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SPECIAL BULLETINS

COMMERCIAL AIR TRANSPORT

GENERAL AVIATION

CONTENTS (Continued)

SPORT AVIATION / BALLOONS

ADDENDA and CORRECTIONS

None

(ALL TIMES IN THIS BULLETIN ARE UTC)

ACCIDENT

Aircraft Type and Registration:	Beech Baron, N23659
No & Type of Engines:	2 Continental IO-520-C piston engines
Year of Manufacture:	1975
Date & Time (UTC):	4 August 2008 at 1116 hrs
Location:	Runway 27 at Guernsey Airport, Guernsey
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to both propellers and engines and to the right wing / fuselage attachments
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	57 years
Commander's Flying Experience:	2,475 hours (of which 10 were on type) Last 90 days - 10 hours Last 28 days - 5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft, which was for sale, was being flown with the aircraft commander in the right seat and the prospective purchaser in the left seat. The commander performed a normal touchdown on Runway 27 at Guernsey. As the aircraft rolled along the runway the pilot in the left seat offered to raise the flaps but inadvertently raised the landing gear. The aircraft sank onto the runway and veered to the right stopping on the edge of the runway.

History of the flight

The aircraft had been flown from Guernsey to Jersey for an inspection of the engine cylinders to check for corrosion; following the inspection the aircraft returned to Guernsey. The aircraft was for sale, and on the return flight the aircraft commander occupied the right seat and the prospective purchaser, who was an experienced pilot but not current on type, occupied the left seat. The departure was normal and some general handling was carried out by the pilot in the left seat before he handed control back to the aircraft commander for the landing.

The approach speed was normal and full landing flap was selected. The commander confirmed that the landing gear was down and locked and made a normal touchdown on Runway 27. The weather was good and the surface wind was from 230° at 13 kt. The commander did not apply any braking during the initial landing roll

and the other pilot offered to raise the flaps. Before the commander could prevent him from doing so, the pilot in the left seat inadvertently selected the landing gear handle instead of the flap lever and moved it to the UP position. The commander immediately returned it to the DOWN position but the retraction cycle had commenced and the aircraft sank onto the runway. The aircraft came to a stop on the right side of the runway with the nose and right main landing gear retracted and the left main landing gear partially retracted. The commander isolated the fuel and electrical system before both pilots vacated the aircraft through the normal exit. The airport Rescue and Fire Fighting Service attended immediately and helped to secure the aircraft.

The landing gear system on the aircraft was fitted with a weight-on-wheels protection system. This utilises a microswitch on each main landing gear oleo which, when it is compressed, prevents the landing gear handle form being raised and activating the system. With the aircraft light on the wheels, and the oleo extended and not compressed, this protection is not available.

Conclusions

The commander assessed the cause of the accident as the left seat pilot, who flew a number of general aviation aircraft types, assuming that the flap lever was in the same place on the Beech Baron as the aircraft in which he normally flies. The accident illustrates the need to confirm that the correct switch or lever is identified before operating it.

SERIOUS INCIDENT

Aircraft Type and Registration:	Let 410, HA-YFC
No & Type of Engines:	2 Walter M601D turboprop engines
Year of Manufacture:	1985
Date & Time (UTC):	20 June 2008 at 0830 hrs
Location:	Peterborough/Sibson Airfield, Cambridgeshire
Type of Flight:	Aerial Work
Persons on Board:	Crew - 1 Passengers - 5
Injuries:	Crew - None Passengers - None
Nature of Damage:	Right propeller, nacelle and co-pilot's door
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	49 years
Commander's Flying Experience:	6,670 hours (of which 1,270 were on type) Last 90 days - 69 hours Last 28 days - 26 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Immediately after takeoff, with five parachutists on board, the co-pilots door/emergency exit opened and departed the aircraft, striking the right propeller, engine nacelle and fuselage. The aircraft made an immediate return to the airfield and carried out an uneventful landing.

History of the flight

Prior to the flight, the co-pilot's door/emergency exit, which normally remains closed, had been opened to facilitate a routine maintenance task. Due to the late arrival of the pilot, the engineer volunteered to carry out the pre-flight walk around inspection of the aircraft. The pilot reported that, as he approached the aircraft, the door appeared closed and there was no indication that it was unlocked prior to takeoff. The aircraft was carrying out a parachutist dropping detail and, as is usual, the rear fuselage door was locked open for the flight. Shortly after takeoff, the co-pilot's door opened and was pulled from its hinges, striking the right propeller, engine nacelle and fuselage. The aircraft made an immediate return to the airfield and carried out an uneventful downwind landing.

Investigation

Door locking mechanism description

The co-pilot's door/emergency exit is hinged on its rear edge and is fitted with a spring loaded locking mechanism which extends locking lugs into receptacles in the fuselage when the door is fully closed. The hinge

is also fitted with a spring, but this has insufficient strength to close the door fully. A secondary internal latch is also fitted which is designed to prevent the door from opening in the event of a failure of the primary lock. However, the door must be closed with the primary latches engaged for this secondary latch to function.

Door examination

Examination of the door and its mounting structure revealed no evidence of a failure of the door latching mechanisms. The pre-flight cockpit checklist includes an item to verify that the co-pilot's door/exit is locked and this is normally done by a visual check of position of the door locking handles. However, these handles are not conspicuous, being painted the same colour as the surrounding structure.

The aircraft is fitted with a single warning light in the cockpit, which illuminates when either the rear fuselage door and/or co-pilot's door is unlocked. When being used for parachute operations, as on this occasion, the aircraft is frequently operated with the rear door open, with the result that the pilot expects to see the door warning light illuminated before taking off. There is no additional warning to advise the pilot of an unlocked co-pilot's door when the rear door is open.

Safety Action

In order to prevent any similar future incidents, the operator has introduced procedures to ensure that positive steps are in place to verify that it has been closed and locked on completion of maintenance. The internal door locking handle is also to be repainted to increase its visibility within the cockpit.

In May 2008, the European Aviation Safety Agency (EASA) published Airworthiness Directive AD 2008-0103 following an analysis of incidents involving the LET 410 series of aircraft. The reason for this was that early variants of the LET 410 series had certification bases that precluded them from being certificated in EU member states. On accession of the country of manufacture to the EU, responsibility for certification issues was transferred to EASA on the basis that essential safety improvements would be introduced to enable continuing operation in EU member states.

Part B of the AD includes modification of the locking mechanism and the installation of a discrete door warning light for the co-pilot's door/emergency exit to indicate an unlocked condition.

ACCIDENT

Aircraft Type and Registration:	AS355F2 Twin Squirrel, G-BYPA
No & Type of Engines:	2 Allison 250-C20F turboshaft engines
Year of Manufacture:	1986
Date & Time (UTC):	1 May 2007 at 2325 hrs UTC
Location:	Near Thornhaugh, Peterborough
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 3
Injuries:	Crew - 1 (Fatal) Passengers - 3 (Fatal)
Nature of Damage:	Helicopter destroyed
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	49 years
Commander's Flying Experience:	8,000 hours, estimated (of which in excess of 500 hours were on type) Last 90 days - 47 hours Last 28 days - 18 hours
Information Source:	AAIB Field Investigation

Synopsis

The accident occurred when a technically sound helicopter, with a pilot and three passengers on board, crashed into trees while engaged on a night flight from Liverpool to a private landing site near Peterborough. As it approached its destination the helicopter probably encountered an area of shallow fog and low cloud. The helicopter descended to approximately 20 feet at 60 kt and the pilot, possibly using an illuminated haulage yard and quarry for guidance, attempted to fly below the cloud to complete the flight. After descending to approximately 20 ft at 60 kt, either imminent contact with the ground or impending contact with trees ahead forced the pilot to climb, where it is possible that he became disorientated and lost control. All the occupants received fatal injuries.

Background

The helicopter was flown several times on the day of the accident. The first flight took the owner of the helicopter from his house near the village of Thornhaugh to Vanguard helicopter landing site on the Isle of Dogs in London. It departed at about 1005 hrs, arriving without incident at around 1043 hrs. The pilot then went off duty, handing over to another pilot who flew the remaining flights that day, including the accident flight. The helicopter left Vanguard at about 1412 hrs, returning the owner to the landing site at Thornhaugh. The helicopter was then flown to Conington Airfield, landing at about 1455 hrs, where it was refuelled before departing for Thornhaugh again.

On arriving at Thornhaugh the helicopter was shut down to await the owner and two other passengers for a private

return flight to Liverpool, where they were due to watch a football match that evening. Whilst waiting, a life raft and other survival equipment brought by the pilot when he took over at Vanguard, were unloaded and taken into the house. They were required for a planned flight the following day to take the owner to a meeting in Jersey. The passengers arrived at about 1621 hrs, after which the helicopter departed, arriving at John Lennon Airport, Liverpool, at about 1707 hrs.

G-BYPA was one of numerous aircraft that had flown to Liverpool that evening in connection with the football match. They were all attended to by the same handling agent, who reported that G-BYPA was refuelled after its arrival. He provided weather reports to pilots on request, but did not recall G-BYPA's pilot either requesting or being given any weather information. Whilst waiting for their passengers to return, some pilots waited in a lounge provided by the agent. The pilot of G-BYPA was seen in the lounge during the evening. A pilot who spoke with him reported nothing unusual in his demeanour.

History of the flight

The helicopter was due to depart Liverpool at 2130 hrs. However, the football match went into extra time and, as a result, the passengers returned to the helicopter somewhat later than planned. The pilot booked out with ATC for a special VFR departure and, at 2219 hrs, they departed for the return flight to Thornhaugh. The helicopter climbed to a cruising altitude of 2,000 ft and, on clearing the Liverpool zone, set course to East Midlands Airport. At 2234 hrs, the pilot transferred from Liverpool to East Midlands ATC and was given a Flight Information Service, being cleared to pass just to the south of the airport.

At 2311 hrs the following exchange was made between the pilot and East Midlands ATC.

PILOT	ER EAST MIDS ER TRIDENT ONE ER I'LL JUST STAY WITH YOU A FEW MORE MILES IF I MAY ER JUST COMING UP TO RUTLAND WATER WE'LL GIVE YOU A CALL THEN ER BEFORE HEADING INTO PETERBOROUGH TRIDENT ONE
ATC	YEAH NO PROBLEM I CAN'T SEE ANYTHING TO AFFECT YOU
PILOT	OKAY THANKS ER TRIDENT ONE
ATC	DON'T THINK THERE'S ANYBODY TO TALK TO OUT THERE ANYWAY I S- I PRESUME PETERBOROUGH ER ARE WAITING FOR YOU
PILOT	YEAH THEY ARE THANKS VERY MUCH ER TRIDENT ONE WE'LL JUST STAY A FEW MORE MILES
ATC	YEAH THAT'S FINE ER THERE'S NOTHING ON RADAR SEEN TO AFFECT YOU
PILOT	THANKS VERY MUCH TRIDENT ONE

There were no more radio transmissions until, at 2314 hrs, the following exchange was made.

PILOT	AND EAST MIDS ER TRIDENT ONE PROBABLY LOOSE RT WITH YOU SHORTLY ER AND ER WE'LL Q S Y DOWN TO PETERBOROUGH NOW THANKS VERY MUCH HAVE A GOOD NIGHT
ATC	TRIDENT ONE THANK YOU SQUAWK SEVEN THOUSAND SERVICE TERMINATES ER NOTHING SEEN TO AFFECT YOU ER THE SURFACE WIND HERE IS ZERO FIVE ZERO AT SEVEN
PILOT	OK (TWO OR THREE WORDS UNINTELLIGIBLE) SEVEN THANKS VERY MUCH SQUAWK SEVEN THOUSAND GOOD NIGHT

No evidence was discovered of the pilot making any subsequent transmissions to East Midlands or any other ATC provider.

At between 2300 hrs and 2320 hrs, three men working at a haulage yard, situated about 2 nm west of the Thornhaugh landing site, saw a helicopter flying slowly, at a height of about 100 ft, around the area of the floodlight yard. They described seeing its navigation lights and silhouette for a few minutes. They stated that the engines sounded normal and that the helicopter appeared to be lost or looking for something, before it finally flew off in the direction of Thornhaugh. One of the men recalled hearing a sound like "crashing steel tubes" shortly after it disappeared from view.

The wreckage of the helicopter was discovered the following morning, having crashed in Bedford Purlieus Wood, about 1 nm from the haulage yard. All four occupants received fatal injuries.

Helicopter information

The AS355F2 helicopter is a twin-engine, four-seat helicopter constructed largely from conventional materials. The 'shell' of the cabin (above the floor line) is mostly constructed from relatively low strength plastic materials. It has a three-bladed main rotor, and a two-bladed tail rotor. G-BYPA was configured at the time of the accident with a single set of flying controls, such that it could only be flown from the front right seat. It was equipped with an autopilot and a Stability Augmentation System (SAS), and was instrumented for flight under IFR. This allowed single pilot operation at night and under IFR conditions. As the helicopter was fitted with only a single inverter for operation of the SAS and autopilot, operations in IFR were limited to non-commercial flights only.

The instruments included a radar altimeter, fitted with a moveable bug. Should the helicopter's height go below the bugged height, an audio warning would sound and a light on the instrument panel would illuminate. Although the audio warning could be silenced by pressing a button, the light would remain illuminated until the height increased above that indicated by the bug.

The helicopter had two landing lights. One was permanently fixed to illuminate the area directly in front of the helicopter while the other could be moved during flight by the pilot to point in different directions. Only one of the lights could be operated at any one time. When not in operation, the moveable light was capable of being retracted although the operator stated that, at night, it was not unusual to leave the light extended after takeoff for the remainder of the flight in anticipation of requiring it again during the landing.

Site and initial wreckage examination

The wreckage was found in a woodland area in which the tallest trees were estimated to have been 80 ft high. Examination of the site indicated that the helicopter had struck tree tops with relatively low forward and downward speed components, whilst on an approximately south-easterly track. After that, it had descended to the ground, striking a number of trees in the process, before coming to rest semi-inverted some 50 m from the initial tree impact. The nature of damage to several trees and the main rotor blades were consistent with the helicopter being under power at the time it struck the trees. All extremities of the helicopter and rotor system were identified and recovered at the site, indicating that it had been complete at the time of the impact with the trees.

Data extracted from a GPS unit recovered from the proximity of the wreckage indicated that, prior to its

final set of manoeuvres, the helicopter had travelled at low level over ground that was gently sloping and free from obstructions, towards the edge of a forested area. The recorded track took the helicopter towards an individual tree, devoid of foliage and less visible than one in full leaf, before it made a climbing left turn manoeuvre. In doing so, it became aligned with the edge of the forested area, following which it made a sharp turn further to the left, becoming aligned with the edge of another area of trees. Each of these track areas was carefully searched to establish whether any evidence was present of the helicopter having struck trees before descending into the forest. No tree damage or ground markings attributable to the helicopter were found in these areas. Similarly, no helicopter debris was located remote from the area of the wreckage site.

During the initial examination, the Emergency Location Transmitter (ELT) unit in the cabin was found to be functioning. This unit operates in conjunction with an antenna positioned on the airframe to be able to transmit a generally unobstructed upward signal. However, since the helicopter was lying semi-inverted, with the cabin roof largely destroyed, the system was not able to transmit a location signal following the accident.

The radar altimeter indicator in the instrument panel was damaged, in that the instrument glass was broken, and the shaft supporting the bug setting knob was severely bent, so that it could not be rotated. It was established that the gearing between the knob and the bug remained intact, and that the bug was positioned at 120 ft. The nature of this damage was such that the knob was unlikely to have rotated significantly as its shaft deformed, indicating that the 120 ft setting was probably close to its pre-impact setting.

The retractable landing light was in the lowered position**.** The bulb was of a type in which the condition of the filament gave no guidance as to whether or not it had been illuminated at the time of impact. The same situation applied to the bulb of the non-retractable lamp.

Detailed examination

The wreckage was recovered to the AAIB at Farnborough, where a detailed examination was carried out. Certain components were removed and subjected to specialist examination at other locations.

Structure

The fixed structure of the helicopter was confirmed as having been complete prior to initial contact with the tree tops. Although the main rotor blades (MRBs) were extensively damaged, no evidence was present to suggest they had not been complete at the time the helicopter struck the trees. Their root attachments showed evidence of the rotor system having been under power at that time. The tail-rotor blades were almost undamaged.

Impact forces applied to the rotor-head as the semi-inverted helicopter struck the ground, caused disruption and partial collapse of the main rotor gearbox support structure, allowing the axis of the gearbox to deflect substantially to the left. The plastics material and transparencies of the forward and upper part of the cabin were destroyed by ground impact, partly as a result of this deflection reducing the protection of the cabin afforded by the gearbox, had it remained in place.

Flying Controls

The mechanical linkages of the flying control systems were examined through their routing from the cabin to the main rotor control hydraulic actuators (servos). Considerable impact disruption had occurred,

particularly in the region of the gearbox mounting, but no evidence of pre-impact failure was identified in the system. The servos remained attached at their output ends to the lower swash-plate, the scissors links were undamaged and the pitch change links had remained attached to the upper swash-plate and to each MRB pitch change horn. Similarly, the tail-rotor pitch change system exhibited no evidence of pre-impact defects.

Functional tests were carried out on each of the main rotor servos and the hydraulic manifolds. No evidence of failure or incorrect operation was detected. Strip examination of both hydraulic pumps revealed no evidence of failure or excessive wear.

Transmission

The main rotor gearbox was subjected to a strip examination. No evidence of any pre-impact failure was found. The tail-rotor gearbox was also found to be free from any pre-impact defects. Its drive system had been deformed in the accident, and had suffered a single failure. The nature of this failure was consistent with being caused in the impact.

Engines

The engines were strip examined with the assistance of their manufacturer. No evidence of pre-impact failure was found in either unit. One of the two engines had ingested debris in the accident, the consequent damage indicating that it had been operating normally at that time. The other engine had not suffered comparable impact damage and thus exhibited no similar evidence of operation. However, data from one of the GPS units on the helicopter was analysed, in conjunction with the manufacturer, to assess the helicopter's performance during its final manoeuvres with respect to engine power required. This indicated that for the helicopter to have pulled up in to the climbing left turn immediately before the trees, power from both engines would have been required. In addition, as it descended into the trees, power from at least one engine would have been necessary for the recorded flight profile.

Summary

In summary, no evidence was found during the examination of the wreckage of any pre-impact defect or failure which could have caused or contributed to the accident.

Pilot information

The pilot started his flying career in 1987 when he began training in the United States. He gained a Federal Aviation Administration (FAA) Commercial Pilot's Licence and Instructor Rating for both rotary and fixed wing aircraft. He subsequently flew as an instructor and charter pilot in the USA and UK and later gained his FAA Airline Transport Pilot's Licences (ATPLs), again on both rotary and fixed wing types.

In 1990 he gained a CAA rotary wing ATPL and began working for various helicopter charter companies in the UK. During this time he gained experience of flying aerial photography tasks, pipeline and power line patrols.

In 2001, he set up his own helicopter company with a partner, owning and operating one helicopter and managing others for clients. This included the helicopter involved in the accident.

On 14 September 2006, the pilot passed a night Operator's Proficiency Check and on 26 March 2007, he renewed his Instrument Rating.

Meteorological conditions

Forecasts

The pilot had the opportunity to review available forecasts throughout the day at locations he visited. The following forecast information was available prior to the helicopter's departure from Liverpool: Form F215 chart (Appendix 1), Form F214 chart (Appendix 2) and the Central England Airmet (Appendix 3).

In addition, the pilot would have had access to forecast conditions (TAFs) and actual conditions (METARs) for various airports along the return route (Appendix 4). The helicopter's destination and arrival time was such, however, that there would not have been many valid TAFs to consult in the immediate area of Thornhaugh. RAF Wittering, the closest airfield, did not have a TAF valid beyond 1800 hrs on the day of the accident, although RAF Cottesmore, 10 nm NW of RAF Wittering, had a TAF valid to 2300 hrs. Both Luton and East Midlands Airports, the pilot's likely choice of diversion airfields, had TAFs covering the period of the flight.

The RAF Cottesmore TAF forecasted possible temporary reductions in cloudbase, between 2200 hrs and 2300 hrs, to 1,200 ft aal. Both the RAF Wittering and Cottesmore METARS reported no cloud cover below 5,000 ft aal until 2050 hrs, when both reported cloudbases for the remainder of the day of between 200 ft and 500 ft aal. The special observations recorded at 2100 hrs and 2110 hrs (see Appendix 4) were not required to be broadcast on the civilian network so would not have been available to the pilot.

The Cottesmore TAF should have been amended when a special observation, at 2100 hrs on 1 May, recorded a visibility of 6,000 m in haze, and BKN cloud at 500 ft, from which point on, the TAF remained outside tolerance[1]. According to internal Met Office procedures, an amended TAF is required as soon as possible after a TAF falls outside tolerance. An amended TAF was not sent, and there was no subsequent cancellation of the TAF when the airfield closed.

En-route conditions

A detailed aftercast was obtained from the Met Office covering the period of the accident flight, as follows:

Synoptic situation

Analysis of available information showed an area of high pressure centred north of the Shetland Islands and an area of low pressure over western Central France, resulting in a surface flow across England from (generally) the northeast. The influence of the high pressure was that the air was very dry above (generally) 1,500 ft amsl. With a flow over the North Sea, sufficiently moist conditions would exist to generate cloud and mist below (generally) 1,500 ft. The characteristics of such a situation at this time of year would be that any such low cloud/mist would penetrate inland, or form in-situ, during overnight cooling and retreat to coasts, or disperse in-situ, during daytime heating.

The orography of England would influence conditions, with the Pennines providing a location for upslope stratus formation on its windward (eastern) side, but also shelter from cloud on its leeward (western) side.

Footnote

[1] Outside tolerance means that if the conditions change beyond specified limits from the data published in the TAF, then an amended TAF should be published.

Weather

At takeoff from Liverpool Airport, conditions were CAVOK, indicating there was no significant weather. East Midlands Airport reported no significant weather during the period 2220 hrs to 2350 hrs, although fog difference imagery[2] taken at 2315 hrs indicated low cloud over the area (Appendix 5).

Surface visibility

Reports indicate that, to the west of the high ground of the central and southern Pennines, surface visibility was 10 km or greater, up until 2350 hrs. East Midlands Airport reported visibility of 10 km or more during the period 2220 hrs to 2350 hrs but, again, fog difference imagery did indicate low cloud over the area.

Cloud

Reports from Liverpool, Manchester and Birmingham airports indicated no cloud cover up to 5,000 ft aal until 2350 hrs. East Midlands Airport reported no cloud below 5,000 ft aal until 2320 hrs. At 2320 hrs, FEW cloud at 1,200 ft aal was observed and, at 2350 hrs, SCT cloud at 1,000 ft was observed. Fog difference imagery indicated cloud over the area at the time, perhaps more than might be suggested by the observation reports. Evidence from radiosonde ascents at Nottingham suggested that cloud tops would have been limited to less than 1,200 ft in the area, with isolated exceptions to slightly higher values due to topography.

A text message from one of the passengers on the helicopter, sent at 2309 hrs, read: *'We have hit some really bad fog'*. The helicopter was at this time at an altitude of about 2,000 ft and was approximately 12 nm from East Midlands Airport and 24 nm from the landing site.

Footnote

[2] A method of detecting fog or low cloud at night.

Accident site conditions

Witnesses at the haulage yard, about 1nm to the west of the accident site, described the weather at the time they saw the helicopter as being clear with good visibility and no mist or fog. A similar description was given for the landing site at Thornhaugh by members of the owner's family who were outside, at around midnight, awaiting the helicopter's return.

Weather reports were also available from RAF Wittering, about 1.5 nm to the north of the accident site, from which the following information was obtained.

