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SERIOUS INCIDENT

Aircraft Type and Registration:	i) Airbus A340-311, 4R-ADC ii) Boeing 747-436, G-BNLL
No & Type of Engines:	i) 4 CFM 56-5C2F Turbofan engines ii) 4 Rolls-Royce RB211-524G2-19 turbofan engines
Year of Manufacture:	i) 1995 ii) 1990
Date & Time (UTC):	15 October 2007 at 2113 hrs
Location:	London Heathrow Airport
Type of Flight:	i) Commercial Air Transport (Passenger) ii) Commercial Air Transport (Passenger)
Persons on Board:	i) Crew - 15 Passengers - 286 ii) Crew - 19 Passengers - 328
Injuries:	i) Crew - None Passengers - None ii) Crew - None Passengers - None
Nature of Damage:	i) Right navigation light damaged ii) Left winglet detached
Commander's Licence:	i) Airline Transport Pilot's Licence ii) Airline Transport Pilot's Licence
Commander's Age:	i) 56 years ii) 47 years
Commander's Flying Experience:	i) 15,000 hours (of which 7,000 were on type) Last 90 days - 200 hours Last 28 days - 70 hours ii) 16,740 hours (of which 9,411 were on type) Last 90 days - 138 hours Last 28 days - 32 hours
Information Source:	AAIB Field Investigation

Synopsis

A ground collision occurred when an Airbus A340 attempted to pass a Boeing 747 that was stationary on an adjoining taxiway, at night. Various factors contributed to the incident including the challenge faced by the crews of these large aircraft in assessing wingtip clearances, their interpretation of ATC instructions and the taxiway design.

One Safety Recommendation is made.

History of the flight

The crew of the Airbus A340-300, registration 4R-ADC, reported for duty at 1930 hrs, after a rest period of about 36 hours. The flight deck was manned by the commander in the left seat, an operating co-pilot

in the right seat and a relief co-pilot on a jump seat. The aircraft was prepared for departure, during which the crew listened to the Heathrow ATIS broadcast, and was pushed back off its stand at Terminal 4 at 2044 hrs, by which time it was dark. There was no significant weather, 8 km visibility and a south-westerly wind of about 10 kt.

On completion of the pushback and engine start, ATC cleared the A340 to taxi and to hold short of Runway 27L. The co-pilot was the handling pilot for the flight but, in accordance with company procedures, the commander taxied the aircraft. ATC then cleared the aircraft to cross Runway 27L and issued a further clearance for it to taxi to Holding Point A1, which is adjacent to the threshold of Runway 27R. Another aircraft, a Boeing 747-400, registration G-BNLL, which was ahead of the A340, had also been cleared to taxi to Holding Point A1. The B747 had stopped temporarily on Link 23 behind a Boeing 777, as indicated in Figure 1, leaving sufficient space to protect it from the latter's possible jet blast. Its position also avoided stopping in the turn ahead, preventing stress on the landing gear and avoiding excessive thrust when taxiing was resumed.

Prior to reaching Link 22, the A340 was transferred to the departure frequency and was re-cleared by ATC to taxi to Holding Point A2, with the following transmission:

ATC: "XXXX FOLLOW GREEN LIGHTS TO HOLDING POINT ALPHA TWO"

A340: "FOLLOW GREEN LIGHT HOLDING POINT ALPHA TWO XXXX"

On issuing this clearance, ATC illuminated the green centreline lights along Link 22; these lights had been extinguished while the B747 was taxiing along Link 23. The crew of the A340 understood that the ATC instruction meant that there was nothing to impede their progress towards Holding Point A2 but, as the A340 approached the, now stationary, B747, they briefly discussed the separation between the two aircraft. The crew's comments suggest that, although concerned, they believed the separation was adequate; however, the commander, under the guidance of the co-pilot, took the precaution of taxiing the A340 to the left of the taxiway centreline. As they continued, the right wingtip of the A340 struck the winglet of the B747 and the co-pilot called for the commander to stop the aircraft.

The crew of the A340 then informed ATC that their aircraft may have collided with the B747. The flight crew on board the B747 had felt a jolt but thought it was possibly due to jet blast from the B777 ahead. They were, however, able to see the close proximity of the A340 and received a report from a member of their cabin crew who had witnessed the B747's left winglet being struck. They, too, then advised ATC that a collision may have taken place.

