeller constant speed unit (CSU) drive components, were also found to be in good condition. The magnetic chip detector and scavenge filter were clear of debris.

The engine had achieved only 55 hours or so since overhaul and this was reflected in the general condition of the internal components, such as the pistons, cam profiles and cam followers.

The rear of the engine, as noted earlier, had been severely affected by the fire. In particular, the magnesium alloy carburettor had been completely destroyed and part of the accessory gearbox casing was missing. On disassembling the gearbox, two features were noted. These were: an apparently seized bearing in a supercharger spur gear and the fracture of the splined gearbox drive shaft, where it emerged from the rear of the engine. It initially appeared that these findings may have been connected, in that the bearing was in the high speed, low torque part of the drivetrain whereas the shaft operated at a lower speed but higher torque. These components were then subjected to a detailed metallurgical examination.

It was found, on sectioning the bearing, that there had been no metal pick-up or extensive rotational scoring and that the apparent seizure was simply the result of heat distortion and post-fire corrosion.

The shaft failure was found to be the result of torsional overload. It was noted that the fracture surfaces were heavily 'blued', as a result of heat generated in the relative rotation between the fracture faces that occurred immediately following the failure. Most important, however, was the *direction* of the torque that precipitated the failure. It was concluded that this was consistent with the engine end of the shaft suddenly stopping, and the rotational momentum of the gearbox drivetrain components and that of the accessories, particularly the considerable flywheel effect from the generator, creating the overload torque.

The propeller CSU was the only engine accessory capable of being tested, the magnetos having been severely fire-damaged. There was no documentation accompanying the CSU, although it was established, as far as possible, that it was a newly overhauled component supplied with the engine.

The CSU was placed on a test rig and tested in accordance with the manufacturer's test schedule. This demonstrated that the functionality was satisfactory in all respects apart from the delivery flow rate, which was around half the specified value. It was not clear what effect this would have on propeller operation. The CSU was subsequently disassembled, when it was found that all the internal components were in good condition. There was thus no explanation as to the cause of the low flow rates.

Aircraft history

G-YAKR was constructed in 1989 and imported into the United Kingdom in 2002. In the absence of a Type Certificate for the Yak-52, the aircraft was assessed against an Airworthiness Approval Note, following which the Civil Aviation Authority (CAA) issued a Permit to Fly. This was renewed on an annual basis, subject to appropriate maintenance inspections; the last Permit Renewal coincided with an Annual Inspection on 19 July 2013 and was valid for one year. An overhauled propeller was also fitted to the aircraft at this time. The engine was overhauled in 2009 and fitted to the aircraft in May 2011.

The airframe, engine and propeller log book contained no flight entries after 13 April 2013. Some daily flight sheets, from which the log books would have been subsequently made up, were recovered during the investigation, but these finished at approximately the same time. However, movement logs obtained from North Weald Airfield indicated that G-YAKR had conducted a total of 32 flights, totalling approximately 16 hours, between 5 March 2013 and 29 March 2014.

At the time of the accident, the available records indicated that the aircraft had achieved a total of around 1,117 flight hours, with the engine and propeller having achieved approximately 55 and 15 hours, respectively, since overhaul.

Analysis

Operations

The pilot was a professional aviator, who was suitably qualified and acquainted with the area and the aircraft. Also, the weather conditions were benign. He was diabetic and managed his condition in accordance with the CAA's protocols. He held a Class One medical certificate and the post-mortem examination revealed nothing that could have contributed to the accident. Toxicological evidence indicated that the pilot was not hypoglycaemic at the time of the accident and there is nothing to suggest that his diabetes had played any role in the accident.

There was no evidence to explain why the aircraft was flying at a low height when first noticed by eyewitnesses. It is possible that a problem, which had developed after takeoff, led to the pilot descending to that height or that the aircraft was not capable of flight at a higher altitude. However, there was no evidence of a radio transmission by the pilot to provide an explanation, if that was the case.

Witness accounts, and the engineering investigation, indicated that the aircraft's final manoeuvre involved a stall or spin, which occurred at a low height. If, as some witnesses recalled, the final direction of flight was westerly, the last turn would have been on to a downwind heading. This might have been associated with a reduction in airspeed. Why the aircraft then pitched up, climbed and entered a stall or spin could not be determined. Having done so, there was little height in which to recover the aircraft to controlled flight before it struck the ground.

Engineering

The engineering investigation was hampered by the fact that some components were damaged or destroyed in the post-crash fire. Despite this, no defects were found in those parts of the flying controls that remained.

The investigation did not discount the possibility of a significant loss of engine power. As the carburettor had been destroyed and the magnetos severely damaged a failure or malfunction in these components may have prevented the engine from developing full power. However, it was confirmed that the engine was at least rotating, albeit at low power, at the time of impact. Evidence of this was provided by the accessory gearbox shaft overload failure, from which it was concluded that the engine was stopped by the steep impact with the ground.