Visibility

The 2250 hrs observation reported a surface visibility of 3,500 m; the automated observation at 2350 hrs reported this as 5,000 m. Automatic observations are limited in the sample area when they assess visibility so this latter figure, overall, is likely to be less accurate than a reported value. The aftercast was not able to provide visibility figures within the cloud layer but noted it was '*possibly much lower than 200 m*'.

Cloud

From 2250 hrs to 2350 hrs, cloud was reported as BKN or OVC at 200 ft aal. Infra-red satellite imagery and fog difference imagery taken at 2315 hrs suggested that any such low cloud that formed in the area would be relatively thin in vertical depth.

The 2350 hrs observation was an automatic report, and in view of this, further analysis was conducted of the 2250 hrs METAR together with that from a radiosonde ascent from Nottingham at 0000 hrs on 2 May 2007. This indicated a theoretical cloud base of 319 ft aal. This is slightly higher than the range 200 to 299 ft aal that would be reported as an official 200 ft cloud base

but, as a theoretical construction, it is within any realistic tolerance and validates the reported figures. The same analysis suggested a likely cloud top at the accident site of no more than 1,200 ft.

Wind speed and direction

There was evidence of a marked backing and easing of the wind between about 2,000 ft and the surface. An estimate of the wind direction and speed at the surface was 020º/11 kt and at 500 ft, 040º/23 kt.

Freezing level

Evidence from the Nottingham radiosconde ascent suggested it was unlikely the level of the 0°C isotherm would have been any lower than 8,000 ft.

Natural illumination

Sunset on the 1 May 2007 was at 1928 hrs and sunrise on 2 May at 0429 hrs. At the time of the accident, the moon was full and was above the horizon, resulting in good illumination levels above any cloud, but less so beneath any cloud layers.

Night VFR limits

A private helicopter flight must remain clear of cloud and in sight of the surface, with a minimum visibility of 5 km. Commercial helicopter operations are usually further restricted to a minimum cloud base of 1,500 ft.

Both private and commercial flights, in addition, have to adhere to the normal low flying regulations which prohibit flight within 500 ft of persons and structures, except when landing or taking off in accordance with normal aviation practice.

Aids to navigation

Two GPS units were recovered from the helicopter. A Bendix-King Skymap IIIC GPS unit was permanently fitted by a bracket on the right-hand side of the instrument panel placed towards the bottom. A detachable Garmin GPSmap296 unit was also recovered which would normally have been positioned on the instrument coaming.

Helicopter landing site description

The landing site at Thornhaugh is situated within the Aerodrome Traffic Zone of RAF Wittering, a military airfield situated about 2 nm to the north-west. A dual carriageway road (A1) runs north-west to south-east about 2 nm to the east, which is illuminated by streetlights at night. Another main road (A47) runs east to west about 0.5 nm to the south but is not lit at night. To the south of this road there are two quarries, one approximately one mile to the east of the haulage yard, the other about 1 mile further to the east and approximately ½ mile to the south-west of the landing site. Both are partially lit at night. A junction between the two roads, about 2 nm to the east of the landing site, stands out at night due to road lighting and is often used by pilots as an initial aiming point to locate the landing site when approaching from the south or east.

The landing site is positioned in a field next to a large house and outbuildings. The aiming point is depicted by a large white H marked on the grass; the edge of the field is lined with mature trees. The site is illuminated at night by a number of lights which can be switched on remotely by transmitting on a designated frequency as the helicopter approaches the site. These were normally activated from a range of about 10 nm and the lights remain on for 15 minutes before automatically switching off.

The lights are positioned on two sides of the field with some directed to illuminate the landing site surface and others angled upwards to illuminate the surrounding trees. In addition, two strobe lights are positioned on the roof of one of the outbuildings.

Tests revealed the remote switching function was operating normally and that all the landing site lights were working at the time of the accident. On the night of the accident, they had been seen to come on at some time after 2300 hrs, having been operated remotely.

The normal way of approaching the site at night would be to fly overhead at a height of about 800 ft agl to identify the site, before continuing the descent and approaching in to wind.

Recorded data

Sources of data

The helicopter did not carry, and was not required to carry, a crash protected recorder. However, the two GPS receivers recovered from the wreckage were successfully downloaded and provided data pertinent to the accident flight. The majority of the accident flight was also captured on radar recordings.

The three recordings correlated well until the latter stages of the flight when the Skymap IIIC altitude recordings became intermittent and deviated from the GPSmap296 and radar recorded altitudes, even though the lateral position recorded remained consistent with the other recordings. This indicated that the unit was unable to track sufficient satellites to provide an accurate three-dimensional fix. Also, the Skymap IIIC unit only recorded data every thirty seconds, which was insufficient to analyse the helicopter manoeuvres in detail. However, it did provide the details of previous flights carried out that day. Due to line of sight limitations, the radar track did not cover the last three minutes and 25 seconds of the flight.

The GPSmap296 provided data that was recorded every time the helicopter deviated from straight and level flight, creating fast updates during manoeuvring. The track of the accident flight was intermittent at the start of the flight; the message log indicated that this was due to the loss of satellite reception. However, after this initial period, the recorded track correlated with the radar data and Skymap IIIC position data, when available, and extended directly to the wreckage location. The unit had not recorded tracks for any previous flights that day.

Information from the Garmin GPSmap296 data was used to analyse the flight path of the helicopter, but all sources were referenced to review the history of previous flights and navigation aids available to the pilot.

Recorded data

The Skymap IIIC unit recorded data covering six flights that day, including the accident flight, with the recordings totalling three hours and 23 minutes. The first track recorded that day started at 1005 hrs UTC at a point correlating to the owner's private landing site near Thornhaugh. Each subsequent flight was either to or from this site; the accident flight ended approximately 1 nm south-west of the landing site.

Figure 1 shows the GPS position, altitude and derived ground speed for the accident flight. The data indicates the accident flight departed Liverpool John Lennon Airport at 2219 hrs on 1 May 2007. During its climb after departure, the helicopter initially tracked south-east for 12 nm and then turned onto a track of 120ºT. Soon after the turn, the helicopter reached a steady cruise altitude of 2,100 ft amsl and its ground speed stabilised to between 90 kt and 100 kt. When

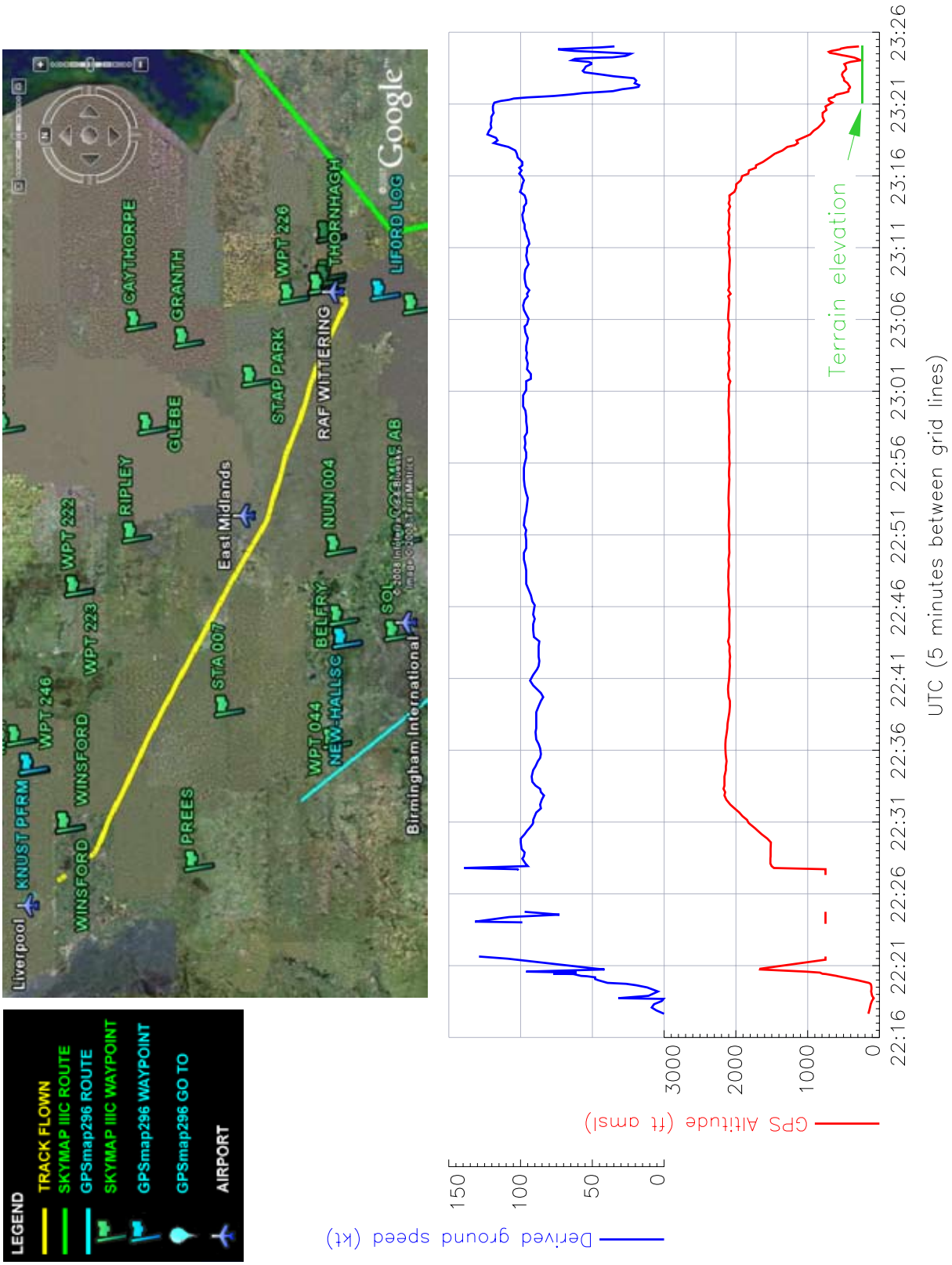

Figure 1

Track recorded by GPSmap296 and waypoint/route data in the memory of both the GPS receivers.

Google Earth ™ mapping service / © 2008 TerraMetrics / © 2008 Infoterra Ltd & Bluesky

it passed south-west of East Midlands Airport, its track changed to an averaged 110ºT. After a further 13 minutes, a steady descent was initiated, with the track drifting to 120ºT once more.

Figure 2 shows the last portion of the flight. The helicopter was briefly levelled at approximately 800 ft amsl before it descended further, with the ground speed reducing. A left orbit was initiated and the helicopter descended to approximately 170 ft agl. The position of this orbit corresponded with the location of a haulage yard. The helicopter then flew further east at less than 300 ft agl, apparently towards a quarry, before altering course approximately 20° to the right. It then dipped to a recorded altitude equating to approximately 20 ft agl[3] with a ground speed of 64 kt, following which it immediately climbed and started a left turn. The turn reached a maximum height of 460 ft agl before continuing in a descent that led to the accident site.

Navigation data

Figure 1 also shows the waypoints and routes pre-programmed into the GPS units. No pre-programmed route covering any part of the flight from Liverpool to Thornhaugh had been stored in either GPS.

The Skymap IIIC had a waypoint marked for the intended destination. However, selected flight plans, 'direct-to' activations and map zoom levels are not recorded, so it was not possible to determine if, or how, this information was being used.

The GPSmap296 did not have a waypoint marked for the intended destination but it had the Wittering TACAN, WIT, as shown in Figure 3b, as its active 'Go-To' point at the time of the accident. Previous 'Go-To' points recorded were not related to this flight. The GPSmap296 provides a moving map display, amongst other optional displays. It was not determined which display was active at the time of the accident. However, the moving map page will retain its last zoom setting and so Figure 3a shows the display that would have been presented to the pilot had it been active. Figure 3b indicates what would have been displayed had a tighter zoom level been selected. Note the dotted grey lines which show the tracks recorded within the unit. With the zoomed display, this provides an indication of where many previous flights had started and finished, and indicates the location of the landing site.

Both GPS units were tracking position with reasonable accuracy and could have provided visual indications of the distance from the 'current position' to the intended destination.

Pathology

Post-mortem reports on the occupants of the helicopter were reviewed by an aviation pathologist. His report indicates that the accident was not survivable. He commented that the pilot was found to have had a benign brain lesion in the right temporal lobe and, whilst it was considered that this could have had the potential to trigger an epileptic seizure, it would have been highly unlikely for the post-mortem to have provided any evidence of a seizure having occurred. Therefore, consideration was given by the pathologist to the circumstantial evidence of such a seizure occurring, from which he deduced that there was a small annual risk of seizures for those with this type of lesion. In addition, his report stated:

Footnote

[3] Note that the altitudes quoted are GPS altitudes with an accuracy tolerance of greater than 20 ft. The GPS receiver horizontal error is quoted as <15m for 95% of the time. Vertical error is regarded as being on average 1.5 times horizontal error due to satellite geometry limitations. These figures are conservative manufacturer figures; normal operation is expected to be better than this. At the time of the accident the geometry of the satellite constellation was favourable for accurate horizontal and vertical positioning. However, how this was adversely affected by obstruction of satellite signals is not known.

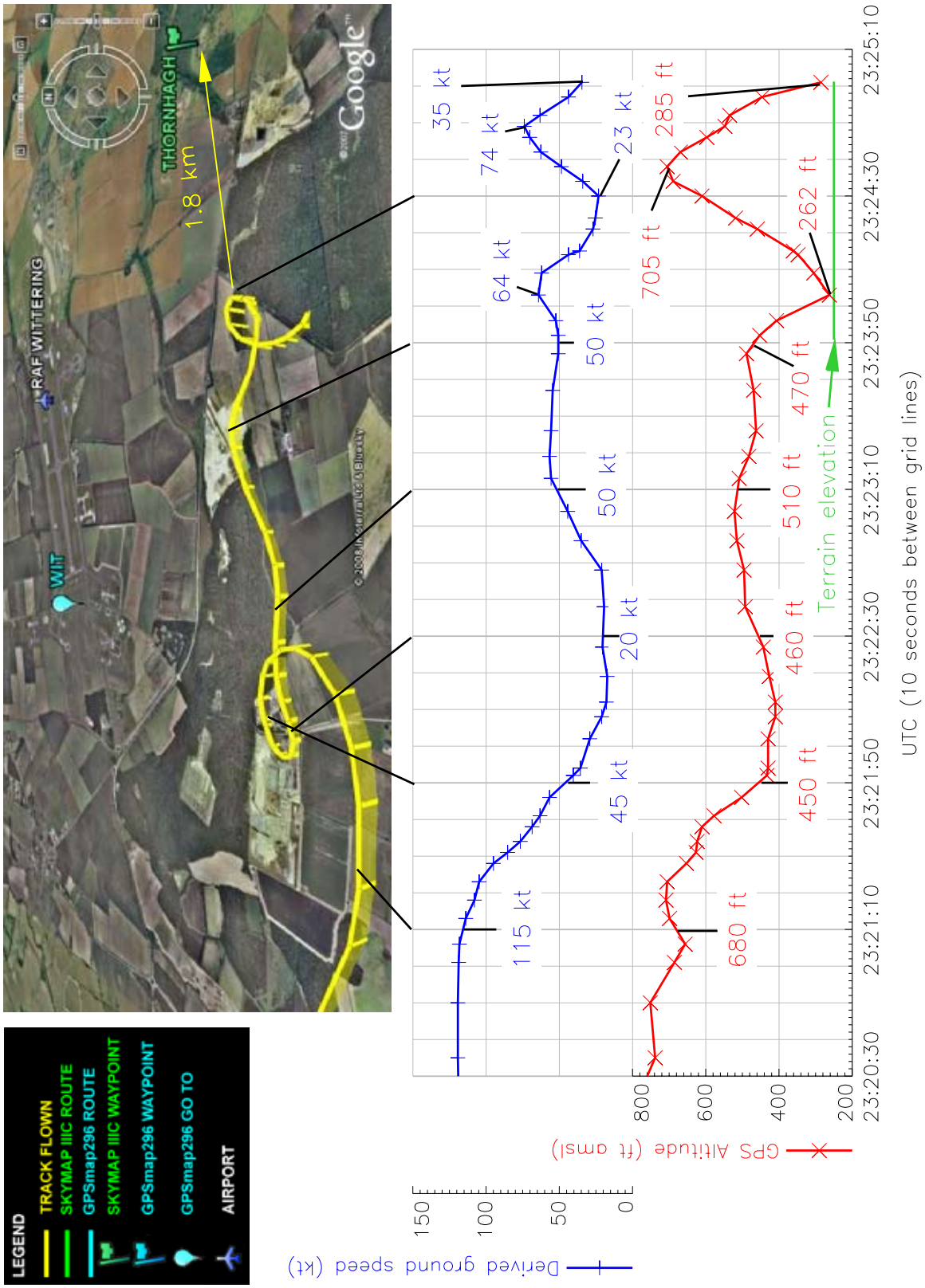

Figure 2

Last portion of track recorded by GPSmap296 and waypoint/route data in the memory of both the GPS receivers

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a)

b)

Figure 3

Photograph of map page of the GPSmap296 with:
a) the last recorded zoom level and
b) a tighter zoom level.
Note that the faint dotted lines are tracks recorded within the unit

'……seizures originating in the temporal lobe need not be associated with convulsions or disturbances of consciousness, but may have much more subtle manifestations, including abnormal bodily sensations, auditory hallucinations or disturbance of time perception. Such manifestations, while not necessarily being totally incapacitating, could certainly potentially impair one's ability to safely control a helicopter'.

Also, the pilot had a history of another condition which is associated with epilepsy. Despite this, there were no indications that he had ever suffered from epilepsy in the past.

Search and rescue

The helicopter was reported missing to Cambridgeshire Police by the owner's family after it failed to arrive at the landing site. The police attempted to trace the helicopter by first contacting the Civil Aviation Authority (CAA), who advised them to contact the National Air Traffic Services (NATS). They also called other police forces on the helicopter's route to see if they had any information on G-BYPA.

At 0116 hrs, the Air Rescue Co-ordination Centre (ARCC) at RAF Kinloss was notified. After making initial enquiries they deployed, at 0227 hrs, a RAF Sea King SAR helicopter, Rescue 128, from RAF Leconsfield to the area of Bakewell in Derbyshire where an emergency location beacon transmission had been received. However, by 0232 hrs, radar recordings had been replayed of the helicopter's flight from Liverpool which identified its last known position near Duddington, a village about 4 nm west of the Thornhaugh landing site. Rescue 128 was diverted to this new position, arriving at about 0318 hrs.

ARCC deployed another SAR helicopter, Rescue 125, from RAF Wattisham at 0232 hrs. Rescue 125 reported initially being unable to approach the scene due to fog and mist. However, by 0324 hrs, it had joined Rescue 128 in the search area where visibility was described as "poor, in fog". The helicopters were able to search the open ground but the use of their forward-looking infra-red (FLIR) cameras was ineffective in searching the dense woodland. The low cloud base continued to hamper their search and a requested forecast predicted the cloud base would not start to lift until between 0800 hrs and 0900 hrs. At 0503 hrs, Rescue 125 withdrew to refuel and change crews, planning to return to the area in time for the predicted weather improvement. Rescue 128 also refuelled but remained in the area until 0708 hrs to continue the search. At 0628 hrs they reported a 200 ft cloudbase with visibility of about 500 m in mist, conditions suitable for a low level search over open ground but marginal over trees, due to mist.

Cambridgeshire Police had been co-ordinating the ground search, which had been joined by neighbouring police forces. Other helicopter landing sites and airfields were checked and, at 0632 hrs, an offer was accepted from ARCC to deploy a mountain rescue team from RAF Leeming to help search the woodland. Their expected time of arrival was 0930 hrs.

The police Air Support Unit helicopter had originally been unable to join the search for technical reasons but, at about 0747 hrs, it spent about 20 minutes conducting a visual search of the area whilst en-route to a maintenance facility, this being the maximum flying time it had available.

At about the same time, a civilian helicopter, owned by friends of the owner of the missing helicopter, also began searching the area. It was cleared to do so by ATC as, at the time, neither of the RAF SAR helicopters were in the area.

At 0835 hrs, Cambridgeshire police received a call from a member of the public who had seen a helicopter flying in the direction of Bedford Purlieus Quarry. This information was then passed to ARCC and RAF Wittering. As the open areas had already been searched, search and rescue assets were directed to nearby woodland known as Bedford Purlieus Wood. This included Rescue 125, which had just returned to the area, and the private helicopter, which had been searching the area since about 0720 hrs. The cloudbase

had lifted enabling a visual search to be made of the woodland and, at 0902 hrs, the private helicopter spotted a small area of broken branches in the tree canopy. Hovering low overhead they could see the crash site and passed this information to Rescue 125. The private helicopter then landed close to Bedford Purlieus Wood to allow one of its two occupants to get out and make their way to the crash site on foot. Rescue 125 meanwhile lowered a winchman to the site through the tree canopy. It was confirmed that the wreckage was that of G-BYPA and that all four occupants appeared to have received fatal injuries.

Fuel

The helicopter's technical log records showed that it had departed Thornhaugh with its fuel tanks filled to 80% of capacity (equivalent to 584 lt, or 461 kg[4]) and landed in London with 60% (equivalent to 438 lt, or 346 kg).

The helicopter was next refuelled at Conington Airfield prior to the flight to Liverpool. Airfield records show that 416 lt were uplifted. Finally, at Liverpool, the helicopter was refuelled, this time with 100 lt, the pilot asking the ground agent to put 50 lt in each of the two fuel tanks.

On departure from Liverpool, the pilot had booked out using an electronic system, declaring the helicopter's endurance as two and a half hours. The fuel required for night operations on the AS355F2, when being operated commercially by its operating company, is determined from their operations manual as the sum of the following:

- Taxi fuel 1%
- Trip fuel 27.5% per hour
- Contingency reserve 10% of planned trip fuel
- Alternative fuel
- Final reserve fuel min 15% (equivalent to 30 mins at holding speed)
- Extra fuel at the commander's discretion

Using a planned flight time from Liverpool to Thornhaugh of 55 minutes (equivalent to 26% of maximum fuel capacity), a planned diversion time of 25 minutes (equivalent to 12%) to either Luton or East Midlands and no discretionary fuel, this equates to a total requirement for the flight of 57 % (about 438 lt or 346 kg).

Although this was a private flight, an estimation was sought, from the helicopter's operating company, of G-BYPA's fuel consumption, based on a combination of experience and figures in the helicopter flight manual; this was about 225 lt/hour. The Skymap GPS on the helicopter recorded a total flight time between departing London and arriving at Liverpool of 96 minutes. Using these figures, combined with the evidence of the technical log and fuel records, the calculated fuel on board on departure from Liverpool was 594 litres. This compares with the 562 lt necessary for the pilot's declared endurance of two and a half hours and the 438 lt necessary for the flight.

Weight and balance

Using the available weight data for the helicopter, fuel and occupants, calculations demonstrated that it was within the permitted maximum takeoff weight and required centre of gravity limits for the entire flight.

Footnote

[4] Fuel figures taken from the Eurocopter flight manual

Pilot duty hours

The pilot woke at about 0400 hrs on the morning of the accident, made a hot drink and returned to bed. At about 0730 hrs, he drove to his parent's house for breakfast and, at approxiamately 0900 hrs, departed for the Vanguard helicopter landing site in London. The journey was a distance of approximately 100 miles and would have taken about two and a half hours. The flight was planned to leave Vanguard at 1300 hrs.

The pilot was occupied for the rest of the day operating the helicopter and carrying out associated functions until soon after reaching Liverpool at 1707 hrs, when he spent time relaxing in a lounge provided by the handling agent at the airport. The departure time had been planned for 2130 hrs, with a planned arrival at Thornhaugh at 2225 hrs but, due to the football match going into extra time, the actual departure time was 2219 hrs.

The planned flight came at the end of a day which represented the maximum duty hours allowable, had this been a commercial operation, of 11 hours 38 minutes, taking into account allowances for travelling times and the rest period at Liverpool. The pilot could have extended this by three hours to take into account unplanned eventualities, such as the late departure from Liverpool. However, as the flight was being operated as a private flight these restrictions did not apply.