ATC dispatched the Airport Fire Service (AFS) to attend the incident, while both aircraft remained in position with their engines running. The AFS confirmed that both aircraft had sustained damage but that there was no evidence of any fuel leak. Both aircraft were shut down and the passengers deplaned normally, before being transferred to an airport terminal by coach. There were no injuries.

Measurements

Following the collision, the B747 was positioned on taxiway Link 23, facing toward Holding Point A1. The aircraft was aligned with the taxiway and the nosewheel was on the centre line, 193 metres short of Holding Point A1.

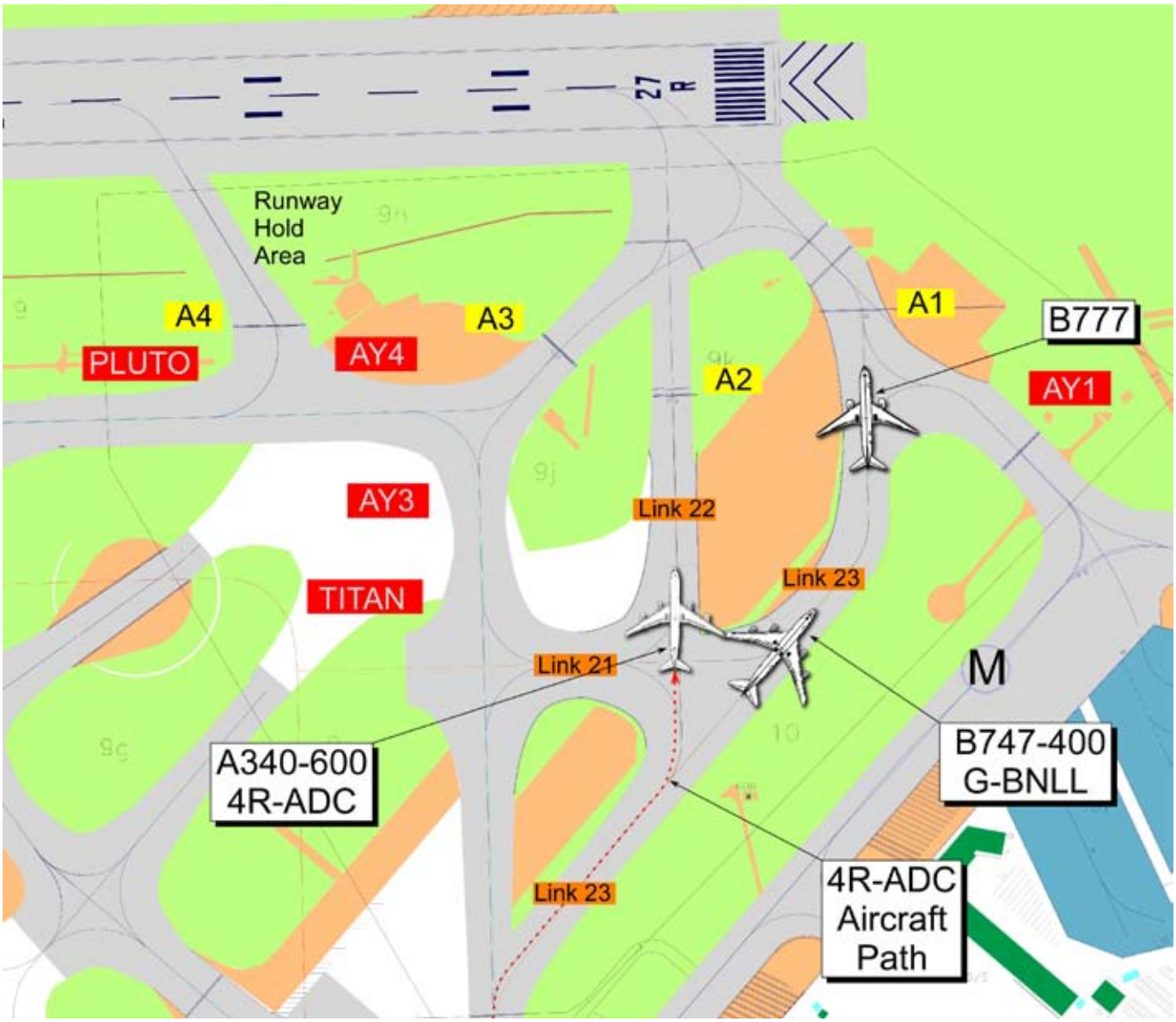

Figure 1

Point of collision at holding points for Runway 27R

The A340 was positioned on taxiway Link 22 facing toward Holding Point A2. The aircraft had come to rest a short distance beyond the point of contact with the wingtip of the B747. The nosewheel was 1.8 metres to the left of the taxiway centreline and the body gear was also to the left of the centreline by 2.3 metres.