Analysis of bulb filaments in the rear cockpit warning and caution panel indicated that the green BATTERY ON caption had been illuminated at impact. This would be a normal indication in flight and at least validated the analysis method. There was thus reasonable confidence in the conclusion that no other captions had been illuminated. It also reinforced the finding that the engine was rotating, as the generator caption would normally light up if the engine had stopped in flight, or if the rpm had reduced significantly below idle.

The propeller CSU test showed that it did not meet the test schedule requirements in that the delivery flow rates were low. Although the effect on the propeller is not known, it was considered that it may have resulted in sluggish operation such that the rpm varied more than usual in response to power changes. The good condition of the internal components suggested that nothing had changed during the accident flight, in comparison to previous flights. It was therefore concluded that it was unlikely that the CSU's non-conformity with the test schedule had contributed to the accident.

The intensity and extent of the fire indicated the presence of a significant amount of fuel on board the aircraft. Following the impact damage to the fuel tanks, it is likely that the fuel was released onto the rear of the engine, where it was ignited after coming into contact with the hot engine exhaust manifold. This could be taken as another indication that the engine was operating at impact, as an earlier in-flight failure would have allowed a degree of cooling to occur. It is possible that there was an electrical ignition source, although this is considered less likely due to the absence of any high current cables in the area.

Conclusions

The pilot was an experienced aviator and suitably qualified. He was diabetic and managed his condition in accordance with the CAA's protocols. He held a Class One medical certificate and the post-mortem examination revealed nothing that could have contributed to the accident.

The low height at which the aircraft was flying when first noticed by eyewitnesses may indicate that the flight was not proceeding normally. It is possible that a problem led to the pilot choosing to descend to low height. There was evidence that the engine was running

at the moment the aircraft struck the ground but the possibility of a significant loss of engine power could not be discounted.

No defects were found in those parts of the flying controls that remained but the engineering investigation was hampered by the fact that some components were damaged or destroyed in the post-crash fire.

The aircraft's final manoeuvre could not be explained but, having entered a stall or spin, there was little height in which the pilot could regain control before it struck the ground.

AAIB Correspondence Reports

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

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

The accuracy of the information provided cannot be assured.

INCIDENT

Aircraft Type and Registration:	Airbus A320-232, G-TTOB
No & Type of Engines:	2 International Aero Engine V2527-A5 turbofan engines
Year of Manufacture:	2002 (Serial no: 1687)
Date & Time (UTC):	18 December 2014 at 2036 hrs
Location:	London Heathrow Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 137
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	40 years
Commander's Flying Experience:	10,700 hours (of which 4,550 were on type) Last 90 days - 185 hours Last 28 days - 78 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and aircraft operator's investigation report

Synopsis

An unusual smell was noticed soon after takeoff, the source of which could not be determined. The flight crew donned their oxygen masks and carried out the appropriate actions to deal with the situation, while arranging with ATC for a return to Heathrow.

Subsequent investigation revealed that hydraulic fluid leaking from a hydraulic actuator had been ingested into the air conditioning system. Following appropriate maintenance action, the aircraft was returned to service and no recurrence has been reported.

History of the flight

The aircraft was operating a scheduled passenger service from London Heathrow Airport to Paris Charles de Gaulle Airport. There were six crew and 137 passengers on board. The aircraft departed Heathrow at 2015 hrs.

As the aircraft climbed through 5,000 ft, the flight crew noticed a musty smell, which was mild at first but strengthened slightly over the next few minutes. As the flight crew were discussing the smell and possible courses of action, the purser called from the cabin and informed the commander that cabin crew at the front and rear of the aircraft had also noticed the smell and that some were also feeling light headed and a little nauseous. The flight crew initiated the smoke / fumes response actions with reference to the Quick Reference Handbook, which included donning their oxygen masks.

With the source of the smell not identified, the flight crew informed ATC of the situation using a PAN call and stated that they wished to return to Heathrow. The commander then briefed the cabin crew accordingly. During the subsequent approach to Heathrow, the smell was still present although not worsening, so the flight crew continued to wear their oxygen masks. After landing and vacating the runway, the aircraft was brought to a stop on a taxiway while emergency services carried out an external inspection. The smell had reduced in intensity by this time and the flight crew were able to remove their oxygen masks before taxiing the aircraft to the stand. There were no reports of lasting adverse effects of the fumes on passengers or crew.

The aircraft operator carried out a technical investigation which found that hydraulic fluid, leaking from a yaw damper actuator, had been ingested into the air inlet for the Auxiliary Power Unit (APU). One of the purposes of the APU is to provide a supply of bleed air to the aircraft's air conditioning system when it is not being provided by the engines. Thus, the ingested fluid found its way into the air conditioning system. The actuator was replaced and a decontamination procedure carried out. The aircraft was subsequently returned to service with no reported recurrence.