Analysis

Detailed examination of the wreckage, stored GPS data and performance calculations, revealed no evidence of a technical failure that may have been causal in the accident. The helicopter had sufficient fuel on board and was within the correct weight and balance limits. There was nothing in the helicopter's operation to suggest a rapid onset of pilot incapacitation, such as an epileptic fit, although it cannot be entirely dismissed that the pilot could have suffered a more subtle incapacitation. In the absence of any reports of the pilot previously exhibiting any unusual behaviour, the lesion found in his temporal lobe would not have been looked for and would not have been readily detectable, during the normal medical examinations that pilots are required to undertake to maintain their flying licences.

The helicopter was seen shortly before the accident being flown apparently under control, but its height, speed and location at this time were not consistent with a planned landing at Thornhaugh, about 2 nm away. It is known that the helicopter had flown over an area of low cloud after it had passed East Midlands Airport and meteorological evidence indicates that low cloud cover extended over the location of the accident site and intended landing site. It is not known what weather information the pilot had obtained prior to the flight, but there was sufficient information available to him, prior to departure, to indicate that his destination was likely to be affected by low cloud at the time of arrival.

Reference to the 1950 hrs METARs for RAF Cottesmore and RAF Wittering would have indicated no adverse weather conditions. However, had he referred to the 2050 hrs and 2150 hrs METARs, this may have caused the pilot to re-consider the suitability of conditions for the intended flight, as these reports would have indicated that the actual conditions in the area of the destination were worse than forecast. As it is not known to what weather information the pilot did refer, the effect of not revising the RAF Cottesmore TAF cannot be established.

Eyewitnesses described the night sky as being clear. This was possibly due to transient gaps in the cloud cover, although it is more likely that the presence of relatively thin cloud was simply not apparent to a casual observer.

The assessment of cloudbase is extremely difficult at night, and requires instrumentation, experienced observers, or both, to obtain accurate values or good estimates. Equally, a thin layer of cloud may not be apparent if a casual observer looks vertically through it from ground level.

Evidence for the existence of low cloud comes from the fact that the helicopter was being flown far lower than would be expected in the area of the haulage yard at night. Its height was about 170 ft agl, against an estimated cloud base of 200 ft to 320 ft agl, and the most likely reason to operate the helicopter in this way would be to remain visual with the surface and clear of the cloud cover above. Had this been due to a mechanical or operational problem, then there was the opportunity to land in the well lit haulage yard or a nearby field. The passenger's text message indicates that, prior to starting his descent, the pilot was almost ceretainly aware of the cloud cover below. The weather at both East Midlands and Luton Airports was suitable for use as diversion airfields, and he had sufficient fuel to fly to either.

The apparent decision to continue to the planned destination might have been driven by a desire to return to Thornhaugh to facilitate the planned flight to Jersey the following day. The decision to continue might also have been influenced by the fact that it was made at the end of what had been a long working day with, possibly, a natural desire to 'get home'. Equally, the pilot may have been unaware of exactly how low the cloud was and he may, therefore, have considered the weather was still suitable to continue safely to the landing site. The lighting above the cloud was good, due to the full moon, and this may have affected his judgement of his ability to fly in the prevailing conditions. The light levels below the cloud, however, would have been significantly reduced.

The normal procedure for landing at the Thornhaugh site at night is to let down over the site once it has been identified. Radar and GPS evidence shows the helicopter making an apparently deliberate turn towards the haulage yard and it is possible that the pilot mistook the yard for the landing site. Both areas would have stood out, being brightly lit, against otherwise relatively dark surrounds, but would have been obscured somewhat and possibly misidentified when viewed from above through cloud. The GPS units on the helicopter could have helped identify the correct position of the landing site but these had been not set in the most appropriate way for doing so. It is possible, therefore, that the pilot either ignored or misinterpreted them at this point.

An alternative reason for the helicopter descending to low level at the haulage yard was not that it was mis-identified but, being so well lit, it might have presented an opportunity for the pilot to get below the thin cloud layer in order to complete the remainder of the flight to the landing site. Whatever caused him to descend over the haulage yard, he would have been well aware of the low nature of the cloud layer, having just passed through it. Irrespective of whether the flight was private or commercial, had the cloud base been as low as the evidence suggests, this should have precluded further flight or precipitated a diversion at a safe height, under such conditions. The opportunities open to the pilot at this point would have been either to land, or revert to flying on instruments and climb to a safe height. However, to attempt the latter would have risked climbing into an area ahead where he would have been unaware of any potential obstructions.

After circling the haulage yard, it appears that the pilot made the decision to continue, flying at low level. This presented the additional challenge of having to navigate at such a height whilst flying in the dark. To do so he

would have either had to rely on his own knowledge of the area or the use of one or both GPS units on board. It is not known if he used either of the landing lights to assist him, but the witnesses at the haulage yard did not recall seeing one on.

The helicopter's initial track from the haulage yard was towards a nearby quarry, which would have been partially floodlit. It is possible the pilot was using this landmark to navigate by or because he thought the lights were those of the intended landing site. Having reached the quarry, the track then turned apparently towards a second quarry, which would also have been partially floodlit. This was possibly for the same reasons that the pilot initially headed for the first quarry, the helicopter's tracks suggesting the pilot was attempting to navigate by visual means. However, the following points relating to the GPS units are of note.

The Garmin GPSmap296 GPS unit did not have the landing site recorded as a waypoint and, therefore, it would not have been marked on the screen. Also, no information on heading and distance to guide him there would have been presented. Previously recorded track lines emanating from the landing site indicated its position, but these lines would have been barely visible under the lighting conditions in the cockpit and would also have required the screen to be set to a suitable scale. It is considered this unit would therefore have been of little use, as set, in navigating between the haulage yard and the landing site.

The Bendix-King Skymap IIIC GPS unit did have the landing site recorded as a waypoint but it could not be determined if this had been selected as the 'go to' point, or what map scale was displayed on the screen. This unit could, therefore, have potentially been used to guide the pilot to the landing site but, due to its position in the cockpit, would have required him to look down to his right in order to see the screen. This would have been distracting and potentially disorientating, particularly when flying under the prevailing conditions.

However the helicopter was being navigated, after having circled the haulage yard, its height varied, initially increasing, but finally reducing from a height of about 240 ft agl, over a period of around 14 seconds, to a height of about 20 ft agl. The prolonged nature and steady rate of this descent indicates it was unlikely, for example, to be due to pilot incapacitation or interference with the controls from a passenger. It may have been the result of the pilot becoming distracted, if he were trying to read or re-programme one or other GPS unit. Also, as it is likely that the radio altimeter had been set to about 120 ft (agl), audio and visual warnings of the aircraft's descent below that height would have been provided. Such warnings could have acted as further distractions at a time when, either he deliberately chose to fly low, or possibly the local cloudbase lowered and forced him down to around 20 ft agl to remain visual with the ground. The recorded speed of the helicopter increased during this descent from 50 kt to about 65 kt, suggesting that it was unlikely the pilot was attempting a precautionary landing.

The rapid climb that occurred immediately after the descent to 20 ft agl could have been a reaction to the pilot suddenly realising how low the helicopter had become. It occurred at a position approaching Bedford Purlieus Wood so he might also have just become aware of the trees ahead. Whatever the cause, the resultant climb could not have been achieved without both engines providing power and the height achieved was likely to have put the helicopter into cloud. This set of circumstances would have been highly disorientating for the pilot and probably resulted in the helicopter

performing the descending left turn into the wood. The helicopter has a natural tendency to turn to the left under high power due to the torque effect of the main rotor.

The subsequent search for the helicopter was made difficult by the poor weather conditions and the fact that the helicopter was well-hidden beneath the tree canopy. This was compounded by the failure of the ELT due to the nature of the impact.

Safety action

Soon after the accident, Cambridgeshire Police reviewed their control room procedures to ensure that the Distress and Diversion unit at Swanick Air Traffic Control Centre is called once an overdue aircraft is notified to them.

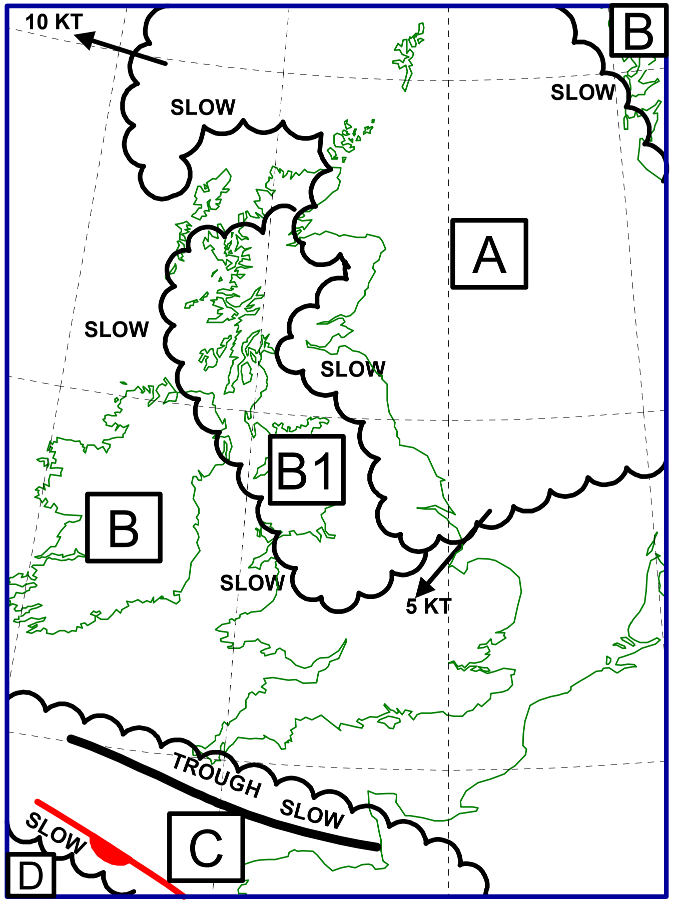
Conclusions

Although the effect of a lesion discovered in the temporal lobe of the pilot during his post-mortem examination was not considered a causal or contributory factor in the accident, the aviation pathologist who reviewed the autopsy reports considered that such lesions, whilst not necessarily causing total incapacitation, could, potentially, impair one's ability to control a helicopter safely. Therefore, the possibility that the lesion could have contributed to the cause of the accident could not be fully dismissed.

In the absence of any technical defect or failure being found during the examination of the wreckage, it was concluded that after the pilot elected to continue the flight, at night, beneath a low layer of thin cloud, he was forced to make a climbing turn to the left, possibly to avoid the ground and/or an area of woodland and that, during this manoeuvre, he became disoriented and descended into trees.

Forecast Weather below 10000 FT

Valid 012000 to 020500 Z MAY 07. Fronts/zones valid at 020000 Z Met Office



AREA	SURFACE VIS AND WX	CLOUD	0 C
A	20 KM NIL OCNL 3000 M BR ISOL 200 M FG OCNL HILL FG	BKN/OVC ST 003-010 / 015-020 ... ... (BASE 000 FG)	080
B	20 KM NIL OCNL 7 KM HZ **B1** ISOL 3000 M BR LAN FM 00 Z **B1** OCNL ⋀ S OF 52N	NIL	070 E 090 W
C	15 KM NIL ISOL 7 KM SHRA/RA ISOL 3000 M +TSRA ISOL 2000 M BR SEA COT ISOL ⋀ ISOL HILL FG	SCT/BKN CU SC AC ѱ ⋀ 040-060 / XXX ISOL CB 040 / XXX ISOL BKN ST 004-010 / 015 SEA COT	080
D	30 KM NIL ISOL 7 KM SHRA	AREAS BKN CU SC ѱ ⋀ ... ... 015-025 / 060-080	060

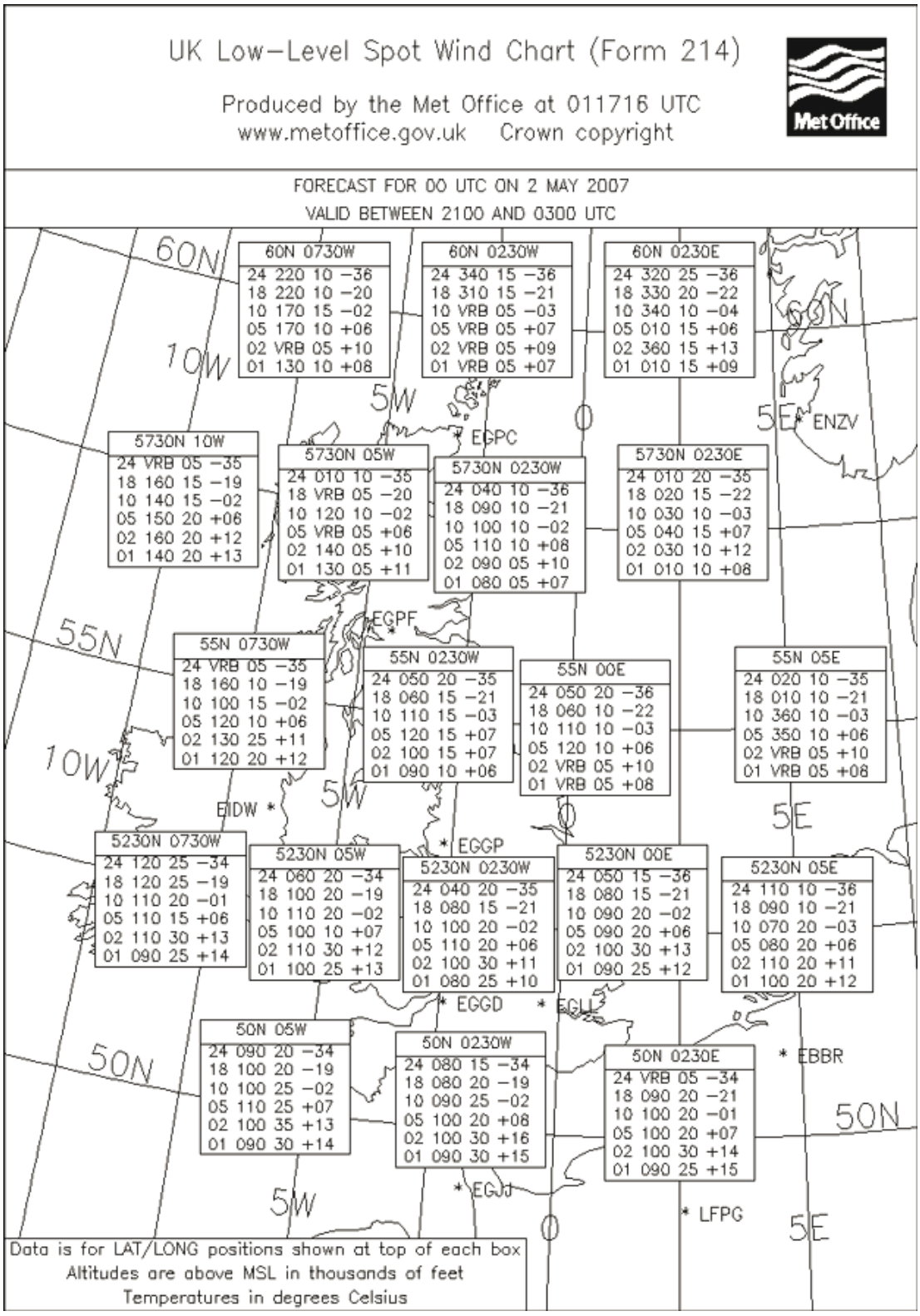
All heights in 100's of feet above mean sea level
XXX means above chart upper limit
Cloud amount (Oktas) MOD / SEV ICE ѱ/ѱ Speed of movement in KT
FEW: 1-2 SCT: 3-4 MOD / SEV TURB ⋀/⋀ Temperatures in DEG C
BKN: 5-7 OVC: 8 TS / CB implies GR/ѱ/⋀ Hill FG implies VIS <200 M

This forecast may be amended at any time.
Issued by Met Office Exeter at 011530 Z
Forecaster: Duty Forecaster
Contact telephone 0870 900 0100

F215

Outlook Until: 021200 Z
BR in zone B clearing. ST BECMG confined to sea/COT.

Appendix 1



Appendix 2

AIRMET AREA FORECAST, CENTRAL ENGLAND,
VALID MAY 01/1700Z TO 02/0100Z.

MET-SITUATION: HIGH PRESSURE N OF SCOTLAND BRINGS A STABLE E FLOW TO THE AREA.

STRONG WIND WRNG: OCNL GUST 25-30KT BECMG ISOL GUST 20KT OVERNIGHT.

WINDS:
1000FT: 080/25KT BECMG 30KT IN S. PS13 BECMG PS09.
3000FT: 100/20-25KT BECMG 30KT IN S. PS09.
6000FT: 110/20KT OCNL 25KT IN S. PS04.

FREEZING LEVEL: 9000FT.

WEATHER-CONDITIONS: 2 ZONES AT 18Z:

ZONE 1: NE OF A LINE MORAY FIRTH DOWN THE E COAST TO N-YORK-MOORS, MOVING INLAND IN A SW'LY DIRECTION AT 10KT FM 18Z:

GEN 15KM, WITH 4-7/8ST 1000FT/1500.
OCNL, 3000M IN BR OR DZ, WITH 7/8ST 300FT/2000.
ISOL, 200M IN FG, WITH 5-7/8ST SFC/1500.

WRNG: CLD ON HILLS.

ZONE 2: ELSEWHERE:

GEN 30KM, WITH 0-2/8SCAC 5000FT/8000.
ISOL N OF 52N FM 20Z, 7KM IN HZ WITH NIL CLD.

WRNG: OCNL MOD TURB BELOW 6000FT S OF 52N.

OUTLOOK: UNTIL MAY 02/0900Z:

AREAS BR/ST AND ISOL FG IN THE NE CORNER AT DAWN MOSTLY CLEARING BY 09Z. ELSEWHERE LITTLE CHANGE.

Appendix 3

Luton (elevation 526 FT AMSL):

TAFs
EGGW 011202Z 011322 09017KT CAVOK TEMPO 1321 09020G30KT=
EGGW 011504Z 011601 09017G28KT CAVOK BECMG 1821 06012KT=
EGGW 011802Z 011904 07014KT CAVOK PROB40 TEMPO 1920 08016G27KT=

METARs
1650Z 01/05/07 EGGW 011650Z 10016KT CAVOK 17/02 Q1014=
1720Z 01/05/07 EGGW 011720Z 08016KT CAVOK 17/03 Q1014=
1750Z 01/05/07 EGGW 011750Z 08016KT CAVOK 16/03 Q1014=
1820Z 01/05/07 EGGW 011820Z 08014KT CAVOK 16/05 Q1014=
1850Z 01/05/07 EGGW 011850Z 08014KT CAVOK 15/05 Q1014=
1920Z 01/05/07 EGGW 011920Z 07010KT CAVOK 14/05 Q1014=
1950Z 01/05/07 EGGW 011950Z 06009KT CAVOK 13/05 Q1015=
2020Z 01/05/07 EGGW 012020Z 06009KT CAVOK 12/05 Q1015=
2050Z 01/05/07 EGGW 012050Z 06011KT CAVOK 12/05 Q1015=
2120Z 01/05/07 EGGW 012120Z 06010KT CAVOK 11/04 Q1015=
2150Z 01/05/07 EGGW 012150Z 05010KT CAVOK 10/05 Q1015=
2220Z 01/05/07 EGGW 012220Z 05010KT CAVOK 09/06 Q1015=
2250Z 01/05/07 EGGW 012250Z 05011KT CAVOK 09/06 Q1015=
2320Z 01/05/07 EGGW 012320Z 04010KT CAVOK 09/06 Q1015=
2350Z 01/05/07 EGGW 012350Z 04009KT CAVOK 07/06 Q1015=
0020Z 02/05/07 EGGW 020020Z 04010KT CAVOK 07/06 Q1015=
0050Z 02/05/07 EGGW 020050Z 04009KT CAVOK 06/06 Q1015=
0120Z 02/05/07 EGGW 020120Z 03009KT CAVOK 06/05 Q1015=
0150Z 02/05/07 EGGW 020150Z 03009KT CAVOK 06/05 Q1015=
0220Z 02/05/07 EGGW 020220Z 03009KT CAVOK 06/05 Q1015=
0250Z 02/05/07 EGGW 020250Z 03009KT CAVOK 06/05 Q1015=

East Midlands (elevation 306 FT AMSL):

TAFs
EGNX 011207Z 011322 09013KT CAVOK PROB40 TEMPO 1318 11015G25KT=
EGNX 011502Z 011601 09013KT CAVOK PROB30 TEMPO 1618 11015G25KT PROB30
2301 7000=
EGNX 011801Z 011904 09013KT CAVOK BECMG 2301 7000 PROB40 0104 4000 BR
BKN004=
EGNX 012103Z 012207 04009KT CAVOK PROB30 0407 5000 BKN005=

METARs
1650Z 01/05/07 EGNX 011650Z 06018KT CAVOK 17/M02 Q1015=
1720Z 01/05/07 EGNX 011720Z 06015KT CAVOK 17/M02 Q1015=
1750Z 01/05/07 EGNX 011750Z 06015KT CAVOK 16/M02 Q1015=
1820Z 01/05/07 EGNX 011820Z 06014KT CAVOK 15/M00 Q1015=
1850Z 01/05/07 EGNX 011850Z 06014KT CAVOK 13/02 Q1016=
1920Z 01/05/07 EGNX 011920Z 05010KT CAVOK 12/03 Q1016=
1950Z 01/05/07 EGNX 011950Z 05010KT CAVOK 11/04 Q1016=
2020Z 01/05/07 EGNX 012020Z 05010KT CAVOK 11/05 Q1017=
2050Z 01/05/07 EGNX 012050Z 05011KT CAVOK 10/06 Q1017=
2120Z 01/05/07 EGNX 012120Z 06011KT CAVOK 09/06 Q1017=
2150Z 01/05/07 EGNX 012150Z 06009KT CAVOK 08/06 Q1017=
2220Z 01/05/07 EGNX 012220Z 05013KT CAVOK 07/05 Q1017=
2250Z 01/05/07 EGNX 012250Z 05010KT CAVOK 07/05 Q1018=
2320Z 01/05/07 EGNX 012320Z 04008KT 9999 FEW012 07/05 Q1018=
2350Z 01/05/07 EGNX 012350Z 05007KT 9999 SCT010 07/05 Q1018=
0020Z 02/05/07 EGNX 020020Z 04007KT 9999 SCT010 07/05 Q1018=
0050Z 02/05/07 EGNX 020050Z 03003KT 9999 SCT010 06/05 Q1018=
0120Z 02/05/07 EGNX 020120Z 02003KT 9999 SCT010 06/05 Q1018=
0150Z 02/05/07 EGNX 020150Z 02004KT 9999 SCT010 06/05 Q1018=
0220Z 02/05/07 EGNX 020220Z 02006KT 9999 SCT010 06/05 Q1018=
0250Z 02/05/07 EGNX 020250Z 02006KT 9999 SCT010 05/04 Q1018=

Cottesmore (elevation 461 FT AMSL):

TAFs
EGXJ 011108Z 011221 08017G27KT CAVOK BECMG 1921 07012KT=
EGXJ 011328Z 011523 06017G27KT CAVOK BECMG 1921 07012=
EGXJ 011654Z 011823 06017G27KT CAVOK BECMG 1921 07012KT PROB30 TEMPO
2223 7000 BKN012=
(note, there was a typo in the 1523 TAF where 'KT' was omitted from
the wind group at the end ('07012' should have read '07012KT').