The point of contact had occurred at the intersection between taxiways Link 22 and Link 23. The overlap between the left wingtip of the stationary B747 and the right wingtip of the A340 was about 2 metres. See Figure 1.

Aircraft damage

The Boeing 747-400's left winglet had been severed approximately 1.7 metres from its tip. The winglet was subsequently replaced prior to the aircraft returning to service.

The Airbus A340-300 had a fractured right wing

navigation light assembly and some damage to the leading edge of the right winglet. The damaged winglet was removed, as permitted in the Minimum Equipment List (MEL), and the navigation light assembly was replaced before the aircraft returned to service the following evening.

Procedures

The UK Aeronautical Information Publication (AIP)

The entry for London Heathrow Airport in the UK AIP, under *LOCAL TRAFFIC REGULATIONS, Ground Movement* stated:

> *'a General*
>
> *i Ground Movement Control (GMC) is in continuous operation and all surface movement of aircraft, vehicles and personnel on the Manoeuvring Area is subject to ATC authority.*
>
> *ii Directions issued by ATC should be followed specifically. RTF transmissions must be brief, concise and kept to the minimum number.*
>
> *iii Within the Movement Area, pilots will be cleared to and from the aircraft stands under general direction from GMC. Pilots are reminded of the extreme importance of maintaining a careful lookout at all times.*
>
> *iv Runway Holding Areas for aircraft departing on Runways 27L/09R and 27R/09L. The areas are illustrated on pages AD 2-EGLL-2-5/8. Within these areas, revised Air Traffic Control procedures are as follows:*
>
> *1 At all times in good visibility an ATIS message will remind pilots that they remain responsible for wing tip clearance. In the hours of darkness, selectable reds and greens are used.*
>
> *2 In promulgated holding areas, flight crew will be expected to follow conditional line-up clearances to maximise runway utilisation, which may entail overtaking and passing other aircraft in the holding areas. It is stressed that during these manoeuvres, avoidance of other aircraft is the responsibility of the flight crew involved. If doubt exists as to whether other aircraft can be overtaken then ATC must be informed that the conditional clearance that has been received cannot be complied with.*
>
> *v ATC will clear aircraft to the holding point of the departure runway in use. Until a line-up clearance or sequence instruction is issued, commanders are to position their aircraft in such a way that the entrances to the runways are not obstructed.'*

The Heathrow Manual of Air Traffic Services (MATS) Part 2, Section 1, Paragraph 7.7.4 stated the following:

> *'Runway Holding Areas - Caution to Pilots*
>
> *The following message is to be broadcast with the Departure ATIS at all times, except when Low Visibility Procedures are in force:*
>
> *"Pilots are to exercise caution when manoeuvring in the Runway Holding Areas as wing tip clearance is not assured."'*

The introduction of this message in the Departure ATIS was the result of an accident at the airport in November 1995 (AAIB Bulletin 07/96 Report Reference EW/C95/11/4) in which the wingtip of a taxiing A340 struck the tail of a B757 that was stationary at a holding point.

The crew of 4R-ADC confirmed that they had heard this message broadcast on the ATIS prior to taxiing. They had misinterpreted the meaning of the message as a disclaimer by the airport authorities against any damage caused to aircraft whilst taxiing. A senior pilot with the same operator, when asked, considered that the message referred to a potential lack of clearance between taxiing aircraft and airfield obstructions. The AAIB was also contacted, as a result of this incident, by a management pilot from another overseas operator. He raised concerns about the Heathrow ATIS message, pointing out that it was not possible to judge wingtip clearance from the flight deck when manoeuvring large aircraft.