ACCIDENT

Aircraft Type and Registration:	Boeing 737-8JP(WL), LN-DYS
No & Type of Engines:	2 CFM56-7B26 turbofan engines
Year of Manufacture:	1998 (Serial no: 39007)
Date & Time (UTC):	23 December 2014 at 0602 hrs
Location:	London Gatwick Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 140 (Estimated)
Injuries:	Crew - None Passengers - None Others - (Serious)
Nature of Damage:	Approximately 1 m tear in lower rear fuselage
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	58 years
Commander's Flying Experience:	13,149 hours (of which 7,189 were on type) Last 90 days - N/K Last 28 days - 89 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional enquiries by the AAIB

Synopsis

Whilst the passengers were boarding, a toilet servicing truck reversed up to the rear left side of the aircraft but failed to stop and ran underneath the fuselage, causing a tear in the skin. Another ground crewman was badly hurt after being crushed between the toilet truck and a baggage conveyor vehicle on the right side.

History of the event

The passengers were boarding the aircraft at Stand 14. After about 140 had boarded and as the flight crew were completing briefings and performance calculations, they felt a lurch sideways accompanied by a "grinding" noise. They received a call from the cabin crew who reported that "a lorry" had hit the aircraft. The commander immediately left the flight deck and stopped the boarding. Descending to ground level outside the aircraft, he saw that a toilet servicing truck was partially under the rear of the aircraft and that the driver was standing by his cab with his head in his hands. Another man, later identified as a second toilet service crewman, was lying on the ground calling out in pain.

The commander knew that the toilet truck was supposed to reverse up to, and stop at, the toilet service panel on the lower left side of the fuselage and the rear deck was too high to pass under the fuselage. He estimated that the truck had overshot its intended stopping position by about 3.5 m, crushing the other crewman between the toilet truck and a baggage

conveyor positioned by the rear freight bay door on the right side of the aircraft. A gash of about one metre in length had been torn in the aircraft's fuselage skin and the forward fuselage had made contact with the air bridge as it slewed left.

After seeing that fire service paramedics were attending to the injured man and that an ambulance had been called, the commander asked for the police to attend. He re-entered the aircraft and ordered the disembarkation of the passengers. He then went back outside the aircraft to check that its condition was safe and that no fuel was leaking. After checking the progress of the disembarkation and making an announcement to the remaining passengers, he gave a statement to the police, who were now in attendance, and was allowed to leave the scene.

Investigation

The ground handling company which operated the toilet servicing truck prepared a report which was made available to the AAIB. In it, the driver reported that he accidentally pressed the accelerator pedal instead of the brake. The man who was injured was acting as a banksman to guide the driver whilst he reversed, as required by company procedures. The observation was also made that the banksman appeared to have been standing directly behind the vehicle he was directing rather than to one side, which is better practice. There were no issues identified with training or vehicle serviceability.

ACCIDENT

Aircraft Type and Registration:	DA 42 Twin Star, G-CTCF
No & Type of Engines:	2 Thielert TAE 125-02-99 piston engines
Year of Manufacture:	2005 (Serial no: 42.045)
Date & Time (UTC):	2 December 2014 at 1352 hrs
Location:	Bournemouth Airport, Dorset
Type of Flight:	Training
Persons on Board:	Crew - 3 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to right main landing gear, right wing control surfaces, tail skid, propeller and gearbox
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	59 years
Commander's Flying Experience:	8,160 hours (of which 2,100 were on type) Last 90 days - 69 hours Last 28 days - 23 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and a verbal report by the maintenance organisation

Synopsis

Immediately after landing in crosswind conditions, the aircraft's right main landing gear drag strut failed, causing the right landing gear to collapse. The aircraft was brought to a stop on the grass just beside the runway. None of the occupants was injured.

History of the flight

The aircraft was flying an approach to Runway 08 at Bournemouth Airport as part of an instructional exercise. The weather was fine but with a surface wind from 010° at 17 kt, gusting to 27 kt. The student pilot flew the approach well in the crosswind conditions, but did not fully remove the drift before landing, so the aircraft touched down with a slight crab angle.

Immediately after landing and before the aircraft had fully settled, the instructor felt that the aircraft did not appear to be responding as expected to the student's inputs. The instructor therefore took control and was immediately aware that something was amiss as the aircraft's right wing was dropping. He attempted to correct this by applying full left aileron and right rudder, but was unable to stop the wing contacting the surface. The aircraft came to a stop on the grass immediately to the left side of the runway. The instructor shut the aircraft down and ordered the evacuation. None of the occupants was injured.

An inspection by the aircraft's maintenance organisation revealed that the drag strut on the right main landing gear had failed and detached from the main leg, causing the right landing gear to collapse. The affected components were removed and sent to the aircraft manufacturer for more detailed examination.