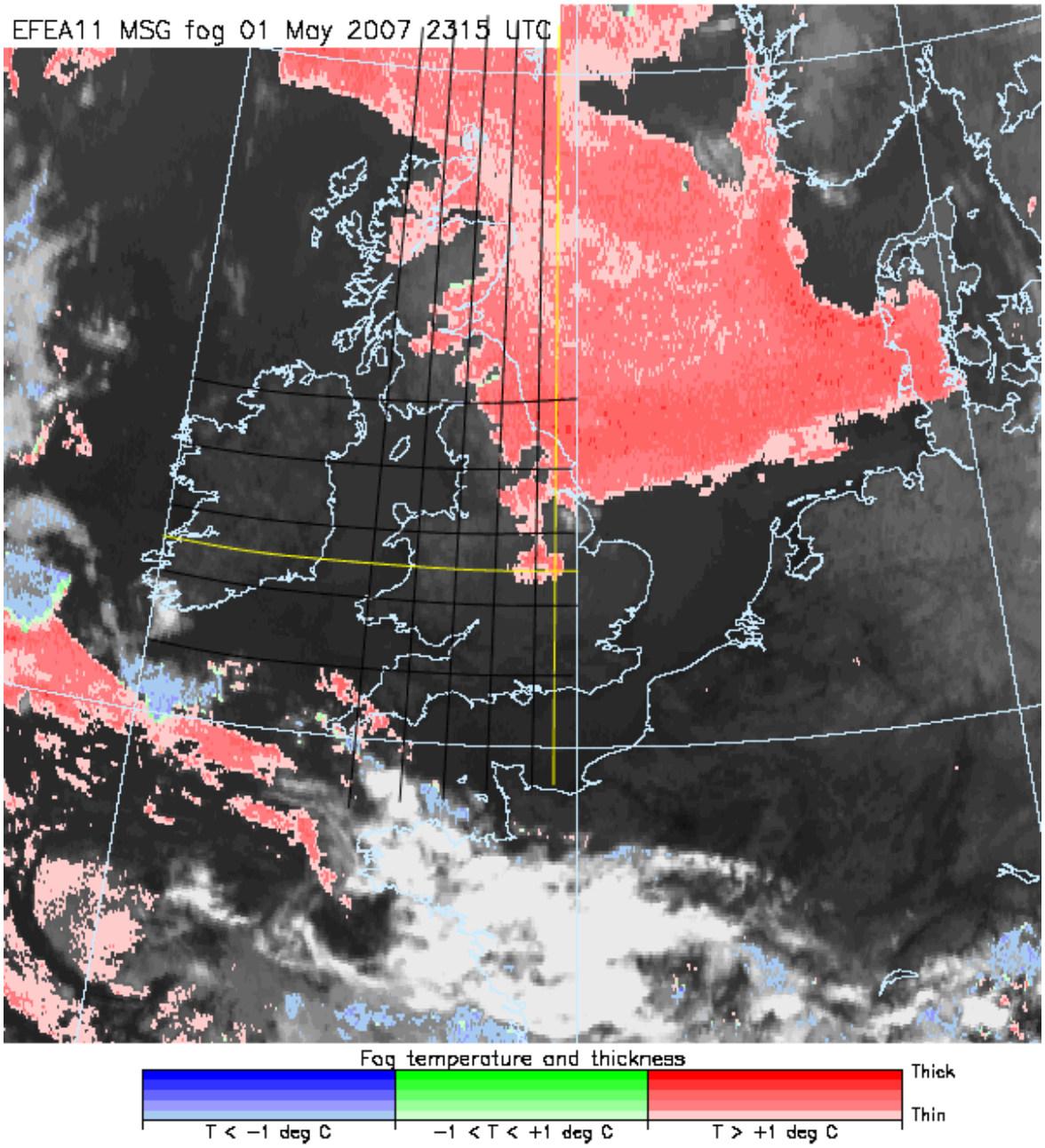
METARs
1650Z 01/05/07 EGXJ 011650Z 05017KT CAVOK 16/M00 Q1016 BLU NOSIG=
1750Z 01/05/07 EGXJ 011750Z 05018KT CAVOK 14/01 Q1016 BLU NO SIG=
1850Z 01/05/07 EGXJ 011850Z 06016KT CAVOK 12/04 Q1016 BLU NO SIG=
1950Z 01/05/07 EGXJ 011950Z 06015KT CAVOK 10/07 Q1017 BLU NOSIG=
2050Z 01/05/07 EGXJ 012050Z 04012KT 8000 HZ FEW003 08/07 Q1017 BLU
BECMG 5000 HZ SCT002 AMB=
SPECM EGXJ 012100Z 05013KT 6000 HZ BKN005 08/07 Q1017 YLO1 BECMG
BKN002 AMB=
SPECM EGXJ 012110Z 05015KT 5000 HZ BKN002 08/07 Q1017 AMB NOSIG=
2150Z 01/05/07 EGXJ 012150Z 05014KT 5000 HZ BKN002 08/07 Q1017 AMB=
2250Z 01/05/07 EGXJ 012250Z 05013KT 5000 HZ BKN002 08/07 Q1018 AMB=
2350Z 01/05/07 EGXJ 012350Z AUTO 03010KT 7000NDV BR OVC002/// 07/06
Q1018=
0050Z 02/05/07 EGXJ 020050Z AUTO 03009KT 5000NDV BR FEW003/// 06/06
Q1018=
0150Z 02/05/07 EGXJ 020150Z 02009KT 5000 HZ FEW004 06/05 Q1018 WHT=
0250Z 02/05/07 EGXJ 020250Z 01009KT 5000 HZ SKC 05/05 Q1018 WHT=

Wittering (elevation 273 FT AMSL):

TAFs
EGXT 011031Z 011218 09015G25KT CAVOK=
EGXT 011345Z 011518 08015G25KT CAVOK=
No more TAFs issued, due to airfield closure.

METARs
1650Z 01/05/07 EGXT 011650Z 04016KT CAVOK 17/04 Q1015 BLU=
1750Z 01/05/07 EGXT 011750Z 05015KT CAVOK 15/05 Q1015 BLU=
1850Z 01/05/07 EGXT 011850Z 04012KT CAVOK 12/07 Q1016 BLU=
1950Z 01/05/07 EGXT 011950Z 04012KT CAVOK 11/08 Q1016 BLU=
2050Z 01/05/07 EGXT 012050Z 04012KT 9999 BKN005 09/08 Q1017 YLO1=
2150Z 01/05/07 EGXT 012150Z 03010KT 5000 HZ BKN004 09/08 Q1017 YLO2=
2250Z 01/05/07 EGXT 012250Z 02011KT 3500 HZ BKN002 08/07 Q1017 AMB=
2350Z 01/05/07 EGXT 012350Z AUTO 02011KT 5000NDV BR OVC002/// 08/07
Q1017=
0050Z 02/05/07 EGXT 020050Z AUTO 02011KT 5000NDV BR BKN002/// 07/07
Q1017=
0150Z 02/05/07 EGXT 020150Z 01012KT 3000 BR BKN002 07/06 Q1017 AMB=
0250Z 02/05/07 EGXT 020250Z 02012KT 3000 BR BKN002 07/06 Q1017 AMB=

Appendix 4



Appendix 5

Fog Difference Image
10 minutes prior to the accident
(Intersection of the yellow lines identifies RAF Wittering)

ACCIDENT

Aircraft Type and Registration:	Cessna F150L, G-BAEU
No & Type of Engines:	1 Continental Motors Corp O-200-A piston engine
Year of Manufacture:	1972
Date & Time (UTC):	4 June 2008 at 1345 hrs
Location:	Full Sutton Airfield, Yorkshire
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Collapsed nosewheel, propeller bent, shock-loaded engine
Commander's Licence:	Student Pilot
Commander's Age:	37 years
Commander's Flying Experience:	19 hours (of which 19 were on type) Last 90 days - 19 hours Last 28 days - 11 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

During the flare of a touch-and-go on Runway 22 at Full Sutton Airfield, Yorkshire, the student pilot noticed a glider landing in the opposite direction. He pushed forward on the control column in an attempt to stop quickly and avoid colliding with the glider. This resulted in the aircraft landing on its nosewheel, which subsequently collapsed, causing damage to the propeller and shock-loading the engine.

History of the flight

The student pilot was on his second solo flight and had completed two or three circuits on Runway 22 at Full Sutton Airfield, Yorkshire, without incident. The surface wind was 220º/5 kt. Whilst in the landing flare, he became aware of a glider coming towards him in the opposite direction "filling the windscreen." He felt he had no option but to try to stop his aircraft as soon as possible. He pushed forward on the control column to get the aircraft onto the ground, so he could commence braking to try to avoid a collision. This resulted in the aircraft landing on its nosewheel, which, after two bounces, collapsed, causing damage to the propeller and shock-loading the engine. The student pilot vacated the aircraft uninjured. He had not seen any aircraft in the circuit whilst he was airborne.

The student pilot added that he came to rest about 250 m from the threshold of Runway 22, approximately 100 m from the glider; his instructor estimated that the two aircraft were about 200 m apart when they stopped.

Airfield information

Full Sutton Airfield has a grass runway orientated 22/04 approximately 730 m long. It also has a published air-to-ground radio frequency which is annotated in the Pooley's Flight Guide, *'Radio use Mandatory'*. Circuits are flown right-hand on Runway 22 and left-hand on Runway 04.

Glider pilot's comments

The glider pilot stated that he had been gliding for 10 years gaining 250 hrs flight time.

On 4 June 2008 he launched in a 13.5 m glider, from his base at Pocklington Airfield, Yorkshire, with the intention of flying to Elevington Airfield, 6 nm west of Pocklington and returning to Pocklington via Full Sutton. Pocklington Airfield is situated approximately 4 nm south-east of Full Sutton. As he approached Full Sutton he experienced a "massive amount of sink" and realised that he would not be able to reach Pocklington, so he decided to land at Full Sutton. Approaching Full Sutton, he did not see any other aircraft in the circuit and noticed that the wind sock was showing no significant wind. He therefore positioned to fly a right-hand circuit to Runway 04. The glider pilot continued to keep a lookout for other traffic and landed on the eastern edge of the runway to leave room for unseen aircraft that might have landed behind him. He estimated the glider came to rest approximately 100 m from the threshold of Runway 04. It was at this point that the glider pilot first saw the Cessna ahead of him with its nosewheel collapsing. Having vacated his glider, the glider pilot pulled it into the standing crops to clear the runway and went to the tower to apologise for his unscheduled landing and see if anyone was injured.

The glider pilot added that although he had a radio in his glider, he did not tune it to the Full Sutton frequency because he was concentrating on flying the circuit with a high rate of descent. He considered landing in a field but as most of the suitable ones contained standing crops and others had wires in the vicinity he thought his best option was to land on the airfield. He added that this was the second time he had "landed out" in over 1,000 flights.

Safety action

As a result of this accident the glider pilot's Chief Flying Instructor debriefed him and re-educated him on radio techniques and how to stay within gliding range of his operating base.

ACCIDENT

Aircraft Type and Registration:	Denney Kitfox, G-BSSF
No & Type of Engines:	1 Rotax 582 piston engine
Year of Manufacture:	1997
Date & Time (UTC):	30 June 2008 at 2015 hrs
Location:	Near Humberside Airfield, Lincolnshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	One propeller blade broken; damage to the lower engine cowling, fin/rudder and tailplane
Commander's Licence:	Private Pilot's Licence
Commander's Age:	38 years
Commander's Flying Experience:	134 hours (of which 70 were on type) Last 90 days - 33 hours Last 28 days - 12 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot was on a local area flight and elected to perform a Practice Forced Landing (PFL) in an area normally used for that exercise. Having successfully completed the PFL the aircraft entered a climb, during which the engine stopped. The pilot carried out a forced landing, but shortly after touchdown the aircraft nosed over and came to rest inverted in standing crops.

History of the flight

The pilot had planned to carry out a one-hour local flight which comprised a navigation exercise and a PFL before returning to Northmoor Airfield. The pre-flight inspection and preparations were completed and the aircraft departed at 1939 hrs. The engine performed normally during the climb and in the cruise at 2,000ft.

The weather was good with a light south-westerly surface wind; the wind at 2,00 ft was from 240° at 12 kt. The visibility was in excess of 10 km with scattered cloud at 4,000 ft; the surface temperature was 21°C, the dew point 8°C and the QNH was 1020 hPa.

Having completed his navigation exercise, the pilot headed towards Northmore Airfield maintaining 2,000 ft and advised air traffic control (ATC) of his intentions. He selected an area normally used for PFLs and having

completed the appropriate checks he closed the throttle. The aircraft descended normally with the engine at idle; during the descent the pilot advanced the throttle on three occasions to prevent excessive engine cooling. Having completed a satisfactory PFL approach the pilot applied power and the aircraft climbed away. At about 700 ft, the engine stopped suddenly and began to run very roughly. The engine rpm became erratic and a severe banging was heard; the loss of power was such that level flight could not be maintained. The pilot confirmed that both the magnetos and engine coolant temperature were normal. He attempted to regain power by pumping the throttle but the engine then stopped. The pilot adopted the gliding attitude and transmitted a MAYDAY call.

All the fields available within gliding distance were covered in crops and the pilot selected the largest field for the forced landing. He selected 5° of flap, as recommended, and adopted the landing attitude when just above the crops, in order to reduce groundspeed. The aircraft touched down and, after some 14 metres of ground roll, it nosed over and came to rest inverted. The cereal crop, which was 2-3 ft in height, cushioned the impact and both the pilot and passenger exited through the pilot's door; neither occupant was injured The pilot switched off the master switch and magnetos and closed all three fuel cocks before using his mobile telephone to advise ATC of their situation.

In his report the pilot pointed out that he regularly conducts PFLs. He also reported that in February 2008, he had flown a successful forced landing following an engine stoppage in flight due to a piston seizure caused by a failure of the lubricating oil injection pump mechanism. The 'top end' of the engine had been rebuilt with new pistons and rebored cylinders and had since operated successfully for 42 hours.

Following the accident on 30 June 2008, it was established that the engine contained the normal level of oil and that the fuel tanks still contained in excess of two hours of fuel. Examination of the engine revealed that the crankshaft had failed approximately halfway along its length, in the vicinity of the rotary valve shaft drive gear. The engine had been manufactured in 1990 and had been operated in the aircraft for a total of 519 hours.

The engine manufacturer's maintenance schedule specifies that after 300 hours of operation, or five years, the engine should undergo a general overhaul by an authorised distributor or service centre. This overhaul includes replacement of the crankshaft with a new assembly. The owner was aware of the overhaul requirement and advised that he was operating the engine 'on condition' in consultation with an engineer reportedly qualified on this engine type. The owner was particularly concerned with monitoring bearing wear, as he believed this was the most critical aspect for continued operation.

The engine manufacturer's documentation contains several references to the importance of following the maintenance schedule to avoid engine problems. Based on the available data and discussions with the engine manufacturer's UK agent, this failure is consistent with the service life and history of the engine.

ACCIDENT

Aircraft Type and Registration:	Denney Kitfox Mk 3, G-BWWZ
No & Type of Engines:	1 Rotax 912 piston engine
Year of Manufacture:	1999
Date & Time (UTC):	15 June 2008 at 1723 hrs
Location:	City Airport Manchester (Barton)
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:	Private Pilot's Licence
Commander's Age:	57 years
Commander's Flying Experience:	1,224 hours (of which 657 were on type) Last 90 days - 31 hours Last 28 days - 8 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Whilst landing at Barton the pilot lost control of the aircraft, which drifted to the left and struck trees and two cars in the airfield car park. The pilot was slightly injured.

History of flight

The pilot had flown to Barton to practise circuits, the wind was 270-300°/7-12 kt. After 38 minutes of circuits and five landings, the aircraft touched down on Runway 27 but bounced into the air again. The pilot applied power to soften the next landing, but it bounced a second time and by now the airspeed was deteriorating and the aircraft started to drift to the left. He applied full power to go around, adopting a nose-up attitude to climb away, but the aircraft kept drifting towards the aircraft parking area. The pilot was reluctant to correct the drift because the airspeed was only some 5 mph above stall speed and the climb rate was poor.

Because he was watching the airspeed indicator and the aircraft's nose was high, the pilot did not see that he was heading towards some trees at the edge of the airfield car park. Having struck the trees the aircraft spun to the ground from about 30-40 feet, causing slight damage to two cars in the car park. The pilot evacuated the aircraft unaided but with minor injuries.

In a frank assessment of the cause of the accident, the pilot was of the opinion that he was "behind the aeroplane", that he should have reacted to the bounced

landings by applying more power and that he should have corrected the drift. By his own admission, when the aircraft was on the verge of stalling he was only thinking about keeping the wings level and hoping to build airspeed.

ACCIDENT

Aircraft Type and Registration:	DH82A Tiger Moth, G-ANFV
No & Type of Engines:	1 De Havilland Gipsy Major 1F piston engine
Year of Manufacture:	1942
Date & Time (UTC):	21 June 2008 at 1620 hrs
Location:	Shempston farm strip, Duffus, near Elgin, Moray
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to left side of the lower fuselage near the landing gear attachment, and rippling of the fabric covering in this area
Commander's Licence:	Private Pilot's Licence
Commander's Age:	63 years
Commander's Flying Experience:	348 hours (of which 102 were on type) Last 90 days - 18 hours Last 28 days - 7 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot had returned to Shempston farm strip from Perth following an uneventful flight. The ATC tower at RAF Lossiemouth, which is located less than half a mile from the farm strip, reported the wind direction and speed as 130°/16 kt. The pilot therefore planned his approach to land on Runway 07, the shorter of two runways at the farm. However, he also observed the windsock at the western end of RAF Lossiemouth was frequently indicating a more easterly wind direction. He continued the approach at an indicated airspeed of 60 kt, flared the aircraft at between 6 ft and 8 ft and closed the throttle. The aircraft responded normally but, before touching down, the pilot reported that the aircraft experienced a sudden downdraft and contacted the runway heavily in a slightly left wing low attitude. Despite sustaining some damage, the aircraft continued the landing roll before coming to rest. Both occupants exited the aircraft without difficulty and were uninjured.

ACCIDENT

Aircraft Type and Registration:	DH82A Tiger Moth, G-AXAN
No & Type of Engines:	1 De Havilland Gipsy Major 1F piston engine
Year of Manufacture:	1943
Date & Time (UTC):	1 June 2008 at 1420 hrs
Location:	Sandtoft Aerodrome, Belton
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Broken propeller, damage to fin, rudder, upper mainplane and engine cowls
Commander's Licence:	Private Pilot's Licence
Commander's Age:	49 years
Commander's Flying Experience:	1,147 hours (of which 80 were on type) Last 90 days - 10 hours Last 28 days - 8 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Landing on wet grass adjacent to the paved runway, in crosswind conditions, the aircraft veered off the strip and nosed over in long grass.

History of the flight

The pilot was landing at Sandtoft Aerodrome, which has a paved Runway 05/23 and, adjacent, a strip of grass mown short for safety. There was a variable crosswind component so the pilot elected to land on the grass strip. During the landing roll, the aircraft veered to the right into an area of long grass and stopped quickly, turning over. The pilot estimates that he lost directional control partly due to the wet condition of the grass, and the crosswind, and that the aircraft was travelling at less than 20 mph when it turned over.

ACCIDENT

Aircraft Type and Registration:	Druine D.31 Turbulent, G-APTZ
No & Type of Engines:	1 Volkswagen 1600 (Peacock) piston engine
Year of Manufacture:	1959
Date & Time (UTC):	15 March 2008 at 1534 hrs
Location:	Headcorn Airfield, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - N/A
Injuries:	Crew - 1 (Minor) Passengers - None
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	44 years
Commander's Flying Experience:	152 hours (of which 32 were on type) Last 90 days - 5 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and witness observations

Synopsis

During a display practice which involved flying at approximately 5 ft above the ground under a line of bunting, the aircraft probably encountered a disturbed air mass that resulted in an uncommanded change of flight path. The pilot was unable to recover the aircraft before it impacted the ground.

History of the flight

The accident occurred during practice for an air display in which three aircraft would fly the team's 'standard' routine. This involved the aircraft flying in procession to conduct a series of passes at a height of approximately 5 ft under a string of bunting held between two 'limbo poles'. The practice was conducted in an area north of the active runway, with the closer of the two limbo poles located approximately 50 ft north of the runway edge. The licensed grass Runway 11 was in use and at least one other aircraft, a Cessna 172, continued to operate in the circuit during the display practice. There was a light south-easterly wind with good visibility and no cloud below 5,000 ft.

Prior to the flight, the pilots of all three aircraft discussed and 'walked through' the routine. The accident aircraft then took off and followed the leader, flying as number two in the procession of three aircraft. Having made the first pass parallel to Runway 11 each aircraft turned north, perpendicular to the runway, before executing a right turn

through 270° at approximately 200 ft agl to position for a second pass, this time heading in a westerly direction parallel to the active runway. The pilot of G-APTZ stated that during this manoeuvre, he turned slightly inside the leader to avoid flying "unnecessarily in any wake turbulence" and also to "fractionally close the gap between these two aircraft". He positioned the aircraft for a straight descending approach to the limbo poles and after levelling out, applied full power approximately 50 m before the poles, intending to "maximise control authority during the limbo manoeuvre". He judged that his position relative to the leader and to the poles was correct and nothing at that stage caused him to consider flying over, rather than under, the bunting.

His recollection of subsequent events was less clear, but he remembered that immediately prior to passing under the bunting, the aircraft made an uncommanded climb and change of direction. He estimated that the aircraft was travelling at 100 kt at a height of 5 ft agl. Shortly afterwards the aircraft impacted the ground. It came to rest upright, facing 180° to the original flight path with both wings detached and considerable disruption to the cockpit and forward fuselage. The pilot was attended at the scene and taken to hospital by air ambulance, but was subsequently discharged with what he described as minor injuries.

Accident site

Marks on the ground leading from the point of initial impact to the final resting position of the aircraft indicated that it had impacted the ground in an essentially level attitude, probably touching down first on the right main wheel. There was evidence, from regularly spaced cut marks in the ground beyond the initial impact point, that the engine had been producing power when the propeller blades struck the ground. There was no evidence that the aircraft had fouled the bunting.

CAA Display Authorisation Evaluator

There were several witnesses, including a CAA Display Authorisation Evaluator (DAE) who was a former member of the team and an experienced pilot of this type of aircraft. Aware that the team was conducting a pre-season practice, he "took a keen interest" in the activity commenting that, in his role as a DAE, he would almost certainly have been asked to renew the team's Display Authorisations for the coming season, either on that day or at a later date. He stated that at least one display practice had been conducted that day prior to the accident and that the 'limbo routine'appeared normal.

Immediately before the accident flight, the DAE witnessed a formal briefing by the leader which included a 'walk through' of the planned sequence. The limbo poles were being held by ground crew members who the DAE understood had been briefed and were familiar with the display sequence. The bunting was made of cord and fixed to the poles with thread so as to be frangible if struck by an aircraft. Describing the force required to break the thread, he stated that in his experience it would break on a windy day if held too tightly between the limbo poles.

The DAE did not see the aircraft impact the ground but did see it breaking up as it slid across the ground. He also took photographs of the aircraft and accident site. In a written statement to the AAIB he noted that the Turbulent had sensitive controls, adding that relaxed control inputs were required to avoid pilot-induced oscillations of the aircraft. He concluded that the aircraft may have encountered the wake of the preceding aircraft in the formation and that the pilot may have over-compensated for the resulting flight path deviation, causing the aircraft to descend and impact the ground.

Applicable regulations

Rules of the Air Regulations 2007

Rule 5(3)b – *'The 500 feet rule'* states that:

> *'Except with the written permission of the CAA, an aircraft shall not be flown closer than 500 feet to any person, vessel, vehicle or structure.'*

Rule 6 provides several exemptions from this rule, including:

> *'(a) Landing and taking off*
>
> *(i) Any aircraft shall be exempt from the low flying prohibitions in so far as it is flying in accordance with normal aviation practice for the purpose of—*
>
> *(aa) taking off from, landing at or practising approaches to landing at; or*
>
> *(bb) checking navigational aids or procedures at, a Government or licensed aerodrome.*
>
> *(ii) Any aircraft shall be exempt from the 500 feet rule when landing and taking-off in accordance with normal aviation practice or air-taxiing'*

And,

> *'(f) Flying displays etc*
>
> *An aircraft taking part in a flying display, air race or contest shall be exempt from the 500 feet rule if it is within a horizontal distance of 1,000 metres of the gathering of persons assembled to witness the event.'*

The DAE stated that an exemption from Rule 5(3)b was in force for display practices at Headcorn.