Heathrow Airport Eastern Apron Development – Runway 27R Holding Area

The area of apron on which the incident occurred had recently been re-developed by the airport operator. The re-development project had various aims which included:

- Re-aligning existing dual taxiways to provide maximum space for other infrastructure developments
- Provide Code F[1] routes to the Runway 27R holds
- Provide sufficient holding areas to maintain capacity
- Reconstruct life-expired pavement areas
- Provide one Airbus A380 and two Boeing 747 remote stands

The plans were complicated by the need to fulfil these requirements, whilst using as much of the existing infrastructure as possible. Initial plans were rejected as they were unable to fulfil the requirements for Code F operations. A subsequent plan utilised the disused Runway 05/23 and, whilst it met the requirements of Code F operations, it reduced the operational flexibility of the runway holding area. Evaluation by ATC of this new design indicated that, should one particular junction become unavailable, access to the Runway 27R hold would become extremely difficult. This would have led to a rapid loss of runway capacity, resulted in outbound delays and, as such, was deemed unacceptable. The design was, therefore, modified further and resulted in the design that was finally adopted, as depicted in Figure 1.

The airport operator had designed the taxiway development to comply with the guidance laid down in Civil Aviation Publication (CAP) 168 – *Licensing of Aerodromes*. The final design was based on a separation requirement that only one aircraft should occupy any length of taxiway between any two adjacent stopbars at any one time. These taxiway 'blocks' also included junctions and as a result meant that two or more different taxiways might be included within such a block. The airport operator believed that, should the taxiway system be operated to this requirement, it could guarantee aircraft separation at all times.

As a result of allowing space between it and the B777

Footnote

[1] This refers to routes capable of being used by aircraft with wingspans up to 80m, a requirement for Airbus A380 operations.

in front, the rear of the stationary B747 extended over a stopbar beneath the aircraft. Thus, at the point where the collision occurred both aircraft were occupying the same taxiway block. ATC were not aware of this fact as they had no means of accurately determining the position of the aircraft.

The taxiway lighting system also operated on a block system, so that only one route guiding taxiing aircraft was illuminated in a block at any one time. Thus, as the green taxiway centreline lighting along Link 22 to Holding Point A2 was switched on, the green taxiway centreline lights along Link 23, to the rear of the stopbar under the tail of the B747, were extinguished.

Published instructions to pilots

CAP 637, the *Visual Aids Handbook*, Chapter 2, Section 2.3.1 b) states:

> *'Taxi holding positions are normally located so as to ensure clearance between an aircraft holding and any aircraft passing in **front** of the holding aircraft, provided that the holding aircraft is properly positioned **behind** the holding position. **Clearance to the rear of any holding aircraft cannot be guaranteed.** When following a taxiway route, pilots and persons towing an aircraft are expected to keep a good lookout and are responsible for taking all possible measures to avoid collisions with other aircraft and vehicles.*
>
> *NOTE 1: Upon reaching a Taxi Holding Position identifying a taxi clearance limit, the pilot should stop the aircraft as close as possible to the Taxi-Hold Position Marking, whilst ensuring that no part of the aircraft protrudes beyond the marking.'*

Previous incidents

A review of AAIB reports identified nine previous ground collisions between taxiing aircraft at Heathrow Airport since 1975. In all cases the collisions were the result of a wide body aircraft attempting to pass a stationary aircraft waiting at a holding position. These reports identified various factors, including the difficulty in assessing wingtip clearance from the flight deck of large aircraft and the belief of some of the pilots involved that, by maintaining the taxiway centreline, separation between their aircraft others would be assured. It was also apparent that some of the crews involved did not realise that their aircraft had been involved in a collision. The reports commented on the potential influence of taxiway design and operational procedures in use.

Analysis

The crew of the A340 incorrectly believed that ATC had issued the instruction to follow the green centreline lights to Holding Point A2 on the basis that there was nothing to impede their progress. The illumination of the green taxiway centreline lights along the taxiway in front of them reinforced this assumption. The crew were aware of the B747 on the adjacent taxiway but had assessed that they had sufficient room to pass, although the decision to move to the left of the centreline, away from the B747, indicated a lack of confidence as to the true extent of the separation between the two aircraft.

The commander of the A340 was seated in a position that placed him furthest away from the B747 and was unable to make an accurate assessment of the clearance between the two aircraft as they drew level. He, therefore, relied on guidance from the two co-pilots, neither of whom had direct experience of taxiing large aircraft. As with most large aircraft, it is difficult to see the wingtips on the Airbus A340 from the flight deck. It was also dark,

adding to that difficulty. This was further compounded by the acute angles between the two aircraft, which may have given the impression of more distance between their wingtips than existed.

When taxiing, the inability of crews to judge wingtip positions accurately, particularly on large aircraft, can make it difficult to decide whether sufficient clearance exists. The design of an airport layout, in particular its taxiways, and clear operational procedures can help to minimise the risk of collisions between such aircraft. This is of particular importance at large busy airports, where limited available space and high capacity demands impose additional pressures.