ACCIDENT

Aircraft Type and Registration:	Denney Kitfox Mk 2, G-KITY
No & Type of Engines:	1 IAME KFM 112 piston engine
Year of Manufacture:	1998 (Serial no: PFA 172-11565)
Date & Time (UTC):	19 November 2014 at 1409 hrs
Location:	Near Castle Bytham, Lincolnshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Serious) Passengers - N/A
Nature of Damage:	Damage to forward fuselage and engine bay, and to left wing
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	73 years
Commander's Flying Experience:	682 hours (of which 329 were on type) Last 90 days - 4 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot, recorded meteorological information and photographs of the accident site

Synopsis

After touching down on a relatively short, wet grass runway, the pilot decided that he would be unable to stop the aircraft before encountering a boundary fence. He applied full power and selected a climbing attitude in order to fly a go-around. The aircraft cleared the fence but failed to climb, subsequently colliding with the roof of a bungalow, about 50 m beyond the fence. The pilot, who sustained a serious injury, believed that the aircraft had most probably been placed in a high drag situation which exceeded its performance capabilities.

History of the flight

The pilot reported that he had been conducting a local flight from a private airfield where the aircraft was based. There were two grass runways at the airfield: 15/33, which was about 435 m long, and 08/26, which was about 285 m long. The airfield was situated in undulating countryside, at an elevation of 291 ft. There was a light and variable wind, with a visibility of 5,000 m and a cloud base between 1,000 ft and 1,500 ft. Recorded meteorological data for airports in the region indicated a widespread slack weather system, with surface winds reported from 110° to 130° at 4 to 8 kt. The runway surfaces on the day of the accident were described as soft and wet.

The pilot initially flew six visual circuits from Runway 15 without incident, flying touch-and-go landings. He then noted from the windsock that the wind had shifted to favour Runway 26, so positioned to make a final landing on that runway. The approach was normal, but the pilot sensed a higher than usual groundspeed just before landing and, after landing, recalled seeing the windsock indicating a slight tailwind on that runway. He commented that he had previously observed rapid changes in indicated wind direction when light wind conditions existed at the airfield.

The pilot reported that he seldom needed to apply wheel brakes during landing. However, although the initial part of the landing roll was uphill, the aircraft landed slightly further along the runway than the pilot had intended and with a slight tailwind, so he applied wheel brakes to reduce speed. The latter part of the runway sloped downwards and, as the aircraft crested the highest point, it became apparent that wheel braking was ineffective. Realising that a collision with a small boundary fence was imminent, the pilot applied full power in order to fly a go-around.

The pilot rotated the aircraft to a climbing attitude and recalled that it lifted off and cleared the approaching fence. Shortly afterwards, with full power applied and whilst still in a climbing attitude, the aircraft collided with the lower part of a bungalow roof, coming to an abrupt stop, still in a nose high attitude, with its forward fuselage resting on the roof and the rear fuselage supported by hedging and small trees.

The pilot remained conscious throughout the accident sequence and afterwards. The aircraft's attitude and position prevented him from vacating normally, so he remained in the aircraft until extricated by the emergency services. He was then flown by air ambulance to hospital, where it was established that he had suffered a serious back injury.

The distance from the estimated lift off point to the fence was about 60 m, with about a further 50 m to the bungalow. From photographs taken at the scene, the ground fell away at an increasing rate beyond the fence, such that the bungalow roof was not visible from the runway at the point the aircraft lifted off. Until the point of collision, the pilot believed that the aircraft had successfully transitioned to a climb, reinforced by the fact that it cleared the fence (the forward view being obscured by the aircraft structure). In fact, the aircraft had descended approximately 30 ft from the point where it lifted off, with a high nose attitude and full power applied throughout.

The pilot did not believe that he had lost control of the aircraft, nor did he suspect a failure or defect with the aircraft's structure or its systems, noting that damage to the propeller was consistent with a high power setting. Instead, he thought it most likely that the aircraft had lifted off prematurely at a low speed and he had selected a slightly higher pitch attitude than was normal, resulting in a high drag condition which prevented the aircraft climbing or accelerating.

ACCIDENT

Aircraft Type and Registration:	Pietenpol Air Camper, G-ECVB	
No & Type of Engines:	1 Continental Motors Corp O-200-A piston engine	
Year of Manufacture:	2002 (Serial no: PFA 047-13014)	
Date & Time (UTC):	23 July 2014 at 1750 hrs	
Location:	RAF Cranwell, Lincolnshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Right landing gear and right wingtip damaged	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	34 years	
Commander's Flying Experience:	133 hours (of which 58 were on type) Last 90 days - 4 hours Last 28 days - 1 hour	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The right landing gear collapsed during a touch-and-go due to the failure of the right landing gear tie-rod-end. The Light Aircraft Association (LAA) investigation identified that the tie-rod-end was of a lower specification to that required by the production drawings. As a result of feedback on the condition of the tie-rod-ends on other aircraft, the LAA published Airworthiness Information Leaflet LAA/MOD/047/009 Issue 1 in November 2014 which introduced a routine inspection and a 100 flying hour life for landing gear tie-rod-ends.