Rules 8 and 12 refer to *'avoiding aerial collisions'* and *'flight in the vicinity of an aerodrome'*. These rules provide for air display activities to take place at an aerodrome providing authorisation is given by an Air Traffic Control Unit (ATSU).

Civil Aviation Publication (CAP) 403 – 'Flying Displays and Special Events'

CAP 403, published by the CAA, is a guide to safety and administrative arrangements for flying displays and special events. It states in its introduction that it is intended as a code of practice to provide guidance to ensure that the safety of both the participants and the spectators is not compromised and that:

> *'minima and standards quoted should be treated as almost absolute unless sound logic demands otherwise. They should be treated as applying equally to practice for, as well as participation in, Air Displays and Special Events.'*

Pilot experience

The pilot gained his Private Pilot's Licence on Tiger Moth aircraft, was current on the Turbulent and held a Display Authorisation valid for this type issued by the CAA. This was his first display season.

Other information provided by the pilot

The pilot was content that the briefing had prepared him adequately for the intended routine. There was, for example, "lots of emphasis put on not staying close to the ground for any longer than necessary", "a discussion of the dive down, pull up under the poles" technique and an exploration of the options available to each pilot for exiting a given manoeuvre or terminating the whole

routine. He thought that adequate consideration had been given to his inexperience by the more experienced members of the team.

The pilot did not see the C172 during the accident because he was concentrating on following the aircraft ahead, but noted that turbulence from the 172 that was doing circuits might have been carried from the runway toward the practice area by the southerly component of the surface wind. He suggested that one way to improve the safety of the activity night be to practise at a location which provided more separation from non-participating aircraft. Indeed, the next team practice was at a different aerodrome, free from other traffic.

Discussion

The practice was similar to displays and practice sessions that had been carried out by the team at Headcorn for several years and the pilot appeared to have been briefed properly. The activity was conducted at an airfield where an appropriate exemption from Rule 5 was in force for such practices.

CAP 403 states that:

> *'minima and standards quoted should be treated as applying equally to practice for, as well as participation in, Air Displays and Special Events'.*

The distance between the display practice and the edge of the active runway was less than the minimum specified between a crowd and display line for this type of display. It could be argued that aircraft operating from the active runway that were not active participants in a practice should have been afforded the same protection as spectators at an air display. However, Rules 8 and 12 of the Air Regulations 2007 together provide for such activities to take place if they do so in accordance with an authorisation provided by an ATCU. It is therefore beholden upon the ATCU to determine whether such an authorisation is appropriate and, by extension, to ensure that other aircraft operating at the aerodrome are aware that such an activity is taking place.

The DAE commented that to curtail normal flying activities during display practice would adversely affect the operation of this busy aerodrome and would probably mean that no such practices would take place in the team's familiar 'home' surroundings. During several years of successful operations of this sort at Headcorn, there is no previous evidence that the activity itself has endangered the participants, nor is there any evidence that the sequence of this accident presented a danger to non-participants.

Conclusion

During a display practice conducted close to the ground but in accordance with applicable regulations, the aircraft probably encountered a disturbed air mass that resulted in an uncommanded change of flight path. The pilot was unable to recover the aircraft before it impacted the ground.

ACCIDENT

Aircraft Type and Registration:	Dyn'Aero MCR01 Club, F-PYMD
No & Type of Engines:	1 ROTAX 912 ULS piston engine
Year of Manufacture:	1999 (serial no. 102)
Date & Time (UTC):	30 September 2007 at 1352 hrs
Location:	Near Fridd Farm Airstrip, Bethersden, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Serious) Passengers - 1 (Fatal)
Nature of Damage:	Aircraft destroyed
Commander's Licence:	UK Private Pilot's Licence
Commander's Age:	74 years
Commander's Flying Experience:	537 hours Last 90 days - 7 hours Last 28 days - 5 hours
Information Source:	AAIB Field Investigation

Summary

The aircraft, soon after takeoff, suffered a partial loss of engine power. The pilot returned to the farm strip from which he had taken off, and attempted to land. However, the approach was made with a tailwind and the aircraft was too fast to land before the end of the runway. The pilot attempted a go-around but there was not sufficient engine power available; the aircraft descended and landed in a field just beyond the end of the runway. The aircraft struck a large oak tree, the passenger-side harness mounting was disrupted and the passenger was fatally injured.

The investigation found that the main fuel jet of the right carburettor had become obstructed by a corrosion fragment liberated from the carburettor bowl. The failure of the passenger's restraint was found to be due to the failure of the bond between the shoulder harness attachment fitting and the inner surface of the fuselage, to which it was secured.

One Safety Recommendation is made, at the end of this report.

History of the flight

The pilot, together with his wife, was planning to fly on a trip from Fridd Farm strip to Pontoise, France, where the aircraft was usually based. This particular route was a fairly regular flight for him.

On the morning of the accident the pilot drove from London to Fridd Farm. He stopped on the way at a

garage and filled a container with petrol; this was fuel for the aircraft. When he arrived at Fridd Farm he went to the hangar where the aircraft was kept, pushed it out, refuelled it and got it ready for the flight. The fuel container was made of clear plastic so that it could be inspected for contaminants. The fuel was strained as it was put into the tank, then the fuel drains were tested for water.

It was the pilot's normal practice to arrange with the Air/Ground (A/G) radio operator at nearby Headcorn (Lashenden) Aerodrome to activate a previously filed flight plan once he was airborne.

The owner of Fridd Farm strip was there when the aircraft left. He saw the aircraft start, taxi and noticed it spent a few minutes on run-up checks before takeoff. The aircraft took off from Runway 32 at 1348 hours and carried out a normal climbing turn to the right. A short time later the pilot contacted Lashenden Radio, there was a brief general conversation and then the radio operator asked if the pilot wanted the flight plan activated. The pilot replied, after a pause, that he did not because he had a rough-running engine and was instead going to return to Fridd Farm. The radio operator asked if he would like him to telephone anyone but the pilot replied that there was no need, he was fine. About a minute later the radio operator called the aircraft again and asked how he was getting on, the pilot replied "I am OK, on short finals, thanks."

The owner of the farm strip saw the aircraft returning and watched some of the approach to land. He noticed that the flaps were down and the propeller was turning. He thought that the aircraft was a little higher than usual on the approach. He saw it cross the threshold of Runway 32 at a height of a few feet and later commented that it appeared too fast to land and that there was a tailwind. He watched the aircraft fly at a low height down the runway and then, towards the end, saw it start to climb. The aircraft cleared the hedge at the end of the runway then, as he watched, it descended again and, shortly before it went out of sight, he saw the left wing drop. He realised the aircraft had crashed and went to ask his wife to call the emergency services. He then drove down to where the aircraft had come to rest, the air ambulance arrived on the scene a few minutes later. The pilot was taken to a local hospital, his wife had suffered fatal injuries in the impact.

The accident site

The aircraft had come to rest in a field immediately beyond the road which passed across the end of the runway at Fridd Farm. The aircraft had struck an oak tree in the field, which resulted in the right wing separating from the aircraft. The aircraft had then come to rest approximately 14 metres beyond the tree, having spun approximately 180° from its direction of approach. The first ground mark was found 14 metres before the aircraft struck the tree and consisted of a straight cut 3.7 metres long. This mark had been made by the base of the rudder and the aircraft had been on a heading of 288°. A second mark started some 7 metres from the tree, made by the aircraft's nosewheel, this mark continued to the tree. The right wing of the aircraft had struck the tree approximately 1.4 metres from the wing root; the impact caused the right wing spar to move aft, disrupting the mounting structure and cockpit floor on the right side. The spar had then failed, allowing the right wing to separate.

Damage to the propeller indicated that it had been turning at the impact with the tree. The mounting structure for the nose leg had distorted, allowing the leg to rupture the aircraft's fuel tank which resulted in a significant amount of fuel spilling into the cockpit. The cockpit was

substantially intact, with the exception of the cockpit floor and the rear bulkhead, which had separated from the fuselage; the instrument panel had separated from its mountings and been distorted on the passenger side. Both control columns had failed where they protruded above the seats and the seats remained secured to their mountings. Whilst the seat harnesses were found to be intact, the attachment point for the passenger's shoulder harness had pulled away from the inside surface of the fuselage.

Meteorological information

The general weather conditions in the area were fine with easterly winds and scattered or broken cloud at 3,000 ft. The anenometer at Headcorn Aerodrome, 4.5 nm to the west, recorded the surface wind at the time of the accident as from 100° at 8 kt.

Aerodrome information

Fridd Farm has a single bi-directional grass runway of 500 metres length, and orientated 14/32. The surface was in good condition at the time of the accident, the grass had been recently mown and was short and dry. Runway 32 has a downslope along its length. There is a windsock located to the south of the runway about half-way along. At the end of the runway there is a hedge and a public road, then there is a grass field beyond with a small thicket and the large oak tree in line with the extended centreline of the runway.

Aircraft information

The Dyn'Aero MCR01 type was first produced in 1998 and was designed to meet JAR-VLA requirements: there is also a 'microlight' version, complying to FAI ULM conditions. The aircraft F-PYMD, manufacturers serial number 102, was registered in 1999 and had been bought by the owner/pilot in 2000. It was registered in France and was normally based at Pontoise airfield. It was originally fitted with a ROTAX 912 S (80hp) engine and a variable pitch propeller. In February 2001 a new ROTAX 912 ULS (100hp) engine was fitted.

The Basic Empty Mass of the aircraft was 278 kg and the Maximum Takeoff Mass (MTOM) was 490 kg. The two persons on board weighed 140 kg and the baggage on board, which was weighed after the accident, amounted to a total of 30 kg. The estimated fuel load was around 50 kg and it is calculated that the mass at takeoff was close to the maximum.

At the aircraft's MTOM of 490 kg, landing from an approach at 57 kt would have required a distance of 270 metres under standard conditions. Using the information published in CAA General Aviation Safety Sense Leaflet 7B, *Aeroplane Performance*, with a tailwind component of 8 kt (+20%), a downslope (+10%) and a grass surface (+20%), this would have increased to 430 metres. Any extra approach speed would also have increased the distance required.

Pilot information

The pilot had qualified for his UK Private Pilot's Licence in 1991 and had recorded a total of 537 hours flight time. Since the year 2000 he had almost exclusively flown this aircraft. He was in regular flying practice and it was his habit to practise emergencies. In May 2007, he had completed a biennial flight review for a US Federal Aviation Administration PPL revalidation.

Pathological information

A post-mortem examination of the passenger was carried out. Death was as a result of multiple injuries which included a severe head injury. The report noted that the crash was of relatively low energy and that the accident was potentially survivable. The pilot suffered less serious injuries. The report also remarked that

if the passenger's harness had remained intact her injuries may not have been significantly worse than those sustained by the pilot.

Recorded information

The pilot was equipped with a hand-held GPS receiver which was powered throughout the flight, recording time, position and GPS altitude. This device suffered minor damage during the accident but was successfully downloaded at the AAIB. F-PYMD was also captured on the Fridd Farm CCTV system which was also downloaded.

The CCTV identified F-PYMD, starting to taxi from outside the Fridd Farm storage hangar at around 13:41:45. After travelling a short distance, the footage then showed the aircraft stopping for around three minutes. During this period, the GPS was powered and began recording.

The aircraft was then seen taxiing towards the threshold of Runway 32. After waiting about two further minutes on the runway, the takeoff commenced at around 13:48:21. The aircraft lifted off and performed a right-hand circuit, achieving a maximum GPS altitude of 981 ft, before returning to the runway from which it had departed (Figure 1).

Just before the Runway 32 threshold, the groundspeed derived from GPS position and time was 76 kt with a heading of 315° True. F-PYMD crossed the runway threshold at around 13:51:00, just over two and a half minutes after takeoff commenced. Four further positions were recorded by the GPS as the aircraft continued tracking along the runway. The last five track points represented a ground track distance of 0.4 nm.

The last two GPS positions were located in fields just beyond the end of the runway. The final position was

Figure 1

Fridd Farm airstrip with final 5 recorded GPS trackpoints
(Google Earth ™ mapping service/Infoterra Ltd & Bluesky /Tele Atlas)

recorded at 13:51:20, located around 56 metres from the location of the accident site:

Figure 1 also shows the aircraft groundspeeds as derived from the GPS positions over time. Due to the limited number of points over the runway and the inaccuracy of the final track point, speed measurements for the end of the flight cannot be considered accurate.

The CCTV system also caught, briefly, the image of F-PYMD as it crossed the road at the threshold of Runway 32 and the image data was assessed by the National Imagery Exploitation Centre. The accuracy of the photogrammetry was affected by the poor image resolution and unverified CCTV 'frame rate' (nominally four frames/sec). However, the assessment that the wheels were about 0.5 metres above the ground and the speed was about 70 kt, accorded well with the witness report and the GPS data.

Engineering investigation

Measurement of the flap drive screwjacks confirmed that the flaps had been at, or close to, fully retracted when the aircraft collided with the tree. Ground marks confirmed that the aircraft had touched down 14 metres ahead of the tree and the aircraft's wing had been seen to 'drop' in flight; it is therefore likely that the speed of the impact was around the aircraft's stall speed of about 50 kt.

Based on the pilot's report of rough running, the engine was removed from the aircraft and tested under AAIB supervision, installed in a test stand and fitted with a fixed-pitch propeller. The engine was found to operate normally up to 3,500 rpm, beyond which it ran roughly and would not accelerate further.

Carburettors

Examination of the left carburettor showed that its barrel had been misaligned. The position of the barrel is determined by a diaphragm fixed to the top of the barrel; this has a locating tab on its outer edge which sits in a slot in the carburettor case to prevent rotation of the barrel after assembly. When disassembled, the diaphragm locating tab was found to have been incorrectly aligned, producing the misalignment of the barrel. However, after correctly reassembling the carburettor the engine again failed to accelerate beyond 3,500 rpm.

The right carburettor was removed and a well-defined area of exfoliating corrosion was found in the bottom of the carburettor bowl, a small piece of this material was also found in the main fuel jet, see Figures 2 and 3. There was no evidence of corrosion on the left carburettor bowl. The position and clearly defined nature of this material suggested the presence of water in the carburettor bowl. It was noted that the inclusion of a drip tray under the carburettor prevented removal of the carburettor bowl without first removing the carburettor from the intake manifold and there was no requirement to carry out an inspection of the bowls during routine maintenance. Burring found on screw heads around the carburettor did indicate that it had been disassembled at some point prior to the accident.

The right carburettor bowl was examined under a scanning electron microscope, which confirmed that the material in the bowl was a corrosion product of the zinc alloy bowl. Swabs taken for analysis confirmed the presence of chloride, bromide and acetate ions on the inner surface of the bowl. The concentration of these ions within the corroded area was found to be significantly higher than the surrounding material and sufficiently high to have initiated corrosion in the zinc

Figure 2
Corrosion in right carburettor bowl

Figure 3
Blocked fuel jet

alloy bowl in the presence of moisture. Whilst the origin of the chloride and bromide ions could not be positively determined, their level of concentration meant that they were probably introduced as a result of chemical contamination, possibly by a cleaning solution, rather than by natural residues.

In January 2001 the pilot had purchased a new engine, complete with carburettors, from the manufacturer's agent and this was installed in February 2001. The aircraft's log book confirmed that since its purchase the engine had been removed from the aircraft on three occasions. The first was in April 2004 to balance the carburettors

and the second was in April 2005 to incorporate a starter clutch modification during which the carburettors had been cleaned. The final workshop visit was in July 2005 to carry out adjustments to the carburettors to cure engine misfiring in flight. The pilot confirmed that on these occasions the work had been completed by the same ROTAX agent, all other scheduled work being carried out by a subsidiary of the airframe manufacturer.

Information provided by the repair agency (ROTAX agent) confirmed that they had carried out work on the engine on the occasions detailed in the aircraft log. It was also stated that the engine components had been cleaned in an ultrasonic tank using water and detergent, and dried prior to reassembly.

Passenger restraint

The aircraft had been fitted with two three-point harnesses. The harnesses had remained intact, although the stitching at the point where the upper attachment strap was joined to the main harness had begun to stretch and 'open out'. Each harness was secured to three bonded carbon-fibre fittings, two on the cockpit floor beside the seat and a fitting secured to the inner surface of the upper fuselage, behind the rear cockpit bulkhead, see Figure 4. All the lower harness attachment points remained attached to the fuselage structure and, whilst the pilot's shoulder harness fitting remained attached to the fuselage, it had become disbonded from the fuselage at its forward edge. As noted earlier, on the right side of the fuselage the passenger's shoulder harness fitting had separated entirely.

A section of the fuselage, together with the rear cockpit bulkhead was removed to examine the bonds under laboratory conditions.

Fuselage inner surface

The inner face of the fuselage showed four areas of differing surface finish, see Figure 5. Area A was an area where no bonding had taken place and had been painted for aesthetic reasons, Areas B and D were shiny in appearance and had a smooth surface finish. Area C had a rough finish, normally associated with the

Figure 4

Shoulder harness installation

removal of a 'peel ply' from the composite structure[1]. The manufacturer's documentation confirmed that the harness fittings were to have been bonded in Area C and, in the event that the bond extended beyond the 'peel ply' area, the surface finish in those areas was to have been abraded to improve the bond strength. The remains of the bond for the passenger harness fitting extended 45 mm forward and 18 mm aft of the peel ply area, whereas the pilot's fitting had, with the exception of the rearmost 25 mm, been bonded to area C. The positioning of area C across the fuselage was not uniform: the area was narrower and its forward edge was displaced aft on the right (passenger) side of the fuselage. Adhesive paste had extruded from both harness fitting joints which indicated that there was adequate adhesive present during the bonding process. However, the depth of adhesive varied across the cross section of the fitting, possibly in an attempt to maintain the vertical alignment of the fitting when bonded to the curved cross section of the fuselage.

A detailed examination of the area where the passenger attachment had been bonded revealed that in area B the surface of the carbon fibre remained highly reflective and the bond failure appeared to be 'adhesive' (the bond having failed at the interface between the adhesive and the composite surface). This was clear evidence of a relatively poor bond. There was evidence of light abrasion to the surface in areas B and D but this had not improved adhesion in those areas. In area C, the prepared area, the bond line had a dull appearance and was characteristic of 'cohesive' failure of the bond, with the surface of the composite structure being pulled away together with some of the underlying fibres.

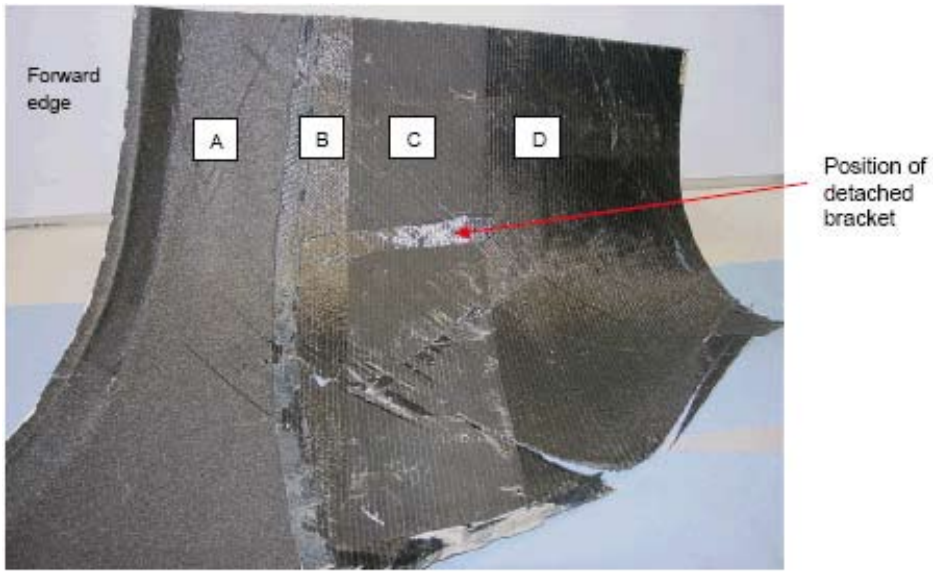


Figure 5

Interior fuselage surface finish

Footnote

[1] A peel ply is applied to the surface of a composite material during its manufacture. When removed after curing it leaves a rough surface finish suitable for bonding.

Seat harness attachment and modifications

Figure 6 shows the normal position of the shoulder harness. The location of the shoulder harness fittings allows the shoulder harness to remain roughly horizontal when worn; however, given the contour of the fuselage, any application of load on the harness will produce a perpendicular 'peel' load on the bond between the harness fitting and the fuselage. These 'peel' loads would be increased as the size of the occupant of the seat decreased. The bulkhead, constructed of a thin lamination of carbon fibre through which the harness attachment passes, was found to offer little additional resistance to the application of peel loads. The curvature of the fuselage cross section in this area means that it is also possible to introduce torque loads into the fitting if it is not accurately aligned.

The Dyn'Aero MCR01 was designed to meet the requirements of Joint Aviation Requirements (JAR-VLA). This required the design of the seat harnesses and attachments to be capable of withstanding a '9g' forward deceleration (JAR-VLA.561). Shortly after the introduction of the aircraft type to the UK, the Light Aircraft Association, LAA (formerly the Popular Flying Association) issued a mandatory modification, MOD/301/001 to reinforce the harness attachment fittings with additional carbon fibre 'straps' at the rear of each fitting to improve the resistance of the fitting to peel loads. In 1999 the manufacturer issued Service Bulletin BS 201 0005, which required the installation of two 5 mm bolts to provide additional retention of the fittings. This Service Bulletin is mandatory for aircraft serial number 130 and above, together with earlier serial numbered aircraft already on the UK register and was released to satisfy the requirements of LAA MOD/301/001, The accident aircraft, being on the French register, however, was not required to comply with LAA MOD/301/001 or Dyn'Aero Service Bulletin BS 201 0005.

Figure 6

Normal shoulder harness position

Climb performance

Performance data published by the engine manufacturer showed that at 3,800 rpm the engine would produce approximately 52 HP, in contrast to the maximum rated power of 100 HP at 5,800 rpm. This performance is reliant on both carburettors providing a 'balanced' and sufficient fuel flow, which appears not to have been the case during the attempted go-around. It is therefore probable that the engine would have been unable to produce 52 HP at 3,800 rpm. The aircraft's weight at the time of the accident, and the restricted engine performance, would have severely affected the aircraft's climb performance.

Analysis

The landing

The aircraft suffered a partial loss of power in flight soon after takeoff. The pilot attempted to return to land on the runway from which he had taken off but this was not the most suitable runway because of a tailwind and a downslope. The approach was unsuccessful and when a go-around was attempted there was not enough power available for the aircraft to climb. The aircraft made a forced landing in a field just off the end of the runway. The aircraft struck the tree at a moderate speed such that it is considered that the accident should have been survivable.

On departure from Fridd Farm the pilot chose to use Runway 32, accepting the tailwind and benefiting from the downslope. When the emergency arose he decided he would return to land. He continued with a right-hand circuit and chose to use Runway 32 again. However, he now had both a tailwind and the downslope for the approach and landing. Given the prevailing wind conditions, there would have been a significant tailwind on base leg, as well as on the final approach. Although it is possible that he was keeping extra height in case the engine stopped altogether, the result was that he ended up too high and in a position from which he could not land. When he tried to go around there was not enough power for the aircraft to climb so he landed in the field beyond the end of the runway. The aircraft touched down but, after only a short ground roll the right wing and fuselage hit a very substantial tree. This caused considerable disruption to the right side of the aircraft.