This and previous investigations revealed a lack of understanding amongst some pilots of the protection afforded by airfield markings to taxiing aircraft. In particular, there was a certain amount of misunderstanding that taxiing along the centreline of a taxiway provided separation from all other aircraft. As CAP 637 explains, clearance is only guaranteed to aircraft taxiing in front of a holding position from those aircraft holding behind it. When taxiing, responsibility for the avoidance of other aircraft lies with the flight crew of an aircraft.

This lack of understanding was a factor in this and other accidents. The extent of the problem is unclear but it highlights the need for greater awareness amongst flight crews in the area of ground operations. There is a possibility that a ground collision could occur which is not identified in time to prevent one or both aircraft attempting to become airborne, having sustained damage that may affect their airworthiness. The airport operator's attempts to raise awareness, through the message on the Departure ATIS, may have lead to further misunderstanding. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2010-010

It is recommended that Heathrow Airport Limited improve the effectiveness of the warnings issued to pilots of manoeuvring aircraft, to clarify that clearance from other aircraft is not assured in all circumstances, regardless of the ATC taxi clearance.

ACCIDENT

Aircraft Type and Registration:	Beech B200GT, G-RAFX
No & Type of Engines:	2 Pratt & Whitney PT6A-52 turboprop engines
Year of Manufacture:	2008
Date & Time (UTC):	4 December 2009 at 1137 hrs
Location:	RAF Valley, Anglesey
Type of Flight:	Military
Persons on Board:	Crew - 2 Passengers - 2
Injuries:	Crew - None Passengers - None
Nature of Damage:	Significant damage to the right outer wing
Commander's Licence:	Military
Commander's Age:	39 years
Commander's Flying Experience:	2,810 hours (of which 128 were on type) Last 90 days - 77 hours Last 28 days - 30 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft, although operated by the RAF, was on the civil register and therefore subject to investigation under the *Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996*. The RAF also instigated a 'Unit Inquiry'.

The aircraft landed on Runway 13 at RAF Valley and was taxiing to park on the northern dispersal to disembark a passenger with the engines running. Fencing had been erected on the right (northern) side of the northern taxiway to protect an area where there was work in progress. ATC warned the crew of the fencing and the possible need to offset the aircraft to the left of the centreline on that part of the taxiway. Both the student, in the left seat, and the handling instructor in the right seat, however, assessed that maintaining the centreline would keep the aircraft clear of the fence. The student diverted his attention within the cockpit and the instructor concentrated on maintaining the centreline. Shortly afterwards their attention was drawn to a rumbling vibration which they initially assessed as being due either to an uneven taxiway surface or a problem with the landing gear. As they looked to their right however it became clear that the right wing had, for a distance of approximately 5 m, contacted the fence line.

The instructor taxied the aircraft clear of the fence, continued to the dispersal, parked the aircraft and shut down the engines. Inspection revealed significant damage to the outboard section of the right wing.

SERIOUS INCIDENT

Aircraft Type and Registration:	Fokker F50, OO-VLF
No & Type of Engines:	2 Pratt and Whitney Canada PW 125B turboprop engines
Year of Manufacture:	1991
Date & Time (UTC):	15 January 2009 at 1008 hrs
Location:	Ronaldsway Airport, Isle of Man
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 2 Passengers - 20
Injuries:	Crew - None Passengers - None
Nature of Damage:	No reported damage
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	37 years
Commander's Flying Experience:	6,500 hours (of which 4,950 were on type) Last 90 days - 120 hours Last 28 days - 9 hours
Information Source:	AAIB Field Investigation

Synopsis

Selection of a high reverse power setting while landing on a wet runway, in a crosswind which was close to the maximum demonstrated limit, resulted in the aircraft departing from the paved surface. No injuries or damage resulted.

History of the flight

Following a routine flight from London City Airport, the aircraft made an approach to Ronaldsway, Isle of Man Airport. The commander was the pilot flying and had briefed for a radar vectored ILS approach to Runway 26. The brief included the surface wind and that the runway was wet.