History of the flight

During a touch-and-go the right landing gear collapsed, so the pilot climbed to a safe altitude to assess the situation. The pilot informed ATC and then carried out a series of low passes to allow visual inspection of the landing gear by persons on the ground, followed by a number of practice approaches, before attempting a landing. The aircraft touched down on the left mainwheel and continued along the runway for approximately 150 m, until lift was lost and the right wing dropped, causing the aircraft to rotate horizontally though 180° prior to coming to rest. Neither the pilot nor the passenger received any injuries

Previous Pietenpol Air Camper landing gear failures

A number of Air Campers, including G-ECVB, have had their original wooden landing gear replaced with a steel tube landing gear similar that fitted to the Piper Cub. There have

been a number of incidents with this type of landing gear, caused by failure of the rod-end bearing. These previous incidents were only on landing gears which used bearings that incorporated a grease nipple. It was believed that the hole for the grease nipple was acting as a 'stress raiser' causing the rod-end to fail. As a result the Pietenpol Club published a service bulletin requiring owners to replace the rod-ends with ones which did not have a grease nipple.

Investigation

Initial examination of G-ECVB showed that the rod-end bearing connecting the right mainwheel struts to the right tie-rod had failed, allowing the landing gear to collapse, Figure 1. The failed rod-end did not incorporate a grease nipple.

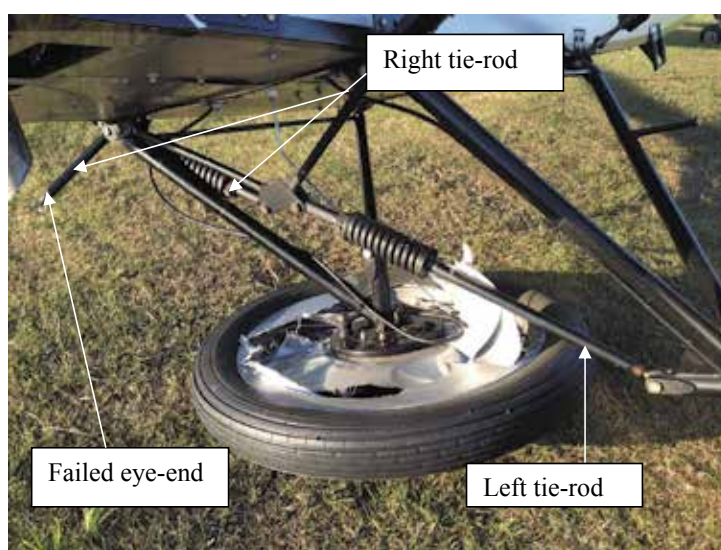


Figure 1
Failed landing gear

A detailed examination was carried out by the LAA which determined that the rod-end was of a lower specification to that specified in the production drawings and that the failure appeared to have been as a result of progressive deterioration in-service. As a result of the investigation the LAA published details of the incident and findings in Light Aviation magazine.

Safety action taken by LAA

Feedback received by the LAA as a result of the article indicated that a number of other aircraft showed evidence of rod-end deterioration. After examining a number of these rod-ends the LAA published Airworthiness Information Leaflet (AIL) LAA/MOD/047/009 Issue 1 in November 2014 which required inspections of Cub type landing gear rod-ends to confirm that the correct parts were fitted and that there was no evidence of deterioration. In addition the AIL introduced a 100 flying hour life for the rod-ends. Publication of the AIL was highlighted in LAA Airworthiness Alert LAA/AWA/14/13.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-161 Cherokee Warrior II, G-BFYM	
No & Type of Engines:	1 Lycoming O-320-D3G piston engine	
Year of Manufacture:	1978 (Serial no: 28-7816586)	
Date & Time (UTC):	30 December 2014 at 1015 hrs	
Location:	Beverley Airfield, Yorkshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Right mainwheel and nosewheel detached, damage to left wingtip, right flap, firewall, engine frame and propeller	
Commander's Licence:	Commercial Pilot's Licence	
Commander's Age:	62 years	
Commander's Flying Experience:	1,163 hours (of which 1,019 were on type) Last 90 days - 17 hours Last 28 days - 6 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and enquiries by the AAIB	

Two days previously, the aircraft had force-landed without damage in a field just south-east of Beverley Airfield following an engine failure. After examination by an engineer during which no faults were found, the engine was successfully test run and it was concluded that the failure may have been due to carburettor icing. The decision was made to fly the aircraft out of the field and back the short distance to the airfield.

At about 1000 hrs on the day of the accident, the pilot started the engine and ran it for 10 minutes, including a power check, before taxiing for take off. A second power check was performed before the aircraft took off under full power and climbed away normally. However, on final approach to Runway 30 the engine again lost all power and the pilot lowered the nose to maintain airspeed. Fearing that it might strike a ditch that preceded the threshold, he raised the nose again just clearing the ditch, although the aircraft now stalled and landed heavily, detaching the nosewheel and right mainwheel before coming to a halt.