The pilot had practised forced landings on a number of occasions but on this occasion he misjudged the approach and landing and was forced to go around. Despite having practised, in the situation of a real emergency there is considerable added pressure. This can reduce the time available to think and, given that on this occasion the aircraft was only at 1,000 ft, time would already have been short, indeed, the whole flight lasted less than four minutes. The conditions for landing all favoured Runway 14, but the pilot instead used Runway 32. The reason for this is likely to be that, because he had taken off from Runway 32, without time for thinking he chose to use the same runway. If he had been able to consider the circumstances for longer it is probable that he would have chosen to use Runway 14, into wind and upslope.

Safety action

It is possible that were a pilot to give consideration to the most suitable runway for a return, before taking off, the problem of the reduced time available for deciding upon the best course of action in the event of an emergency could be mitigated. It is hoped that publicising the circumstances of this accident may help to remind pilots that a runway suitable for a departure may not always be the best runway for a return to land.

Loss of power

The loss of power was established to have been caused by the blockage of the right carburettor main fuel jet by corrosion products from the carburettor bowl. Analysis showed that the initiation of corrosion in the bowl was due to the presence of concentrations of chloride and bromide ions, normally associated with the residue of cleaning products. Whilst the origin of the chloride and bromide ions could not be positively determined, their level of concentration meant that they were probably introduced as a result of chemical contamination. The only work carried out on the engine which involved removal of the carburettor bowls was completed at the ROTAX agent's facility; it is possible that the contamination of the carburettor bowl occurred during one of the engine's visits. The installation of drip trays beneath each carburettor prevented the carburettor bowls being easily removed to check for the build-up of water or sediment/corrosion.

ROTAX confirm that the Maintenance Manual (Line maintenance) for the 912 series of engines strongly recommends removal of both carburettors for inspection every 200 hours. The following recommendation is therefore made with regard to the engine maintenance:

Safety Recommendation 2008-029

It is recommended that ROTAX introduce a requirement into the engine maintenance schedule for engine type 912 series, to remove and inspect the carburettor bowls periodically for the presence of moisture and other contaminants.

Restraints

Assuming that the aircraft was travelling at around the stall speed of about 50 kt when it hit the tree, calculations show that, in order to exceed the '9g' forward deceleration load, it would have had to come to a complete halt within about 5 metres. Given that the aircraft came to rest 14 metres beyond the tree, it is unlikely that the aircraft and its occupants were subjected to any sustained decelerations greater than 9g. The attachment fitting for the passenger's shoulder harness failed during the impact sequence, which allowed the passenger to be thrown forward striking the control column and the right side of the instrument panel. The area within the fuselage to which the fitting should have been bonded was narrower than the fitting which was to be bonded to it, and it appeared to have been misaligned, with the forward edge displaced aft on the right side of the fuselage. This resulted in the first 45 mm of the passenger's fitting being bonded to an area of structure not fully prepared for bonding. The poor bond in this area would have failed at lower loads than the bond in the 'peel ply' area and resulted in the remaining bond becoming overloaded and failing. It should also be noted that, despite the pilot's shoulder harness attachment point being correctly bonded to the fuselage, it had also begun to fail.

The installation of two fasteners in accordance with Dyn'Aero bulletin BS 201 0005 was intended to improve the harness attachment fittings' ability to withstand peel loads and meet the UK LAA requirements. However, it cannot be determined whether this modification would have prevented the separation of the shoulder harness fitting in this instance.

Safety action

The accident to F-PYMD clearly demonstrates the potentially life-saving properties of a correctly fitted harness with effective upper body restraint. From late 2006 the manufacturer has introduced an improved method of diffusing the restraint loads into the upper fuselage and this attachment is used where a ballistic recovery system is fitted to the aircraft.

ACCIDENT

Aircraft Type and Registration:	Maule M5-235C Lunar Rocket, G-RAIN
No & Type of Engines:	1 Lycoming O-540-J1A5D piston engine
Year of Manufacture:	1979
Date & Time (UTC):	22 August 2008 at 1725 hrs
Location:	Perrow Farm, Crickham, Somerset
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - 1 (Serious)
Nature of Damage:	Extensive
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	57 years
Commander's Flying Experience:	14,502 hours (of which 60 were on type) Last 90 days - 50 hours Last 28 days - 15 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Whilst approaching to land at Perrow Farm, the aircraft struck the bank of the airstrip boundary ditch and pitched nose-down. It came to rest inverted, approximately 50 m further on. There was no fire. The pilot, who was uninjured, vacated the aircraft through the cabin door but the passenger, who suffered serious injuries, had to be assisted from the aircraft.

The pilot advised that he was deliberately low and slow on approach which, together with a gust of tailwind, resulted in an uncontrollable sink into the obstacle.

ACCIDENT

Aircraft Type and Registration:	Morane Saulnier Rallye 180T Galerien, G-BTOW
No & Type of Engines:	1 Lycoming O-360-A3A piston engine
Year of Manufacture:	1982
Date & Time (UTC):	28 June 2008 at 1210 hrs
Location:	Gransden Lodge Airfield, Cambridgeshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Propeller, nosewheel, exhaust damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	54 years
Commander's Flying Experience:	326 hours (of which 70 were on type) Last 90 days - 4 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

Towards the end of G-BTOW's landing run, its nose gear collapsed, the propeller hit the ground and the nose leg folded back under the fuselage. The fitting at the top end of the nose landing gear oleo had failed leaving the nose gear free to rotate backwards. The failure was caused by the growth of fatigue cracks weakening the fitting's attachment lugs which failed on this flight due to overload.

History of the flight

G-BTOW landed after its ninth glider tow of the day, with the accident flight and first part of the landing ground run reported as "normal" by the pilot. Towards the end of the landing run and at a low taxiing speed, the nose gear collapsed. The propeller hit the ground and stopped and the nose gear leg folded back under the fuselage. The aircraft came to a stop resting on the lower part of the engine cowling. The pilot was wearing a full harness and was unhurt. He shut the engine down and vacated the aircraft using the normal exit.

Determination of the cause

The fitting at the top end of the nose landing gear oleo had failed and was found on the grass about 10 ft away from the aircraft. The failure left the nose gear free to rotate backwards. Examination of the fitting showed that both the attachment lugs had failed in almost

identical positions across their 7 mm thick sections. Each fracture appeared to have a pre-existing crack extending from the bore. Both fractures were caused by the growth of fatigue cracks from multiple origins within the bore of the attachment lugs. The fatigue growth extended into the lug to depths of 3 mm and 1.5 mm respectively before final failure occurred due to overload.

The operator reported that the aircraft had flown approximately 150 hours per year since 1992 with a landing rate of about five per hour. This suggested that the aircraft had made over 11,000 landings at the time of the accident. The mode of operation of the aircraft and the benign conditions reported at the time of failure, were consistent with fatigue being the underlying cause of the accident.

ACCIDENT

Aircraft Type and Registration:	Nord 1002 Pingouin II, G-ATBG
No & Type of Engines:	1 Renault 6Q10B piston engine
Year of Manufacture:	1945
Date & Time (UTC):	15 August 2008 at 0950 hrs
Location:	Near Headcorn Aerodrome, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers: None
Injuries:	Crew - None Passengers: N/A
Nature of Damage:	Minor damage to propeller, nose and lower cowling, right aileron, flaps, pitot tube and venturi
Commander's Licence:	Private Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	1,592 hours (of which 68 were on type) Last 90 days - 41 hours Last 28 days - 18 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

The pilot was forced to land the aircraft in a field after the engine failed to respond when he attempted a go-around manoeuvre. This was as a result of another aircraft turning on to final approach ahead of him, leaving insufficient separation for him to continue. The pilot was uninjured and the aircraft sustained minor damage. The weather conditions were conducive to serious carburettor icing at descent power settings.

History of the flight

The aircraft was approaching to land at Lashenden/Headcorn Airfield after an uneventful flight from Audley End. The pilot joined the left-hand circuit pattern for Runway 29 and called 'finals' as he turned the aircraft onto final approach. Another aircraft was approaching to land and had advised that he was conducting a non-standard right base leg join. The airfield air/ground radio operator informed this aircraft of the runway in use, the altimeter pressure setting and reminded the aircraft to give way to circuit traffic.

When this other aircraft turned on to final approach in front of the aircraft, the pilot of G-ATBG elected to commence a go-around as there was now insufficient separation. When the throttle was advanced, the engine failed to respond and a subsequent reselection by the

pilot had no effect. After a check of cockpit settings, which appeared normal, a MAYDAY was declared.

As the runway was occupied by the other aircraft, the pilot elected to land in a stubble field with the landing gear retracted, approximately ½ mile west of the airfield. The pilot was uninjured and able to vacate the aircraft normally. The aircraft sustained minor damage.

Weather conditions at the time were CAVOK but the temperature and dew point indicated that serious carburettor icing was likely at descent power settings, reference CAA Safety Sense Leaflet 14.

There were no obvious signs of mechanical failure of the engine, but should any be identified in any subsequent overhaul activity, they will be reported in a future AAIB Bulletin.

Comment

The Autumn 2008 issue of the CHIRP General Aviation Safety Newsletter - Issue 37, identifies circuit indiscipline as a growing safety concern. CAA Safety Sense Leaflets 1 and 6d give guidance on good airmanship and standard joining procedures.

ACCIDENT

Aircraft Type and Registration:	Piper PA-25-235 Pawnee, G-BFSC
No & Type of Engines:	1 Lycoming O-540-B2C5 piston engine
Year of Manufacture:	1976
Date & Time (UTC):	10 August 2008 at 1243 hrs
Location:	Ridgewell Airfield, Ashen, Sudbury, Suffolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to engine cowling, propeller and left wing tip
Commander's Licence:	Private Pilot's Licence
Commander's Age:	64 years
Commander's Flying Experience:	570 hours (of which 125 were on type) Last 90 days - 26 hours Last 28 days - 10 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft pitched onto its nose and the left wing struck the ground when the aircraft turned crosswind in a strong wind whilst taxiing.

History of the flight

Having completed a glider tow the pilot returned to the departure airfield and landed on grass Runway 23. He brought the aircraft to a halt into wind on the runway whilst he retracted the flaps and then commenced a left turn, by use of the rudder and differential braking, to backtrack up the runway. The aircraft had turned through about 70 degrees when the left wing dropped and the aircraft slowly pitched forward. The aircraft continued to pitch forward and to the left until the propeller and wing tip struck the ground. The pilot was uninjured and vacated the aircraft unaided after making the switches safe.

The wind at the time of the accident was 230º/22 kt. The pilot assessed the cause of the accident was the wind lifting the tail and right wing as he turned crosswind.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-140 Cherokee, G-BAGX
No & Type of Engines:	1 Lycoming O-320-E2A piston engine
Year of Manufacture:	1967
Date & Time (UTC):	31 July 2008 at 1640 hrs
Location:	New York Airstrip, Coningsby, Lincolnshire
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:	48 years
Commander's Flying Experience:	355 hours (of which 85 were on type) Last 90 days - 195 hours Last 28 days - 19 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Prior to the approach to New York, an airstrip near RAF Coningsby, the pilot had identified the windsock and noted that it indicated a calm wind. During the landing on the grass Runway 09, the pilot became aware of excessive ground speed. This excess speed did not seem to abate, despite full braking, and the aircraft then struck a hedge at the end of the runway. The pilot then noted that the windsock indicated a strong wind from the west. Shortly after the accident a rainstorm passed through the area and some 45 minutes later the wind was calm again.

History of the flight

The pilot's intention was to fly the aircraft from Little Staughton airfield to its home airfield at New York, near Coningsby. Prior to the flight the pilot had consulted the Waddington TAF and checked the reported winds as being 10-15 kt and from east-south-east. The pilot also contacted RAF Coningsby to advise them of the flight and to obtain their current weather; this was reported as being overcast in drizzle with a wind of 11 kt from 125º.

The pilot departed without incident but on passing Peterborough he experienced deteriorating weather and entered IMC. About 7 miles from New York, the visibility improved and the rest of the flight was conducted in VFR.

On arrival at New York the pilot conducted a flypast to

observe the windsock which was hanging limply by the pole indicating little or no wind. Due to the reported winds from Waddington and RAF Coningsby the pilot elected to use the grass Runway 09.

As the pilot started his flare and closed the throttle, he became aware of excessive ground speed. As the aircraft touched down it still carried excess speed, which did not seem to abate despite the application of full braking. There was insufficient runway left to take off again so the pilot elected to remain on the ground and attempt to stop. As the end of Runway 09 approached the pilot tried to steer the aircraft along the adjacent Runway 17. However, the momentum of the aircraft carried it toward a hedgerow at the end of the runway. The left wing struck the hedge causing the aircraft to swing round before coming to rest.

The pilot was uninjured and, after making the aircraft safe, he exited normally. At this point he checked the windsock and noticed that it now stretched outward, showing a strong wind from the west. Shortly afterwards a rain storm passed through the area; 45 minutes later, when the storm had finished, the wind became calm again.

The pilot assessed the reasons for the runway excursion as being due to the strong tailwind, associated with the approaching storm, and the wet grass on the runway.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28RT-201 Cherokee Arrow IV, G-BPZM
No & Type of Engines:	1 Lycoming IO-360-C1C6 piston engine
Year of Manufacture:	1979
Date & Time (UTC):	14 August 2008 at 1040 hrs
Location:	Exeter Airport, Devon
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Propeller destroyed and engine shock-loaded, skin damage to right wing lower surface, damage to engine cowling underside
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	65 years
Commander's Flying Experience:	14,600 hours (of which 300 were on type) Last 90 days - 80 hours Last 28 days - 60 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The flight was part of an Instrument Rating (IR) course and was the student's first in a PA-28R Cherokee Arrow, having completed a multi-engine conversion course in a BE-76 Duchess. The PA-28 was being used for specific instrument training, with no intention of converting the student to the aircraft type. Only two flap selections were made during the ILS approach, both by the instructor. The student landed the aircraft satisfactorily but during the landing roll the instructor heard a loud bang and the aircraft swerved towards the right side of the runway. Whilst completing the shutdown checks the instructor noticed that the landing gear selector lever was in the 'UP' position. Although the landing gear selector is in a similar location in the Cherokee Arrow and the Duchess cockpits, the flap selector position is different. In his haste to retract the flaps, the student had inadvertently retracted the landing gear. Both occupants were uninjured and exited the aircraft without difficulty. Inadvertent selection of the landing gear on the ground should be prevented by means of an electrical circuit signalled by a microswitch on the left main landing gear. However, as the landing gear was selected shortly after touchdown, it is likely the oleo may not have been sufficiently compressed to operate the microswitch, thereby allowing the gear to retract.

ACCIDENT

Aircraft Type and Registration:	Piper PA-32R-300, Cherokee Lance, N38945
No & Type of Engines:	1 Lycoming IO-540-K1G5D piston engine
Year of Manufacture:	1977
Date & Time (UTC):	30 June 2008 at 1515 hrs
Location:	North Weald Airfield, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to propeller, flaps, pitot tube and wing/fuselage underside
Commander's Licence:	Private Pilot's Licence
Commander's Age:	50 years
Commander's Flying Experience:	392 hours (of which 155 were on type) Last 90 days - 18 hours Last 28 days - 14 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

After two successful touch-and-go landings the aircraft made an inadvertent gear-up landing. The pilot believed that he had selected the gear lever down but then became distracted and may not have checked for 'three greens'.

History of the flight

The pilot had completed two touch-and-go landings and was climbing into the circuit for a third landing. On the downwind leg there was another aircraft ahead; the pilot of this aircraft asked the air/ground operator for the position of the other aircraft in the circuit. The operator reported that the traffic was behind him and the pilot of N38945 followed this report with a "downwind" call and then carried out his downwind checks. The pilot stated that he normally lowers the landing gear abeam the numbers on the downwind leg and then turns base and selects two stages of flap. On final he normally selects the third stage of flaps and checks "reds, blues and three greens". When he was established on final the air/ground operator reported the wind and the position of the aircraft ahead. The pilot did not hear the position report and asked for it to be repeated. He then reported final and started to slow the aircraft. During the flare he realised that something was wrong when he heard a scraping noise from underneath the aircraft. He looked down at the gear lever and saw that the lever was selected

DOWN but the three green lights were out. The aircraft slid on its underside and then veered to the right and came to rest in the grass area to the side of the runway.

An engineering company at the airfield examined the aircraft after the accident and reported that they did not find a fault with the landing gear system.

Pilot's assessment of the cause

The pilot believed that he had selected the gear lever down but then became distracted and may not have checked for 'three greens'.

ACCIDENT

Aircraft Type and Registration:	Pitts S1 Special, G-BXAU
No & Type of Engines:	1 Lycoming O-320-D2B piston engine
Year of Manufacture:	1978
Date & Time (UTC):	16 July 2008 at 1815 hrs
Location:	Kemble Airfield, Gloucestershire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to landing gear, propeller, underside of fuselage and lower wing
Commander's Licence:	Private Pilot's Licence
Commander's Age:	55 years
Commander's Flying Experience:	462 hours (of which 40 were on type) Last 90 days - 18 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft was returning to Kemble following a short aerobatic flight. Following the landing on Runway 26, the lower left wing struck the runway and the aircraft ground-looped, coming to rest facing the direction of approach. The sole occupant was uninjured and exited the aircraft without difficulty. The wind had been calm at takeoff and the pilot reported that, during the time the aircraft was airborne, the wind speed had increased to around 10 kt, from a direction around 40º off the runway heading, thereby increasing the crosswind component.

ACCIDENT

Aircraft Type and Registration:	Pitts S1 Special, G-MAXG
No & Type of Engines:	1 Lycoming IO-360-B1B piston engine
Year of Manufacture:	2001
Date & Time (UTC):	10 May 2008 at 0817 hrs
Location:	York (Elvington) Airfield, Yorkshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to propeller, left aileron spade and wheel fairings
Commander's Licence:	Private Pilot's Licence
Commander's Age:	44 years
Commander's Flying Experience:	250 hours (of which 46 were on type) Last 90 days - 12 hours Last 28 days - 9 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft touched down heavily in a three-point attitude causing the main gear legs to splay outwards and the propeller and left aileron spade to strike the runway.

History of the flight

The pilot was returning to land on Runway 08 after taking part in an aerobatic competition at the airfield. He decided to land part way down the 3,018 m runway to avoid a long taxi back to the parking area. He used a sideslip to maintain visibility with the runway. During the flare he removed the sideslip, but became aware too late of his higher than normal rate of descent and the aircraft hit the runway in a three-point attitude. The main landing gear legs absorbed the shock of impact and splayed outwards, allowing the propeller and left aileron spade to strike the runway. The pilot was able to taxi the aircraft back to the parking area and shut down.

Pilot's assessment of the cause

The pilot reported that there were two factors that contributed to his heavy landing. First, he had closed the throttle to IDLE during the approach which is something he would rarely do in the Pitts S1. He stated that the Pitts S1 can lose airspeed rapidly when the throttle is set to IDLE and he probably inadvertently allowed this to happen while focusing on the runway during the final stages of the approach. The second factor was the long length and the width (60 m) of the

runway, which created a different perspective from the shorter runways on which he normally landed. He believes that if he had "aimed at the numbers" at the beginning of the runway, rather than landing part way down the runway, he would have had improved visual cues for determining his rate and angle of descent.

ACCIDENT

Aircraft Type and Registration:	Replica Sopwith Triplane, G-BWRA
No & Type of Engines:	1 Warner Aircraft Corp, Scarab 165 piston engine
Year of Manufacture:	1988
Date & Time (UTC):	12 July 2008 at 1130 hrs
Location:	Near Rendcomb, Gloucestershire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to propeller, engine cowling and upper wing
Commander's Licence:	Private Pilot's Licence
Commander's Age:	48 years
Commander's Flying Experience:	1,045 hours (of which 1 was on type) Last 90 days - 29 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot carried out a forced landing when he noticed the engine cowling starting to separate from its mountings. The aircraft touched down in standing crops, pitched forward, and came to rest inverted. The engine cowling forward mountings had failed allowing the cowling to move forward into the path of the propeller.

History of the flight

The pilot was flying from White Waltham Airfield in Berkshire to Rendcomb airfield, which is approximately 5 nm north of Cirencester, Gloucestershire. The weather for the flight was good, with a westerly wind of about 10 kt, visibility in excess of 25 km with scattered cloud above 4,000 ft. The surface temperature was 26°C and there were light, scattered rain showers in the area.

On approaching Rendcomb, the pilot could see a rain shower passing over the airfield and he decided to hold clear of the airfield until the weather improved. The area to the east of the A429 road was clear of the rain and he turned in that direction. As the aircraft crossed the A429, the pilot noticed that the rear left side of the engine cowling was proud of its normal position. Initially he thought that the wire which retained the rear edge of the cowling had failed which, in itself, was not a serious condition. However, approximately 15 seconds later banging noises and a shuddering from the nose of the aircraft indicated that the problem was serious. Concerned that the cowling may be broken up by the propeller, or that major internal damage was being caused to the engine, the pilot decided to make an immediate forced landing.

The aircraft was at a height of about 1,200 ft and the only suitable fields for landing were covered in standing crops. The pilot selected a field with a gentle upward slope which was into the wind. He hoped this would reduce the landing roll and help prevent the aircraft from nosing over. The final approach was made with power applied and the airspeed reduced to a safe minimum. The touchdown was gentle and at a low ground speed, the aircraft settling into the crops which were about two feet high. The main landing gear axle and wheels were retarded by the crops and this, combined with the soft ground, caused the aircraft to pitch forward and it came to rest inverted.

The pilot, who was uninjured, turned off the fuel and electrical system before vacating the aircraft unassisted.

Examination of the cowling mountings

The engine cowling on this aircraft is attached to the engine at four locations around its circumference. At each of these positions, an anti-vibration mounting is used as an insert between brackets on the cowling and engine. Each anti-vibration mounting comprises a pair of bolts with their shanks orientated on the same axis and their heads immersed in a block of rubber. The cowling is secured by means of nuts attached to the bolt tails, which were inserted through holes in the brackets on the engine and cowling.

It was found that all the mountings had failed in an identical manner in that the rubber had failed in between the bolt heads, thereby causing them to be separated. In this condition the cowling would no longer have been attached to the engine, which would have allowed cowling movement in rotational and longitudinal directions, such that contact with the propeller would have occurred.

The rubber in each of the mountings was tested for hardness and it was found that the two lower ones were slightly harder than the upper two. The rubber specification was not known, since the components had been obtained from an automotive supplier. However, in order to provide a rough datum, a rubber fuel system seal, of aviation quality, was similarly tested and found to be considerably softer. This, together with numerous cracks that were noted in the rubber from the failed components, gave rise to the suggestion that they were old stock.

Of more general concern, however, was whether this particular design of component was suitable for this application.

Conclusion

The engine cowling had moved forward into the path of the propeller following the failure of the four front rubber mountings. Forward movement of the cowling had released it from the rear retaining wire. The high centre of gravity of the triplane combined with the retarding effect of the landing gear axle and wheels passing through the crops meant the pilot was unable to prevent the aircraft from pitching forward onto its back.

ACCIDENT

Aircraft Type and Registration:	Robin DR400/160 Chevalier, G-BKVL
No & Type of Engines:	1 Lycoming O-320-D2A piston engine
Year of Manufacture:	1983
Date & Time (UTC):	22 July 2008 at 1347 hrs
Location:	Ledbury Airfield, Gloucestershire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to engine cowling, propeller and right wing leading edge
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	39 years
Commander's Flying Experience:	992 hours (of which 16 were on type) Last 90 days - 91 hours Last 28 days - 27 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During taxi along a grass runway a sudden wind gust, or a bump in the runway surface, caused the aircraft to veer to the left. An over-correction to the right and incorrect application of the brakes caused the aircraft to veer to the right, resulting in the right wing leading edge striking a barbed wire fence.