At 1005 hrs the aircraft was cleared to land and ATC reported that the surface wind was from 180° at 24 kt. The commander disconnected the autopilot and continued to fly the approach manually with a crab angle of 20° ie aircraft heading 245° versus runway centreline of 265°. At about 50 ft agl, the commander began to decrab the aircraft by applying right rudder and left (into wind) aileron. The aircraft touched down on a heading of 253°, bounced and, as it landed a second time, the commander applied and held full right rudder. He was aware that the aircraft immediately began tracking towards the left side of the runway and thought that he had selected the engines to ground idle power as well as applying the wheel brakes. The aircraft continued to deviate from the runway centreline and the commander recalled that he then selected maximum reverse power

shortly before the aircraft departed the left side of the paved surface. The aircraft came to a stop with the nose and left main gear off the paved surface. The aircraft's speeds during final approach and at touchdown were consistent with its weight, configuration and the weather conditions.

After the aircraft came to a stop the commander made a brief call on the intercom to the Senior Cabin Crew Member (SCCM), who confirmed that everyone in the cabin was secure and unharmed. The commander then attempted to taxi the aircraft back onto the paved surface; however, the left main landing gear would not move and the aircraft slewed further to the left, away from the runway. The Airfield Fire and Rescue Service (AFRS) Watch Officer had observed the aircraft in difficulties and the AFRS deployed to provide assistance and fire protection. ATC advised the commander to call the AFRS on 121.6 Mhz. Once two-way communications were established, the AFRS advised the commander that shutting the engines down was the most sensible course of action, as the aircraft was becoming increasingly bogged down. The commander accepted this advice and shut the aircraft down. The passengers were deplaned using the rear right exit which had remained above the paved runway surface (see Figure 1). Several passengers commented that the height of the door sill above the runway caused difficulties as they jumped down from the aircraft.

Weather conditions

The 0950 METAR meteorological observation (recorded 18 minutes before the incident) reported a surface wind of 180°/26 kt, 8 km visibility with few clouds at 700 agl.

At the time of landing, the airport Automated Weather Observation System (AWOS) showed a two minute average wind of 170°/25 kt, with a maximum gust in the previous ten minutes of 34 kt. The maximum gust recorded in the ten minutes following the incident was 37 kt.

Figure 1

Aircraft and runway examination

Examination of the aircraft confirmed that there were no defects with the braking and anti-skid systems. Tests confirmed that both the nosewheel steering and rudder operated freely through their operating range. No faults were recorded on the Electronic Engine Controls (EECs), which indicated that there had been no disparity recorded between the commanded and achieved engine power.

Runway 26 had recently been resurfaced and fully grooved. A surface friction test completed on 26 December recorded an average friction coefficient of 0.9, which is greater than that required. This was verified by a friction test carried out on the day after the incident. No abnormalities were observed on the surface of the runway and there was no evidence of the application of heavy braking or anti-skid operation by the aircraft.

Recorded information

The aircraft was fitted with a 30-minute, four-channel Cockpit Voice Recorder (CVR) and a solid-state Flight Data Recorder (FDR). Both were successfully downloaded at the AAIB and captured the incident landing. The FDR contained just over 25 hours of operation and was time-aligned with the CVR recording.

The data showed that the approach to the Isle of Man was stable, with an ATC "WINDCHECK" 35 seconds prior to touchdown of "180, 24 KNOTS". The aircraft touched down at an indicated airspeed of 91 kt on a heading of 253°M. Over the next few seconds, the heading increased and full right rudder was applied, together with control wheel inputs into wind. Just over two seconds after touchdown, the engine torque and propeller rpm on both engines increased, suggesting that reverse was engaged. Analysis of these rpm and torque values by the aircraft manufacturer confirmed that they corresponded to maximum reverse power.

Five seconds after touchdown, at an indicated airspeed of 77 kt, the commander handed control of the control column to the co-pilot, which was acknowledged. During the next three seconds, the control wheel position moved from commanded left roll to commanded right roll. The maximum recorded control wheel position was +56° [1], as the indicated airspeed reduced through 63 kt.

As the speed continued to decrease, the control wheel was returned to command left roll and the rudder position remained at full right deflection, as it had been since the beginning of the touchdown. Fifteen seconds after touchdown, the aircraft departed the left side of the paved surface, signified by an increase in normal acceleration and slight roll to the left. Groundspeed was not recorded and recorded airspeed is not accurate below 50 kt, so the speed at which the aircraft left the runway could not be established precisely. Approximately six seconds after departing the runway, the aircraft stopped on a heading of 258°M.