No cause of the failure has been determined, although the pilot suspects that the second failure was not carburettor icing.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-181 Cherokee Archer II, G-TALE	
No & Type of Engines:	1 Lycoming O-360-A4M piston engine	
Year of Manufacture:	1981 (Serial no: 28-8290048)	
Date & Time (UTC):	1 November 2014 at 1440 hrs	
Location:	Blackbushe Airport, Surrey	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 3
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to propeller, nosewheel leg and engine mount	
Commander's Licence:	National Private Pilot's Licence	
Commander's Age:	35 years	
Commander's Flying Experience:	163 hours (of which 162 were on type) Last 90 days - 1 hour Last 28 days - 0 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The aircraft had been high on the approach to land and bounced a number of times. The pilot later discovered that the throttle had jammed slightly open as a result of nose leg damage sustained at some point during the landing. He assessed the cause of the accident as a pilot-induced-oscillation and that he should have initiated a go-around at an early stage.

History of the flight

The pilot reported that the aircraft had been high on the approach to land and, after touching down on Runway 25, the aircraft lifted off again. The pilot immediately checked by feel that the throttle lever was fully closed and he felt it was. He thought the aircraft would settle but it bounced again. He decided against a go-around as he still thought the aircraft would settle, but the aircraft went higher this time and then pitched nose-down. The pilot reported that his split-second decision was that it was "so nose-down" that adding power would have only made the situation worse. It was at this point that he believes the propeller hit the ground. The aircraft bounced about two more times and then veered off the runway to the right and onto the grass where it came to rest about 10 ft from a hedge.

The pilot then noticed that the throttle lever was stuck about 2 inches open and he could not close it, so he closed the mixture and shut down the electrics. He later discovered that

the throttle had jammed as a result of nose leg damage sustained at some point during the landing. He assessed that the cause of the accident was a pilot-induced-oscillation and that he should have initiated a go-around at an early stage.

ACCIDENT

Aircraft Type and Registration:	Ikarus C42 FB100, G-FLYC	
No & Type of Engines:	1 Rotax 912 ULS piston engine	
Year of Manufacture:	2005 (Serial no: 0503-6656)	
Date & Time (UTC):	2 January 2015 at 1230 hrs	
Location:	Lower Upham Airfield, Hampshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to nose leg, propeller, wheel spats, wing struts and left wing	
Commander's Licence:	National Private Pilot's Licence	
Commander's Age:	55 years	
Commander's Flying Experience:	298 hours (of which 276 were on type) Last 90 days - 13 hours Last 28 days - 3 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The pilot commenced takeoff from the left side of the grass runway in order to avoid wetter ground to the right. There was a crosswind from the right and the aircraft deviated to the left early in the takeoff roll. The pilot abandoned the takeoff and attempted to slow the aircraft, but wheel braking was ineffective on the wet surface. The pilot was unable to prevent the aircraft leaving the runway on the left-hand side, where it encountered a drainage ditch and came to an abrupt stop.

History of the flight

The pilot planned for a navigation exercise to Compton Abbas airfield, 35 nm to the west. The weather was fine, but with strong winds forecast at 2,000 ft. Takeoff was planned for Runway 22, a grass runway 648 m long. The runway surface was wet and there was a 10 kt surface wind from 280°.

As the aircraft taxied along the runway prior to takeoff, the pilot experienced some handling difficulty on the wet ground and noted that the aircraft was slipping on occasions, but not to the extent that she was concerned. The pilot lined the aircraft up for takeoff to the left of the centreline in order to avoid wet ground to the right. Without stopping, she applied full throttle to commence the takeoff run, while holding the control column to the right and slightly aft to cater for the crosswind.

After a short distance, the aircraft began to deviate to the left. The pilot was unable to correct the deviation and decided to abandon the takeoff run. She applied the wheel brakes but there was no noticeable retardation. The aircraft's left main wheel ran into a drainage ditch, causing it to yaw rapidly to the left and pitch nose-down, coming to an abrupt stop. The pilot and her passenger, who were both uninjured, shut the aircraft down and vacated.

ACCIDENT

Aircraft Type and Registration:	Pegasus Quik, G-CBVN	
No & Type of Engines:	1 Rotax 912-UL piston engine	
Year of Manufacture:	2002 (Serial no: 7919)	
Date & Time (UTC):	30 November 2014 at 1530 hrs	
Location:	Balado Airstrip, Kinross	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to propeller, main and nose landing gears and pod	
Commander's Licence:	National Private Pilot's Licence	
Commander's Age:	60 years	
Commander's Flying Experience:	90.5 hours (of which 8 were on type) Last 90 days - 6 hours Last 28 days - 2 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

The aircraft arrived at Balado Airstrip after a flight from the Isle of Bute. The wind was light and from the west as the pilot made a normal approach to Runway 24. As he rounded out prior to touchdown, he experienced an area of sink, in addition to being blinded by the glare from a low and bright winter sun. The aircraft landed heavily on the right mainwheel, followed by the nosewheel which dug into the soft grass surface and bent the front forks back as the aircraft came to a halt.

The pilot believes that the unexpected encounter with sink, the low sun and soft ground were all causal factors in the accident.