History of the flight

The pilot was taxiing the aircraft along the grass runway towards the departure end of Runway 07. He was taxiing the aircraft to the right of the runway centreline to allow sufficient room for a left turn at the end of the runway to line up for takeoff. During the taxi a sudden wind gust, or a bump in the runway surface, caused the aircraft to veer to the left. The pilot reacted instinctively by applying right rudder pedal and applying pressure to the 'toe brakes'. However, this aircraft was equipped with a hand brake instead of toe brakes so no braking action occurred. The right pedal correction proved to be excessive and the aircraft veered 30° to the right. Before the pilot could correct the right yaw and apply the hand brake, the right wing leading edge hit a barbed wire fence at the runway's edge. The wire cut through the wing leading edge, preventing the aircraft from being turned to the left. The propeller then struck the barbed wire and the engine stopped. The pilot carried out his shutdown checks and vacated the aircraft.

Pilot's assessment of the cause

The pilot reported that the primary cause of the accident was his unfamiliarity with the braking system on the DR400, having had a long experience flying Piper Cherokee-series aircraft equipped with toe brakes. He considered that his over-correction on the rudder pedals and his decision to taxi to the right of the runway centreline contributed to the accident.

ACCIDENT

Aircraft Type and Registration:	Socata TB9 Tampico, G-BIZE
No & Type of Engines:	1 Lycoming O-320-D2A piston engine
Year of Manufacture:	1981
Date & Time (UTC):	4 May 2008 at 1730 hrs
Location:	1 nm north of Gloucestershire Airport (formerly Staverton)
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Main wheel spats detached, damage to the tailplane leading edge and aircraft step
Commander's Licence:	Private Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	2,500 hours (of which 1 was on type) Last 90 days - 8 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Forms submitted by both the pilots

Synopsis

During a syndicate check flight on a new aircraft type, the pilot did not switch between fuel tanks to the fullest tank as required. Whilst flying a final circuit, the selected tank ran out of usable fuel although the gauge read just under a quarter full. The engine stopped due to fuel starvation and the pilot carried out a forced landing in a nearby field, resulting in minor damage to the aircraft.

Background

The aircraft had recently been purchased by a 20 member syndicate. The trustee committee for the syndicate placed a requirement on the remaining syndicate members to complete a check ride with an instructor and an approval flight with a member of the committee in order to be approved to fly the new aircraft solo. The three committee members were also new to the aircraft and had conducted a check flight with an instructor prior to commencing the approval flights. The trustees were not instructors themselves and had no formal training in this respect; as such the syndicate member under review was the commander of the aircraft during the approval flight. The designated trustee in this accident was also the chairman of the syndicate and this was his first member approval flight in the aircraft. He had a PPL with IMC rating and 234 hours total experience. Two of his 137 hours PIC were on this aircraft type.

History of the flight

The syndicate member undergoing review (hereafter referred to as PIC) returned from a successful check flight with an instructor in the aircraft. He met the trustee (hereafter referred to as the PNF) and went straight back out to the aircraft. The PNF reports that the PIC had already completed the pre-flight checks in his absence. The PIC and PNF then discussed the approval flight in the aircraft and agreed that they would undertake a short local flight including some tight turning and stall manoeuvres, then complete two touch-and-go circuits prior to landing.

The aircraft departed the airfield at 1715 hrs and the flight around the local area was completed without incident, though the PNF comments that the PIC appeared "a little stressed". After the first touch-and-go landing the PIC attempted to continue with the takeoff, but the PNF felt this was not appropriate due to the attitude and position of the aircraft relative to the runway and told the PIC to reject the takeoff, which he did before taxiing the aircraft off the runway. The PIC and PNF then discussed whether to fly another circuit. During this time the PIC was cautioned by air traffic control for obstructing the taxiway. It was agreed that they would fly another circuit and the PIC took off and flew around the circuit normally. On the base leg of the circuit the PNF became aware of a "knocking" sound coming from the engine. As the aircraft turned on finals he requested that the PIC transmit a PAN call due to his growing concern over the noise, which the PIC then did.

As the aircraft descended below 500 ft agl and was approximately 1 mile from the runway threshold, the engine cut out. The PIC did not attempt to restart the engine and prepared for a forced landing in a nearby field. The aircraft landed safely with only minor damage to the landing gear and the tailplane. The PNF states that the noise remained after the aircraft came to rest, though the engine was not running. However, it ceased when he selected the electric boost pump to OFF, indicating that the sound was that of the pump running dry. The PNF returned to the aircraft the following morning and confirmed that the noise was again present with the left tank selected, but with the right tank selected the noise abated and the indicated fuel pressure returned to normal.

Discussion

Both the PIC and PNF submitted accident report forms for this accident. Each suggested the cause of the accident was that the PIC did not switch to the appropriate fuel tank to ensure an uninterrupted supply of available fuel to the engine. The PIC candidly observed this was due to inadequate checks being carried out on the downwind leg of the circuit.

The TB9 Pilot Information Manual quotes a figure of 79 litres total and 76 litres usable fuel quantity per tank. After the accident the left tank was drained recovering about one litre of fuel, despite the gauge reading just under a quarter full, between 15 and 20 litres of fuel were later recovered from the right tank, which had indicated just less than half full (Figure 1). This does suggest both gauges were 'over-reading' by a similar amount. Airworthiness Directive 1999-062(A) was issued for the TB9 by the DGAC to highlight fuel gauges over-reading at low electrical power supply voltage. However, the maintenance facility repairing the aircraft confirmed the directive was not applicable to this aircraft because of the modification standard. Due to the level of disassembly required to recover the aircraft, it has not been possible to confirm whether any fault existed in the fuel quantity indication system at the time of the accident.

Figure 1

Whilst taking these issues into account, it is generally accepted that light aircraft fuel content gauges should not be relied upon, particularly at low tank quantities and with varying aircraft attitudes. The TB9 Pilot Information Manual reflects best practice in requiring a pre-flight inspection of the physical tank quantity. With knowledge of the approximate engine fuel burn rate this gives a secondary indication of remaining fuel in each tank. The CAA-published General Aviation Safety Information Leaflet (GASIL) Issue 2 of 2008 highlights the importance of this technique, particularly when converting to a new aircraft type.

The ambiguous nature of the seniority relationship between the PIC and PNF during the flight may also have been contributory in the accident. As the PIC was an experienced 2,500 hour private pilot, having another pilot exert a level of control and influence during the flight may have been unfamiliar and therefore possibly distracting. Combined with a lack of familiarity with the aircraft type this may have increased his susceptibility to error.

Flight instructors and examiners have a recognised authority with regard to supervision of other pilots. Specific training and associated experience helps them to judge the competence of a pilot and to recognise when a situation requires intervention to maintain safety. This prevents ambiguity and helps to avoid tension in the cockpit, which can lead to human factors related issues. As such, being checked on a new aircraft type, with a qualified instructor, has clear safety benefits which may not be as assured with other forms of approval flights.

ACCIDENT

Aircraft Type and Registration:	Stampe SV4C, G-BNYZ
No & Type of Engines:	1 Lycoming O-360-A2A piston engine
Year of Manufacture:	1946
Date & Time (UTC):	26 July 2008 at 1000 hrs
Location:	Weybourne (Muckleburgh) Airfield, Norfolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Minor) Passengers - 1 (Minor)
Nature of Damage:	Aircraft extensively damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	61 years
Commander's Flying Experience:	204 hours (of which 120 were on type) Last 90 days - 30 hours Last 28 days - 8 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot of a Stampe biplane misidentified the runways at a private airfield and attempted to land on one that was of insufficient length. During the landing roll he commenced a go-around, during which the right lower wing and landing gear struck a perimeter fence. The right tyre and lower wingtip were damaged and the ailerons jammed in the neutral position. During the subsequent landing the aircraft pitched over onto its back; the pilot and passenger received minor injuries.

History of the flight

This was the pilot's first visit to Weybourne (Muckleburgh) and in planning the flight he consulted the Pooleys and Lockyears flight guides. Both flight guides stated that there were two grass runways at the private airfield, but the descriptions of their length and orientation differed. One guide referred to Runways 16/34 and 03/21 as being 610 m and 370 m long; the other referred to Runways North/South and East/West, these being 550 m and 380 m long.

The wind was forecast as 280º/5-6 kt, so the pilot joined on an extended downwind leg for a left-hand circuit to land on Runway 34. There were no runway markings and he misidentified the runways, unknowingly joining the circuit to land on the much shorter Runway 03. He reported that he had to fly a steep approach in order to clear some tall trees and, following the flare, the aircraft floated a long way down the runway. He therefore initiated a go-around and on the second approach adopted

a short field landing technique. This time the aircraft touched down on the runway, but as the landing roll was longer than expected, he decided to go around again. As the aircraft became airborne, the right lower wing struck a concrete post supporting a barbed wire perimeter fence and at the same time he felt a slight 'bump' from the landing gear. He saw that the right lower wingtip had been damaged and established that the ailerons had become jammed in the neutral position. He flew a further circuit to land on Runway 03, controlling the aircraft using rudder and elevator only. As the aircraft touched down, he heard a loud 'bang' and at the same time, felt a 'jerk' through the landing gear, before the aircraft pitched inverted. The pilot and passenger, who both suffered minor scratches and bruises, vacated the aircraft without assistance. When the pilot inspected the aircraft after the accident, he noticed that one tyre had detached from its wheel rim.

Pilot's comments

The pilot commented that he had misidentified the runway and landed on a runway that, with a slight tailwind and downslope, had insufficient length in which to stop safely. He believed that the tyre was damaged when it struck the fence during the second go-around and that this wheel had dug into the soft grass on touchdown, causing the aircraft to pitch over onto its back.

ACCIDENT

Aircraft Type and Registration:	Wolf WII Boredom Fighter, G-BNAI
No & Type of Engines:	1 Continental Motors Corp A65-8F piston engine
Year of Manufacture:	1986
Date & Time (UTC):	9 June 2008 at 0935 hrs
Location:	RNAS Yeovilton, Somerset
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers- N/A
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to left landing gear structure and left leading edge and tip of lower mainplane
Commander's Licence:	Private Pilot's Licence
Commander's Age:	49 years
Commander's Flying Experience:	308 hours (of which 156 were on type) Last 90 days - 7 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

After landing on a paved surface, the pilot disengaged the tailwheel lock for taxi and the aircraft ground looped.

History of the flight

The aircraft is a small single-seat tailwheel biplane, similar in appearance to the classic SPAD scout of World War 1. This design does, however, include wheel brakes and a tailwheel lock.

The pilot was landing on the paved Runway 27 at RNAS Yeovilton. He was positioned behind a Grob light aircraft and, after extending the downwind leg of his circuit, the pilot turned towards the runway and called "finals for a full stop". He received clearance and wind direction and speed from ATC: any crosswind was light.

The pilot reports that the touchdown was close to the runway threshold, slightly to the left of the centreline and he started to brake evenly: at this point he could see, to his right, the exit and taxiway leading to 'Zulu' stand, to which ATC had already cleared him. At some point the pilot disengaged the tailwheel lock, for better manoeuvring during taxi, but he suddenly felt the left wing drop as the landing gear collapsed and the aircraft rapidly ground looped to the right. The pilot immediately contacted ATC, turned off fuel and magnetos and exited the aircraft easily.

There was no indication of earlier damage to the landing gear. In a frank and considered statement the pilot comments that the ground loop was due to a lapse in his concentration on cockpit procedure, in that he disengaged the tailwheel lock too early, above the recommended speed.

ACCIDENT

Aircraft Type and Registration:	Enstrom 280FX Shark, G-BYSW
No & Type of Engines:	1 Lycoming HIO-360-F1AD piston engine
Year of Manufacture:	1988
Date & Time (UTC):	30 August 2008 at 1120 hrs
Location:	Hay Tor, Dartmoor, Devon
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Damage to all rotor blades and to left side of fuselage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	78 years
Commander's Flying Experience:	Total hours N/K (but 267 were on type) Last 90 days - 9 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot was intending to conduct a late morning flight from Plymouth to Dunkeswell and had obtained a weather forecast from Plymouth ATC. However, the Met Form 215 he obtained was issued that morning, but was only valid from 1400 hrs. The pilot also contacted Dunkeswell for their actual weather conditions. Based on this information, and that the top of Dartmoor was clearly visible from Plymouth, the pilot departed with the opinion that the weather conditions were suitable for the flight. As the flight progressed across Dartmoor, he was forced to make several deviations to keep clear of low patches of stratus cloud. At approximately 1120 hrs the pilot attempted a precautionary landing due to a lowering cloud base and reduced visibility. The landing site appeared to be shallow heather but was in fact deep gorse bushes. The helicopter sank into the bushes and rolled to the left, damaging the rotor blades and left door. The pilot, who was uninjured, carried out the shutdown checks and vacated the helicopter through the right door.

The pilot candidly noted that factors leading to the accident were the inadvertent use of the incorrect forecast and not fully considering the possible effects on the cloudbase of a south-easterly wind blowing onto the eastern side of Dartmoor.

ACCIDENT

Aircraft Type and Registration:	Hughes 269A Hughes 300, G-SHPP
No & Type of Engines:	1 Lycoming HIO-360-B1A piston engine
Year of Manufacture:	1968
Date & Time (UTC):	28 July 2008 at 16:20 hrs
Location:	Near Peacehaven, East Sussex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Helicopter damaged beyond economic repair
Commander's Licence:	Private Pilot's Licence
Commander's Age:	47 years
Commander's Flying Experience:	92 hours (of which 91 were on type) Last 90 days - 9 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

A downwind, out of ground effect transition, resulted in overpitching of the main rotor. The subsequent reduction of rotor rpm caused a loss of tail rotor authority and a descending turning flightpath below a height from which recovery could be effected. The helicopter hit a fence on ground impact and rolled over.

History of the flight

The pilot intended to carry out a low-level reconnaissance of a possible landing site before returning to Redhill Airfield. He made two orbits of the site to assess the safest approach. Having considered the wind direction and obstructions, he approached the field from the north-west and entered an into wind hover at approximately 100 feet agl. The into-wind departure would have passed close to a group of horses and so the pilot conducted a pedal turn, intending to depart along the same ground track as his arrival. Aware that he was departing downwind, the pilot attempted a slow transition to forward flight from the hover. During the transition, G-SHPP developed a gentle sink which the pilot counteracted by raising the collective lever. G-SHPP subsequently yawed to the right which the pilot attempted to counter with left pedal. The pilot stated there was not enough left pedal available to stop the yaw and G-SHPP continued to sink and yaw right. He looked at the rotor rpm (rrpm) gauge and noticed that the rrpm had reduced although he cannot recall the exact reading. The pilot realised he had to lower the collective lever to recover the rrpm

but there was insufficient height remaining to do so. G-SHPP touched down at the top of a small slope where the aircraft clipped a fence and rolled over to the left.

Both occupants, who were wearing full harnesses, were uninjured and able to vacate the helicopter by the right door.

The pilot believed that overpitching of the main rotor caused the loss of rrpm. This subsequently caused the loss of tail rotor authority.

Weather

The 1550 hrs weather report for Shoreham was a surface wind of 110°/6 kt, a temperature of +25°C and a QNH of 1011 mb.

Overpitching

Overpitching is a condition where the pilot applies pitch to the blades without sufficient engine power to compensate for the extra rotor drag. This can be due to a limited power condition or a fixed throttle setting due to a malfunction. Overpitching is a hazardous condition requiring the collective to be lowered to allow rrpm to recover.

It is likely that the following four factors contributed to the overpitching event on G-SHPP:

1. The relatively high temperature would have reduced available engine power.

2. The aircraft was operating close to maximum gross weight.

3. The power required for a downwind transition is greater than that required for an into-wind transition.

4. The main rotor on the H269A rotates anti-clockwise so the use of left pedal requires additional power from the engine.

INCIDENT

Aircraft Type and Registration:	Bishop and Dunn Escapade 912 (1), G-CDIZ
No & Type of Engines:	1 Rotax 912 UL piston engine
Year of Manufacture:	2005
Date & Time (UTC):	15 June 2008 at 1200 hrs
Location:	Sandown Airport, Isle of Wight
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Left landing gear leg deformed
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	70 years
Commander's Flying Experience:	275 hours (of which 50 were on type) Last 90 days - 36 hours Last 28 days - 14 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot stated that while conducting his normal short field approach to land on the grass Runway 23 at Sandown, the aircraft encountered turbulence. Noting that he may have flared the aircraft too high, he reported that at an indicated airspeed of 40 kt the aircraft unexpectedly "ran out of lift". The firm landing was followed by a normal landing roll but when the aircraft vacated the runway it ran over some bumps and the left landing gear leg began to deform. The pilot stopped the aircraft, turned off the engine and got out to push the aircraft back to its parking position.

ACCIDENT

Aircraft Type and Registration:	Flight Design CT2K, G-CCNP
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2004
Date & Time (UTC):	23 May 2008 at 1415 hrs
Location:	Bagber Farm, Dorchester, Dorset
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Spinner and propeller, engine and nosewheel assembly, compression damage at base of right wing, rudder damage, abrasive damage to windscreen
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	69 years
Commander's Flying Experience:	577 hours (of which 164 were on type) Last 90 days - 30 hours Last 28 days - 22 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot applied power for take off and the aircraft began to veer to the left. It ran off the side of the runway into a wheat field, the nose gear collapsed and the propeller hit the ground. The aircraft tipped forward and came to rest upside down lying on the cockpit roof and upper surface of the wing.

History of the flight

The pilot planned to fly one circuit from a grass airstrip 500 m long and 18 m wide. The weather was CAVOK and he assessed there was a crosswind from the right of 6 to 8 kt. He applied full throttle and very soon afterwards the aircraft veered to the left. He did not close the throttle and reported that he probably applied left rudder. The aircraft continued to veer left and ran off the side of the runway into a wheat field. The nosewheel collapsed, the propeller hit the ground and the aircraft tipped forward coming to rest upside down lying on the cockpit roof and upper surface of the wing. The pilot undid his harness and exited the aircraft through the left hand door. About a minute later he returned to the aircraft and turned off the fuel supply and electrical master switch.

Human factors

The pilot had 164 hours pilot in command on three-axis microlight aircraft and over 300 hours on flex-wing

microlight aircraft. When power is applied to the CT2K for takeoff, there is a tendency for the aircraft to yaw left and this tendency should be controlled through the use of right rudder. In flexwing aircraft, a yaw to the left on the ground would be controlled by pushing forward with the left foot to steer right.

The pilot gave a frank and open account of the accident. He recalled that events happened very quickly and he did not think to close the throttle and probably applied left rudder. Although he thought regularly about his actions in case of abnormal events during flight, he did not consider fully enough his actions to reject a takeoff.

Analysis

The aircraft began to yaw left at the start of the takeoff run and, rather than correcting with right rudder, the pilot probably applied left rudder. This action, appropriate to a type of aircraft with which he was more familiar, would have exacerbated the situation. The pilot had applied power without a firm idea of his actions should he need to reject the takeoff. The throttle remaining open increased the pace of events and allowed the aircraft to veer off the left side of the runway with enough energy to cause it to turn upside down.

ACCIDENT

Aircraft Type and Registration:	ITV Agena 30 paraglider	
No & Type of Engines:	None	
Year of Manufacture:	1995	
Date & Time (UTC):	12 May 2008 at 1847 hrs	
Location:	3 nm south of Luss, Loch Lomond, Scotland	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Ground assistant -1 (Fatal)
Nature of Damage:	Not applicable	
Pilot's Licence:	Not required	
Pilot's Age:	19 years	
Information Source:	AAIB Field Investigation	

Synopsis

A paraglider became airborne with a second person holding the harness straps in a deliberate attempt to increase the paraglider's weight. The paraglider unexpectedly gained height and the second person fell, suffering fatal injuries. The investigation concluded that unsuitable equipment, unsuitable wind conditions and a lack of formal training were contributory factors.

Background to the accident

On the evening of the accident, a group of four friends travelled with two paragliders to the hill site where the accident later occurred. One of the four had no experience of paragliding and was not directly involved in the flying activities. The other three had limited paragliding experience, although the eldest (35 years) was a commercial fixed-wing pilot with considerable skydiving experience. The accident victim was the elder of two brothers, aged 19 and 21 years.

The eldest of the group had acquired a used paraglider the previous summer and the group had taught themselves the basics of paragliding flight, using books, videos and the internet. That summer (2007) the group confined their activities to ground handling of the equipment and short downhill 'hops' in light wind conditions on gentle slopes. None of the group received any formal instruction in paragliding techniques. A second paraglider was acquired during the winter months of 2007/2008. This was bought by the man who was later to lose his life in the accident. He and his younger brother had subsequently made a number of short 'training' flights similar to those of the previous season. The second paraglider was of a similar category to the first.

Two weeks before the accident, the group had gone to the hill site for the first time, for their first experience of ridge soaring. The site they chose had been used in

the past for paragliding but was not a regular venue. It was situated on the east facing slope of Shantron Hill (elevation 1,243 feet amsl), which commanded views to the east over Loch Lomond. Two of the group flew without incident in fine weather conditions and relatively light winds, using a launch position part way up the hill at about 850 feet amsl. The accident victim chose not to fly on that occasion.

The accident

With fine weather conditions, the group decided to fly again at the same location, arriving there with their equipment in the early evening. The same two fliers made short flights and found that the wind conditions were not as favourable as before. The wind was stronger and gustier and seemed to increase during their time on the hillside. This meant that the paragliders could not penetrate the wind sufficiently to soar the ridge, but instead were forced steadily backwards up the hill before landing on a flatter area above the launch site. The eldest of the group had completed two flights before deciding that he was not comfortable with the wind conditions and would not fly again. At this point, the other pilot had flown once and was further down the slope with his elder brother (who had again decided not to fly), preparing for a further launch.

As the eldest of the group approached the other two down the slope, he saw the second pilot launch his paraglider, with the pilot's brother holding on to the harness straps at his rear. Both the first pilot and the non-flying member of the group were alarmed and shouted to the 'passenger' to hold on. They described the paraglider rising about 10 feet in the air before descending briefly to the surface. It then rose very quickly "straight upwards", still with the pilot's brother holding on.

The paraglider rose to an estimated 150 to 200 feet and the pilot appeared to be having difficulty controlling the paraglider, being tilted backwards in his harness by the weight of the second man. After what the witnesses estimated as two or three minutes, the second man fell from the paraglider, while it was still at a considerable height. The two men on the ground ran to the casualty, who was unconscious and seriously injured, and were later joined by the casualty's brother who landed his paraglider further up the hill. Emergency services attended the scene but the casualty succumbed to his injuries before he could be moved from the hillside.

Pilot's account

The pilot of the accident paraglider gave his account of the event. With the paraglider failing to penetrate the wind, it was decided to try to increase its weight, which would increase the wing loading and forward speed. While the pilot kept the wing on the ground, his brother found some rocks which were put into the harness to increase weight. There were not many rocks nearby, so the pilot decided to launch anyway, accepting that the paraglider would probably still track backwards up the hill. His brother suggested flying the paraglider with their combined weights. Neither knew what effect this would have, or whether it would in fact fly with so much weight. The pilot thought that it probably would, but thought it inadvisable. However, there was a further brief discussion between the men and it was decided that they would attempt to launch with the second man holding onto the rear of the harness. It was agreed that he would let go if the paraglider seemed likely to gain height, but both men thought that it would most probably descend at low height down the hillside.

The pilot recalled that the paraglider seemed to launch rapidly once the wing filled with air, and rose straight

up at an unexpectedly fast rate, describing it as being "wrenched" upwards. The pilot was tipped back in the harness, looking up at the wing, and had difficulty getting his feet behind the speed bar, a control which would allow him to vary the paraglider's airspeed. Eventually he let go of the control lines to free his hands so that he could bring the speed bar into operation. He shouted to his brother to hold on, and thought that he would be able to land the glider lower down the slope; the increased weight did have the effect of allowing the paraglider to make progress down the hillside. He also manoeuvred to his left so that, by flying across the prevailing wind, the glider would descend more quickly. The pilot's brother warned that he may have to let go, and did so soon afterwards.