After stopping, an attempt was made to return the aircraft to the paved surface. FDR data showed that the torque on the left engine increased but with no associated change in heading, until there was a further increase in torque on this engine together with a torque increase on the right engine. At this point, the aircraft swung further to the left, signified by a decrease in heading from 258°M to 230°M over a seven second period. Just less than four minutes after the aircraft came to a stop, both engines were shut down and FDR and CVR recordings ceased.

Footnote

[1] Maximum range of control wheel deflection recordable on FDR is ± 122° but maximum in-flight range from this flight was +34° to -31°. Positive control wheel position corresponds to commanded right roll.

The number of FDR parameters recorded limited the analysis that could be performed on the runway excursion. Nosewheel steering commands and positions, braking, drift and localiser deviation parameters were not recorded.

Commander

Following the incident, the commander stated that he had selected ground idle after touchdown and, once he realised the aircraft was going to depart the paved surface, selected maximum reverse power. Following review of the data, which indicated that maximum reverse was selected just over two seconds after touchdown, the commander commented that if the data was correct then that was not what he had intended to happen as that was not the standard operating procedure (SOP). He recalled seeing the power levers at reverse once the aircraft had come to a stop and thought he had selected reverse just before entering the grass. The commander considered that the airflow effects of reverse power could have caused the directional control issues.

Operations manual

The operator's Operations Manual Part B Section 2.12.1 states:

> *'The rudder is not effective for directional control with reverse'*

Airflow effects

Following touchdown, directional control at high speed is mainly provided by airflow over the rudder. The manufacturer commented that high reverse power disrupts the airflow around the rudder, which may then become less effective. The manufacturer further considered that the main use of aileron in a crosswind was to prevent the upwind wing from lifting. However, in this case the use of reverse power effectively destroyed the lift produced by the wing, therefore the aileron had no effect.

The amount of reverse power generated is determined by propeller blade angle, engine torque and rpm. The engine control system is designed to ensure the engine generates sufficient torque to turn the propeller at the commanded rpm. The torque required is dependant on local airflow around the propeller. In a strong crosswind the fuselage alters the airflow into the downwind propeller. This can lead to a difference in the torque developed by each engine.

Limitations

The manufacturer's Aircraft Operating Manual (AOM) states that the recommended maximum crosswind component for takeoffs and landings on runways with '*good*' braking action is 33 kt.

Manufacturer's AOM operating technique

Landing (AOM 5.05.01 page 3 version 01 issue 009)

> *'Initially keep the aircraft straight with the rudder*
>
> *Select ground idle with uninterrupted movement*
>
> *Use reverse when required.*
>
> *NOTE*
>
> *1 Do not select ground idle until nose wheel is on the ground.*
>
> *2 The rudder is not effective for directional control with reverse.*
>
> *At approx 60kt when PNF calls "60 kt" cancel reverse and release the control column.'*

Crosswind landing

> *'-On final approach maintain runway alignment by crabbing into the wind*
>
> *-When crossing the threshold, apply rudder to align aircraft with the runway centre line and bank into wind to counteract drift (3deg – 5deg bank angle)*
>
> *-Do not delay touchdown after decrabing is complete*
>
> *-After landing keep straight initially with rudder and counteract the tendency of the upwind wing to lift by decisive use of aileron*
>
> *-If reverse is required, apply reverse slowly and symmetrically. If problems with directional control reduce reverse or select ground idle.'*

Worldwide accident data 1995-2008

Statistics provided by the UK CAA show that runway excursions accounted for 417 commercial aircraft accidents, resulting in major or substantial damage, between 1995 and 2008. Around 24% of all turboprop accidents in this period were runway excursions. Turboprops had a greater risk of excursions off the side of a runway, whereas jet aircraft had a higher risk of overruns.

Analysis

The approach was flown in challenging conditions, with a crosswind which was close to the aircraft's recommended limit for landing on a runway with good braking action. The two minute average surface wind, which is that commonly quoted by ATC, was within limits. However, the data did show the possibility of wind gusts up to or slightly beyond the maximum recommended crosswind limit, although the fidelity of this data was insufficient to match it exactly to the aircraft responses. The aircraft's heading during the initial touchdown was 12° to the left of the runway centreline. Although the aircraft began to turn to the right, it never achieved the runway heading. The divergence increased slightly during the bounce, as the rudder was centralised, before correcting sharply to the right as right rudder was reapplied. This correction appears to show that, at this point, the rudder was effective and was capable of countering the crosswind. At the same time, the FDR torque and propeller rpm recordings indicated the application of high levels of reverse power. When the reverse power reached a maximum level, the heading decreased over the following three seconds. This heading change was consistent with the manufacturer's expected response of the aircraft in a crosswind, when the use of high levels of reverse power disrupts the airflow over the rudder.