ACCIDENT

Aircraft Type and Registration:	1) Pegasus XL-Q, G-MWOY 2) P&M Aviation QUIK GT450, G-CEGJ
No & Type of Engines:	1) 1 Rotax 462 HP piston engine 2) 1 Rotax 912 ULS piston engine
Year of Manufacture:	1) 1991 (Serial no: SW-WQ-0414) 2) 2007 (Serial no: 8234)
Date & Time (UTC):	19 November 2014 at 1400 hrs
Location:	Sywell Aerodrome, Northamptonshire
Type of Flight:	1) Training 2) N/A
Persons on Board:	1) Crew - 1 Passengers - None 2) Crew - None Passengers - N/A
Injuries:	1) Crew - None Passengers - None 2) Crew - None Passengers - None
Nature of Damage:	1) Noseleg bent, damage to left wing and monopole 2) Damage to left wing, hangbracket and keel tube
Commander's Licence:	1) Private Pilot's Licence 2) N/A
Commander's Age:	1) 69 years 2) N/A
Commander's Flying Experience:	1) 78 hours (of which 12 were on type) Last 90 days - 4 hours Last 28 days - 2 hours 2) N/A
Information Source:	Aircraft Accident Report Form submitted by the pilot and telephone enquiry by the AAIB

The pilot had been asked by his instructor to start the engine of G-MWOY prior to his arrival in preparation for an instructional session. The pilot strapped himself in the forward seat and commenced pulls of the starter cord: after only a few attempts the engine started and ran up to high power. The aircraft lurched forward, overpowering the foot brake and the pilot found he could not close the throttle. In addition his gloved hand could not operate the ignition switch in time to prevent the aircraft from striking G-CEGJ, which was unoccupied and parked about 8 m away. GJ was spun round and tipped onto its left wingtip whilst OY continued until it encountered a concrete sleeper bordering the car park, the nosewheel bounced over it but the aircraft was brought to a halt when the mainwheels contacted and the pilot finally managed to switch off the ignition.

The pilot reports that a kinked throttle cable, which he possibly damaged when he climbed

into the aircraft, and a weak throttle return spring were probably responsible for the stuck throttle. He noted that everything had appeared normal when he had started the engine earlier in the day.

ACCIDENT

Aircraft Type and Registration:	Team Minimax, G-MYRG
No & Type of Engines:	1 Rotax 447 piston engine
Year of Manufacture:	1998 (Serial no: PFA 186-11891)
Date & Time (UTC):	6 December 2014 at 1055 hrs
Location:	Northrepps Airfield, Norfolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Minor damage to rudder and windscreen broken
Commander's Licence:	Private Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	1,616 hours (of which 4 were on type) Last 90 days - 32 hours Last 28 days - 6 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Whilst overhead Northrepps Airfield after a local flight, the engine suddenly stopped. The pilot states that he misjudged the glide performance of the aircraft with a stationary propeller and, in attempting to land on the runway, feared he would not be able to clear some power lines which ran across the approach. He therefore force-landed the aircraft in a field of sugar beet but, as soon as a bar which stretched between the two landing gear wheels entered the crop, the aircraft flipped inverted. The pilot was uninjured but required the help of members of the local flying club to right the aircraft before he could evacuate from it.

The cause of the engine stopping was found to be a lack of fuel which manifested itself when the aircraft attitude changed. The pilot admits that unfamiliarity with the aircraft type and its fuel consumption combined with overestimating its glide performance with a stationary propeller by about 300 feet per minute were the main causal factors in the accident.

Miscellaneous

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

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

BULLETIN ADDENDUM

Aircraft Type and Registration:	Reims Cessna F172P Skyhawk, G-BITM
Date & Time (UTC):	27 September 2014 at 1330 hrs
Location:	Near Warrington, Cheshire
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional information from an engineering inspection report

AAIB Bulletin No 2/2015, page 44 refers

The aircraft suffered a sudden and significant loss of engine power during the cruise portion of the flight. The pilot identified a field for a forced landing, but the aircraft struck trees at its near boundary and stalled, dropping into the field of intended landing.

An engineering inspection of the engine revealed that the number 3 cylinder rocker cover had been punctured from the inside outwards by the inlet valve rocker arm. From the lack of impact deformations on the rocker cover, it was concluded that the damage occurred before the final accident sequence.

When the engine core was disassembled, it was found that the number 3 cylinder inlet valve had dropped into the cylinder. On removing the induction system, a piece of broken valve head was found within the tube that led to the number 1 cylinder induction valve, partially blocking the tube. This piece of material had been forced out through the broken number 3 inlet valve prior to being drawn into the number 1 cylinder inlet tube. The removal of the number 3 cylinder revealed severe damage to the top of the piston, along with severe damage to the inlet valve.