Post-accident activities

When his friends reached him, the accident victim was lying unconscious at the bottom of a gulley, about 40 feet deep, into which he had fallen after landing on the ground at the gulley's edge. One of the group called the emergency services at 1849 hrs. As well as a ground-based ambulance, the Scottish Ambulance Service's Glasgow-based helicopter was scrambled, taking off at 1859 hrs with a doctor and paramedic on board. The helicopter was able to land on a flatter part of the hill above the accident site, the helicopter's log recording that it arrived on scene at 1916 hrs, 27 minutes after the '999' call.

An ambulance-based paramedic was met at the base of the hill by the fourth group member and guided to the scene, arriving at the casualty just after the helicopter team. At this stage the casualty was breathing with difficulty and was still unconscious. The medical team were in radio contact with a consultant doctor at the Royal Alexandra Hospital in Paisley. It was soon decided that he too should attend the scene, and was ferried there on board a Royal Navy Sea King helicopter from HMS Gannet at Prestwick. Unfortunately, the medical team were unable to save the casualty, who was declared dead at the scene at 2030 hrs. The post-mortem examination revealed that he died as a result of chest injuries sustained in the fall.

Meteorological information

The Met Office provided an assessment of the likely wind conditions. There was little observational data for the accident area, but an isobaric analysis produced a 2,000 feet wind estimate of 30 to 35 kt from the south east. However, there was also a low level inversion at a similar altitude, which may have caused the 2,000 feet wind to have been markedly different from lower levels. With the blocking effect of the mountains and a low inversion layer, the wind at the level of Loch Lomond would probably have been light and variable. Although the wind at the launch site may also have been quite light at times, temporary increases in wind strength to between 20 and 25 kt were probable. Wind direction would have been from between 130º and 160º.

Witnesses described the wind as being reasonably strong at times and quite gusty. There had also been a brief conversation between the older paraglider pilot and a hill walker who passed by before the accident. The walker (who was a Mountain Rescue Team member) had seen that the paragliders were being forced up the hill and commented that he thought the wind would have been too strong for paragliding.

Recorded information

The eldest group member used a helmet-mounted camera which recorded some of the ground training sessions and much of the events of the accident evening. Being helmet-mounted affected the quality of the recording, and the majority of spoken words were

lost against background noise. However, pertinent information was gained, as described below.

Based on the limited information from the recording, the older man was evidently the most experienced of the group and tended to lead the training sessions. The recording of the accident events started on the hillside with both paragliders being readied for flight. There was obviously some early discussion about the wind before launch, as the older pilot commented "it's getting up a little". About seven minutes into the recording the pilot made a failed launch attempt, followed by a successful one. The flight lasted about one minute, and the paraglider's progress back up the hillside could be seen.

The conversation with the passer by was captured in part, when the pilot replied "yeah it's a little bit windy". After this the pilot moved the paraglider back down the slope toward the original launch point. The pilot appeared to be referring to the other paraglider when he shouted "where's (name) going?" then "go back". The pilot was joined by the older brother and there was clearly another conversation about the wind, the pilot saying "the wind is definitely picking up". there was a brief view of the other paraglider, much further up the hill, and the older pilot shouted "speed bar, speed bar", probably meaning that the pilot should increase forward speed against the headwind.

The older pilot launched again for a longer flight of three minutes, before landing considerably further up the hill. He gathered his paraglider then walked to where the other paraglider was being prepared to launch. The camera captured the point at which the paraglider launched with the older brother holding on. For about two seconds the paraglider flew close to the ground, before the ground beneath it fell away and the paraglider rose out of the camera field of view. Both men on the ground shouted "hold on" as it did so. The accident itself was not captured but, assuming it occurred when the men on the ground started running to the scene, the paraglider was airborne for just under one minute before the second man fell.

Paragliding activities

The sport of paragliding is unregulated in the United Kingdom. Consequently, there are no legal requirements for paragliders to be registered or conform to any standards, or for paraglider pilots to undergo training or hold any formal qualifications. Nevertheless, most paraglider types in the UK have been subject to stringent safety tests and classified according to their flying characteristics against standards agreed by the major paragliding federations and associations in Europe.

The majority of paragliding activity in the UK occurs under the auspices of the British Hang Gliding and Paragliding Association (BHPA). Most paragliding clubs and schools are affiliated to the BHPA (though they are not required to be) and training courses at such schools teach a BHPA-approved syllabus which leads to internationally recognised paragliding qualifications. The BHPA also operates a compulsory reporting scheme for paragliding accidents and incidents, and conducts its own investigations, where appropriate, or provides technical assistance to AAIB investigations. Full details of the BHPA's activities, including information on learning to fly, are given on their website at www.bhpa.co.uk.

Paraglider information

The Agena 30 paraglider (the number referring to approximate wing area in square metres) involved in this accident was manufactured by the French company ITV, and was certified for production on 10 October 1993.

According to the ACPUL[1] classification used at the time, the paraglider was suitable for beginners' use, achieving an 'A' rating in each of 10 (later 12) flight manoeuvres. Grades A to C were awarded for each manoeuvre, with 'C' being applicable to the most demanding high performance/low stability wing types and 'A' being suitable for inexperienced pilots and training.

The Agena 30 was the largest of four paragliders in the Agena range and had the largest weight capacity, of between 92 and 110 kg. This was a total weight, to include the paraglider wing and lines, harness, pilot and equipment. Although flight outside the weight range would have been possible, flight tests were only performed at the declared weights. As paragliders are very sensitive to weight variations, the flight characteristics observed in testing could not be relied upon outside the declared weight range. The optimum weight is considered to be at, or slightly above, the middle of the weight range.

The Agena 30 had a quoted maximum speed of 39 km/hr (21.3 kt) and a trim speed of 34 km/hr (18.6 kt). These speeds would be valid for a weight at the top of the allowed range, since this would provide the maximum wing loading and forward speed, albeit at the expense of some gliding efficiency. In the opinion of a BHPA technical officer, the paraglider would be considered to be slow by modern standards, although the handling characteristics would not be dissimilar to a modern design of the same classification.

The paraglider involved in the accident had been purchased by the deceased man via the internet, along with the harness and ancillary equipment. He had established that the equipment was suitable for beginners' use and was satisfied with the vendor's credentials, although the weight capacity of the paraglider and its age had not been major factors in the purchase.

The paraglider was about 12 years old and bore a manufacture date of 8 November 1995. Paraglider wings are relatively delicate and in normal use are subject to deterioration over time through exposure to UV light and general wear, even if regularly serviced. At 12 years of age and with an undocumented past, the paraglider in question should, according to the BHPA technical officer, have been regarded as at, or beyond, the end of its safe life. He advised that it would be unwise to fly such a paraglider without a recent report from the manufacturer (or other suitably able service facility) showing the fabric and suspension lines to be in serviceable condition. The nature of the accident and the paraglider's performance on the day were such that the paraglider and associated equipment were not required to be examined in close detail during the investigation. Based on a visual inspection, the wing and lines appeared to be in reasonable condition.

The pilot of the paraglider on the evening of the accident weighed 75 kg and his brother, who purchased the equipment, weighed 70 to 72 kg. The pilot estimated that the rest of the equipment accounted for 15 to 20 kg. Thus, with either of the brothers as pilot, the paraglider weight would have been at the bottom end of the declared weight range, or slightly below it.

Analysis

Although none of the group had sought or received formal instruction in paragliding, their overall approach to it appears to have been cautious and considered. They had, sensibly, conducted their early activities on gentle slopes and in benign conditions, as witnessed in part by the camera recording.

Footnote

[1] ACPUL was an acronym for a European association of paraglider manufacturers.

The meteorological situation was such that the group would have experienced quite light wind conditions before climbing the hill, but may not have been aware of the potential for relatively strong wind and gusts at the launch point. The fact that the paragliders were unable to make headway and were forced back up the hill indicates a wind strength of 20 kt, or possibly more, was being experienced at times. The wind conditions were unsuitable for the group's experience level, although the older pilot clearly appreciated that the wind was quickly becoming a factor.

The presence in the group of an individual with significant commercial flying and skydiving experience may have been a factor in deciding not to seek formal training, and it is likely that the younger members looked to him for guidance, at least in part. It is also likely that he acted as a positive steadying influence on the younger men, and was more able to recognise higher risk areas and ensure that the group's activities were as safe as they could make them. Although this is supposition, it is supported by the available recorded evidence.

The decision not to seek formal training had a bearing on the accident itself. In the first place, expert advice would have been more readily available concerning the paraglider purchase and one with a more suitable (ie lower) weight range may have been sought. Second, under proper tuition the group would have been more aware of the risks associated with stronger winds and therefore less likely to have been flying on that particular evening. The hazards of what the two young men were attempting to do by increasing the paraglider's weight would also have been better understood, and they would have been trained in a culture in which such experimentation is forbidden.

The decision to experiment with the paraglider's weight came about because the pilot was attempting to fly in relatively strong wind conditions. The group had not encountered the conditions before; the decision taken by the two brothers on the hillside was without input from the oldest and most experienced of the group. The idea was therefore not given sufficient thought and the possible consequences were not foreseen.

Although the theory of increasing weight to increase speed was correct, this was not an accepted practice (with the possible exception of the competition arena, where water ballast is sometimes used). The inclusion of rocks into the harness would have substantially increased the risk of serious injury during landing. The control difficulties experienced by the pilot because of the extra weight and trim change were not considered, nor were the possible adverse effects of an instantaneous reduction in 'all up' weight of nearly a half if the passenger needed to let go. It is also unlikely that the men appreciated the significant risk of structural failure that existed, given the uncertain condition of the ageing paraglider. The brothers' overall lack of paragliding experience meant that they were also unaware of the potential of the wing to lift both men with ease in the wind speeds that existed.

Conclusions

This accident highlights the fact that aviation in any form, regardless of the level of complexity or regulation involved, incurs risks which need to be understood and mitigated. Compared with other sports, aviation is far less forgiving of experimentation and improvisation. The group had acquired considerable knowledge and had taken a cautious approach to flying. Even so, without the benefit of formal training and expert advice, which is readily available within the BHPA system, the two brothers found themselves with equipment unsuited to their weights and in conditions unsuited to their experience level. They embarked on a course of action, the dangers of which they did not fully understand.

ACCIDENT

Aircraft Type and Registration:	Pegasus Quantum, G-BYYY
No & Type of Engines:	1 Rotax 912 piston engine
Year of Manufacture:	1999
Date & Time (UTC):	12 July 2008 at 0930 hrs
Location:	Redlands airfield, Wanborough, Wiltshire
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to nosewheel and trike
Commander's Licence:	Private Pilot's Licence
Commander's Age:	53 years
Commander's Flying Experience:	1,100 hours (of which 1,000 were on type) Last 90 days - 90 hours Last 28 days - 20 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During the approach, in turbulent air, to Runway 24 the instructor assessed that the aircraft was low and instructed the student to increase power. Instead the student closed the foot throttle. The instructor then increased power by opening the hand throttle. The aircraft cleared a fence, but after this the student pulled on the control bar, causing the aircraft to pitch forward and to land on the runway in a nose-down attitude.

History of the flight

The instructor had briefed his student for a lesson on flying a circuit, using Runway 24 at Redlands airfield. The taxi, takeoff, climb and downwind leg of the circuit were flown by the student without incident. The instructor judged that the student's turn onto the base leg was in a good position, although the aircraft was a little low. The turn onto final was conducted satisfactorily with the aircraft positioned toward the runway centreline. However it was still low so the instructor told the student to increase power to correct this.

After a short period the student reduced power by closing the foot throttle. At this point the aircraft was low and appearing to sink due to turbulent air; this occurred close to the fence that runs perpendicular to the approach to Runway 24.

The instructor reached down to operate the hand throttle and this increased the engine power enough for the aircraft to pass over the fence. Having cleared the fence,

the student then pulled on the control bar, causing the aircraft to pitch forward and land on the runway nose first. This resulted in a damaged nosewheel and damage to the front of the trike.

The instructor and student had been wearing full harnesses and helmets and were uninjured.

ACCIDENT

Aircraft Type and Registration:	Quik GT450, G-CDVZ
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2006
Date & Time (UTC):	10 June 2008 at 2040 hrs
Location:	Mount Airey, Huddersfield
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Minor) Passengers - None
Nature of Damage:	Damage to wing, trike unit and nose landing gear
Commander's Licence:	Private Pilot's Licence
Commander's Age:	45 years
Commander's Flying Experience:	300 hours (of which 97 were on type) Last 90 days - 23 hours Last 28 days - 17 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The intention of the flight was to fly from Carlisle to Mount Airey, near Huddersfield, to rendezvous with two other Quik microlight aircraft. Arriving overhead the airfield, following a flight of approximately 1 hr 20 mins, the pilot observed the windsock indicating a wind direction of between 250° and 330°. He also observed the other two aircraft already on the ground. He decided to carry out an approach to Runway 25 and, as the aircraft began to descend on base leg, some turbulence was encountered and he noticed that the ground speed had reduced dramatically. Just before touchdown the aircraft rolled to the left. The pilot regained control but, after touching down, the aircraft ballooned back into the air. The second touchdown was on the nose landing gear, which sustained damage, and the aircraft became airborne again. On the third touchdown the trike unit veered to the right, the left wing dug into the ground and the aircraft came to rest. The pilot sustained a minor injury although the passenger was uninjured. The other Quik pilots who had already landed considered that the wind conditions had been very difficult. The pilot also considered that his judgement and ability could have become impaired as he had felt very cold during the latter stages of the flight.

ACCIDENT

Aircraft Type and Registration:	Quik GT450, G-CEKG
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2007
Date & Time (UTC):	3 August 2008 at 1630 hrs
Location:	East Fortune Airfield, East Lothian
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to nose landing gear and pod
Commander's Licence:	Student pilot
Commander's Age:	59 years
Commander's Flying Experience:	93 hours (of which 22 were on type) Last 90 days - 29 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

A solo student pilot was attempting to land a microlight aircraft in good weather, but with an 8 kt breeze across the runway. Prior to touchdown the pilot successfully corrected a drift to the left, but the aircraft then sank heavily and hit the runway hard, bouncing before again settling heavily onto the ground. This caused the nosewheel tyre to burst and the nose gear to buckle and collapse into the pod. The pilot considers that insufficient airspeed resulted in the aircraft stalling onto the ground.

ACCIDENT

Aircraft Type and Registration:	Skyranger 912(2), G-CDWB
No & Type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2006
Date & Time (UTC):	27 July 2008 at 1345 hrs
Location:	Roche Airfield, Cornwall
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Minor) Passengers - 1 (Minor)
Nature of Damage:	Nosewheel, engine cowling, and nose landing gear
Commander's Licence:	Private Pilot's Licence
Commander's Age:	59 years
Commander's Flying Experience:	283 hours (of which 240 were on type) Last 90 days - 18 hours Last 28 days - 5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

After completing a normal approach and touchdown on the north-westerly runway at Roche Airfield, the pilot realised that the aircraft's ground speed appeared higher than normal. Despite the application of the wheel brakes, the aircraft failed to decelerate as expected. With insufficient distance available to get airborne again, the pilot continued with the landing but the aircraft struck a boundary fence at approximately 20 mph and became inverted. After leaving the aircraft, the pilot observed that the wind was now coming from the south-east. It is therefore probable that, at some point during the approach, a change in wind direction resulted in the aircraft landing with a tailwind, which produced the higher than expected ground speed.

AIRCRAFT ACCIDENT REPORT No: 7/2008

This report was published on 3 October 2008 and is available on the AAIB Website www.aaib.gov.uk

REPORT ON THE ACCIDENT TO AEROSPATIALE SA365N, G-BLUN NEAR THE NORTH MORECAMBE GAS PLATFORM, MORECAMBE BAY ON 27 DECEMBER 2006

Operator:	CHC Scotia Limited
Aircraft Type and Model:	Aerospatiale SA365N, Dauphin 2
Manufacturer's Serial No:	6114
Nationality:	British
Registration:	G-BLUN
Location:	Approximately 450 metres south-south-east of the North Morecambe gas platform, Morecambe Bay, Irish Sea Latitude N 53º 57·361' Longitude W 003º 40·198'
Date and Time:	27 December 2006 at approximately 1833 hrs All times in this report are UTC (coincident with local time)

Synopsis

The London Air Traffic Control Centre notified the Air Accidents Investigation Branch of the accident at 1906 hrs on 27 December 2006; the investigation commenced the next day. The following Inspectors participated in the investigation:

Mr R Tydeman	Investigator-in-Charge
Mr M Cook	Operations
Mr K Conradi	Operations
Mr M Jarvis	Engineering
Mr S Moss	Engineering
Mr P Wivell	Flight Data Recorders
Mr A Burrows	Flight Data Recorders

The helicopter departed Blackpool at 1800 hrs on a scheduled flight consisting of eight sectors within the Morecambe Bay gas field. The first two sectors were completed without incident but, when preparing to land on the North Morecambe platform, in the dark, the helicopter flew past the platform and struck the surface of the sea. The fuselage disintegrated on impact and the majority of the structure sank. Two fast response craft from a multipurpose standby vessel, which was on position close to the platform, arrived at the scene of the accident 16 minutes later. There were no survivors amongst the five passengers or two crew.

The investigation identified the following contributory factors:

1 The co-pilot was flying an approach to the North Morecambe platform at night, in poor weather conditions, when he lost control of the helicopter and requested assistance from the commander. The transfer of control was not precise and the commander did not take control until approximately four seconds after the initial request for help. The commander's initial actions to recover the helicopter were correct but the helicopter subsequently descended into the sea.

2 The approach profile flown by the co-pilot suggests a problem in assessing the correct approach descent angle, probably, as identified in trials by the CAA, because of the limited visual cues available to him.

3 An appropriate synthetic training device for the SA365N was available but it was not used; the extensive benefits of conducting training and checking in such an environment were therefore missed.

Six Safety Recommendations have been made.

Findings

1. The flight crew were properly licensed and qualified to conduct the flight, and were well rested. Their training was in accordance with the operator's requirements.

2. The helicopter was certified, equipped and maintained in accordance with existing regulations and approved procedures. At the time of the accident there were no recorded Acceptable Deferred Defects that might have contributed to the incident.

3. The flight crew had the relevant meteorological information and, whilst the weather conditions were poor, they were above the required minima and not unusual for such operations.

4. The flight crew were familiar with operations onto the North Morecambe platform and the lighting on the platform was serviceable.

5. The co-pilot visually acquired the helideck at a range of about 6,800 m.

6. The crew flew the approach by reference to visual cues that, because of the dark and prevailing poor weather conditions, did not provide adequate information required for the normal perception of distance.

7. The paucity of instrument cross-checks by the commander did not assist the co-pilot in managing the approach profile and there was no evidence of monitoring by the commander.

8. The co-pilot, who became disorientated during the approach, did not positively call 'going around'.

9. The go-around decision and the transfer of control from the co-pilot to the commander were not handled appropriately. The commander, who appeared not to be mentally primed to take control, did not do so until approximately four seconds after the initial request for help.

10. The commander, who took control of the helicopter when it was in an extreme and unusual attitude, rolled the helicopter to a wings level attitude and reduced the pitch angle.

11. During the attempted recovery of the helicopter from its unusual attitude the commander was devoid of any external visual cues and was possibly distracted over concerns for the well being of his co-pilot.

12. Concerns for his co-pilot and some degree of disorientation possibly distracted the commander from his usual instrument scan to the extent that he did not notice the increasing angle of bank to the right and the helicopter's continuing descent into the sea.

13. The impact of the helicopter's fuselage with the sea surface was not survivable.

14. Search and rescue assets at sea and ashore were deployed without delay.

15. The yellow immersion suits worn by the passengers were noticeably more conspicuous in the dark than the blue immersion suits worn by the pilots when illuminated by a helicopter's searchlight.

16. The bodies of the fatally injured crew and four of the passengers were recovered within approximately 4 hours of the accident. The body of the remaining passenger has not been recovered.

17. There was no evidence of any technical malfunction that may have contributed to the accident.

18. There were no handling quality issues identified during the flight testing of another SA365N helicopter that could have had a bearing on the accident.

19. The helicopter's behaviour during the accident flight was consistent with the flight control inputs.

20. The location of the radio altimeter, optimised for reference in the final stages of a visual landing on a helipad was difficult to include in the pilot's instrument scan during a go-around.

21. The torquemeter's size, readability and location made it difficult to use by the pilot in the left seat at any stage during an approach and go-around.

22. The post-mortem examination showed that the commander had severe coronary artery disease but this had no bearing on the cause of the accident.

23. The operator did not train or periodically assess their crews in a synthetic training device although such a device, configured to represent a SA365N helicopter, was available.

24. There is no industry requirement for formal training of those personnel involved in the compilation of meteorological data for aviation weather reports. In addition, the Logistics Supervisor, who compiled the meteorological observation for the gas field used on the evening of 27 December 2006, was not provided with any equipment to assist him in the production of accurate weather observations.

Safety Recommendations

The following Safety Recommendations were made:

Safety Recommendation 2008-032

It is recommended that CHC (Scotia) review their Standard Operating Procedures related to helideck approaches, to ensure that the non-handling pilot actively monitors the approach and announces range to touchdown and height information to assist the flying pilot with his execution of the approach profile. This is especially important on the SA365N helicopter when the co-pilot is flying approaches in poor visual conditions and cannot easily monitor a poorly positioned radio altimeter.

Safety Recommendation 2008-033

It is recommended that the European Aviation Safety Agency ensure that research into instrument landing systems that would assist helicopter crews to monitor their approaches to oil and gas platforms in poor visual flying conditions and at night is completed without delay.

Safety Recommendation 2008-034

It is recommended that CHC (Scotia) conduct a thorough review of their Standard Operating Procedures related to helideck approaches, for all helicopter types operated by the company, with the aim of ensuring safe operations.

Safety Recommendation 2008-035

It is recommended that the Civil Aviation Authority should ensure that the recurrent training and checking of JAR-OPS, Part 3 approved operators should be carried out in an approved Synthetic Training Device.

Safety Recommendation 2008-036

It is recommended that the European Aviation Safety Agency (EASA) investigate methods to increase the conspicuity of immersion suits worn by the flight crew, in order to improve the location of incapacitated survivors of a helicopter ditching.

Safety Recommendation 2008-037

It is recommended that the Civil Aviation Authority ensure that personnel who are required to conduct weather observations from offshore installations are suitably trained, qualified and provided with equipment that can accurately measure the cloud base and visibility.

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on 11 March 2005.
Published December 2007.

6/2007 Airbus A320-211, JY-JAR
at Leeds Bradford Airport
on 18 May 2005.
Published December 2007.

7/2007 Airbus A310-304, F-OJHI
on approach to Birmingham International Airport
on 23 February 2006.
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2008

1/2008 Bombardier CL600-2B16 Challenger 604, VP-BJM
8 nm west of Midhurst VOR, West Sussex
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during the climb after departure from London Heathrow Airport
on 22 October 2005
Published January 2008.

3/2008 British Aerospace Jetstream 3202, G-BUVC
at Wick Aerodrome, Caithness, Scotland
on 3 October 2006.
Published February 2008.

4/2008 Airbus A320-214, G-BXKD
at Runway 09, Bristol Airport
on 15 November 2006.
Published February 2008.

5/2008 Boeing 737-300, OO-TND
at Nottingham East Midlands Airport
on 15 June 2006.
Published April 2008.

6/2008 Hawker Siddeley HS 748 Series 2A, G-BVOV
at Guernsey Airport, Channel Islands
on 8 March 2006.
Published August 2008.

7/2008 Aerospatiale SA365N, G-BLUN
near the North Morecambe gas platform, Morecambe Bay
on 27 December 2006.
Published October 2008.

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