Detailed inspection of the number 3 cylinder and the dropped valve confirmed that the upper valve spring retainer had fractured in half, causing the valve to drop into the cylinder and contact the piston. This caused the valve head to fracture into three large pieces. One of the pieces stayed attached to the valve stem, the second became jammed within the valve seat in the cylinder head, and the third was found within the induction tube of the number 1 cylinder. Other smaller pieces were observed to have been liberated from the valve, some of which were most likely to have been drawn into the number 2 cylinder, causing damage to the piston before being ejected through the exhaust system.

The loss of engine power was thus attributed to the failure of the upper spring retainer of the number 3 cylinder inlet valve, which led to the valve dropping into the cylinder. With one cylinder compromised, there would have been a significant loss of power which, along with partial blocking of the number 1 cylinder induction system and minor impact damage to the number 2 piston, would have meant that there was insufficient power for sustained flight.

BULLETIN CORRECTION

Aircraft Type and Registration:	Sikorsky S-76C, G-WIWI
Date & Time (UTC):	3 May 2012 at 2155 hrs
Location:	Peasmarsh, East Sussex
Information Source:	AAIB Field Investigation

AAIB Bulletin No 12/2014, page 3 refers

The published report of this **Serious Incident** referred to it incorrectly as an Accident.

This was corrected online on 12 February 2015.

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

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

Published September 2010. | 2/2011 Aerospatiale (Eurocopter) AS332 L2
Super Puma, G-REDL
11 nm NE of Peterhead, Scotland
on 1 April 2009.

Published November 2011. |
| 5/2010 Grob G115E (Tutor), G-BYXR
and Standard Cirrus Glider, G-CKHT
Drayton, Oxfordshire
on 14 June 2009.

Published September 2010. | 1/2014 Airbus A330-343, G-VSXY
at London Gatwick Airport
on 16 April 2012.

Published February 2014. |
| 6/2010 Grob G115E Tutor, G-BYUT
and Grob G115E Tutor, G-BYVN
near Porthcawl, South Wales
on 11 February 2009.

Published November 2010. | 2/2014 Eurocopter EC225 LP Super Puma
G-REDW, 34 nm east of Aberdeen,
Scotland on 10 May 2012
and
G-CHCN, 32 nm southwest of
Sumburgh, Shetland Islands
on 22 October 2012

Published June 2014. |
| 7/2010 Aerospatiale (Eurocopter) AS 332L
Super Puma, G-PUMI
at Aberdeen Airport, Scotland
on 13 October 2006.

Published November 2010. | 3/2014 Agusta A109E, G-CRST
Near Vauxhall Bridge,
Central London
on 16 January 2013.

Published September 2014. |
| 8/2010 Cessna 402C, G-EYES and
Rand KR-2, G-BOLZ
near Coventry Airport
on 17 August 2008.

Published December 2010. | |
| 1/2011 Eurocopter EC225 LP Super
Puma, G-REDU
near the Eastern Trough Area
Project Central Production Facility
Platform in the North Sea
on 18 February 2009.

Published September 2011. | |

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

<http://www.aaib.gov.uk>

GLOSSARY OF ABBREVIATIONS

aal	above airfield level	lb	pound(s)
ACAS	Airborne Collision Avoidance System	LP	low pressure
ACARS	Automatic Communications And Reporting System	LAA	Light Aircraft Association
ADF	Automatic Direction Finding equipment	LDA	Landing Distance Available
AFIS(O)	Aerodrome Flight Information Service (Officer)	LPC	Licence Proficiency Check
agl	above ground level	m	metre(s)
AIC	Aeronautical Information Circular	mb	millibar(s)
amsl	above mean sea level	MDA	Minimum Descent Altitude
AOM	Aerodrome Operating Minima	METAR	a timed aerodrome meteorological report
APU	Auxiliary Power Unit	min	minutes
ASI	airspeed indicator	mm	millimetre(s)
ATC(C)(O)	Air Traffic Control (Centre)(Officer)	mph	miles per hour
ATIS	Automatic Terminal Information System	MTWA	Maximum Total Weight Authorised
ATPL	Airline Transport Pilot's Licence	N	Newtons
BMAA	British Microlight Aircraft Association	N_R	Main rotor rotation speed (rotorcraft)
BGA	British Gliding Association	N_g	Gas generator rotation speed (rotorcraft)
BBAC	British Balloon and Airship Club	N_i	engine fan or LP compressor speed
BHPA	British Hang Gliding & Paragliding Association	NDB	Non-Directional radio Beacon
CAA	Civil Aviation Authority	nm	nautical mile(s)
CAVOK	Ceiling And Visibility OK (for VFR flight)	NOTAM	Notice to Airmen
CAS	calibrated airspeed	OAT	Outside Air Temperature
cc	cubic centimetres	OPC	Operator Proficiency Check
CG	Centre of Gravity	PAPI	Precision Approach Path Indicator
cm	centimetre(s)	PF	Pilot Flying
CPL	Commercial Pilot's Licence	PIC	Pilot in Command
°C,F,M,T	Celsius, Fahrenheit, magnetic, true	PNF	Pilot Not Flying
CVR	Cockpit Voice Recorder	POH	Pilot's Operating Handbook
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)		