ACCIDENT

Aircraft Type and Registration:	Cessna 172S Skyhawk, G-UFCG
No & Type of Engines:	1 Lycoming IO-360-L2A piston engine
Year of Manufacture:	2003
Date & Time (UTC):	12 October 2009 at 0925 hrs
Location:	Newtownards Aerodrome, Belfast
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Propeller tips, firewall damage and some distortion to cockpit floor
Commander's Licence:	Student
Commander's Age:	64 years
Commander's Flying Experience:	44 hours (of which 8 were on type) Last 90 days - 15 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

After a dual check circuit and landing, assessed by his instructor as good, the student pilot flew his first solo cross-country exercise. The weather was described as good and the wind was reported as less than 5 kt when he returned to the circuit at Newtownards. The pilot reported that, following a shorter-than-usual base leg, he was too high on finals and elected to lose height, with the engine at minimum power, rather than go-around. Following a touchdown on the main wheels and near the runway numbers, the aircraft bounced; a situation that the student had not experienced before. The aircraft was observed to start to oscillate in pitch, initially nose-down. The second, harder touchdown also resulted in a bounce. The student considered going around but elected not to due to concern about his low airspeed. Further pitch oscillations ensued before he brought the aircraft under control, slowed to a stop and then backtracked Runway 22 to the apron. His instructor, who had been watching the landing, considered that the student's initial flare had not arrested the rate of descent completely, resulting in an early touchdown and the first bounce. Once back on the apron, an inspection revealed damage to the propeller, firewall and cockpit floor.

ACCIDENT

Aircraft Type and Registration:	CASA 1-131E Series 1000 Jungmann, G-JUNG
No & Type of Engines:	1 ENMA Tigre G-IV-A2 piston engine
Year of Manufacture:	1952
Date & Time (UTC):	24 May 2009 at 1413 hrs
Location:	Staunton Caundle, Dorset
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Fatal) Passengers - 1 (Serious)
Nature of Damage:	Substantial
Commander's Licence:	Private Pilot's Licence
Commander's Age:	63
Commander's Flying Experience:	Estimated 980 hours Last 90 days - Unknown Last 28 days - Unknown
Information Source:	AAIB Field Investigation

Synopsis

The aircraft struck telegraph cables during an attempted forced landing following an engine failure. On striking the cables, the aircraft pitched nose-down, struck the ground nose first and pitched over inverted. The pilot was fatally injured and the passenger suffered serious injuries.

History of the flight

The pilot arrived at Henstridge Airfield at around 0930 hrs with the intention of taking some friends flying. He had planned to make six flights; the first three were to be of around 30 minutes duration, followed by two flights of fifteen minutes. He then intended to make a further flight in the aircraft with a regular flying partner.

The pilot conducted a pre-flight inspection of G-JUNG whilst it was in its hangar. Another local pilot who was assisting him checked the fuel level and added about four and a half litres of Avgas to the tank from a plastic container. The pilot and his assistant then moved the aircraft out of the hangar, before attempting to start the engine by hand swinging the propeller. This proved difficult and it took some 40 minutes until it eventually started. The pilot then taxied the aircraft across the runway to a grassed area outside the clubhouse which was used for changing over the passengers between flights.

The first two flights were conducted with a 'running change' ie the engine was kept running as the passenger

in the aircraft disembarked and the next passenger boarded. Following the second flight the pilot parked the aircraft by the fuel bowser; the pilot's assistant then refuelled G-JUNG with 63 litres of Avgas. He believed that he had filled the tank to full, as he observed fuel coming out of the drain mast on the bottom of the fuselage. A bucket was placed under the drain mast and the pilot and four of his passengers then had lunch, which took around an hour. When they returned, fuel had ceased flowing from the drain mast. It was reported that around two litres of Avgas had collected in the bucket.

The engine was hand-swung and, on this occasion, it started easily. The pilot completed a third uneventful flight of about 30 minutes duration before another 'running change' of passenger, after which the aircraft took off from Runway 07. The pilot made a climbing right turn, departing to the south-west. From passenger interviews, it is believed that the previous flights had been flown at a height of around 1,000 ft.

During the accident flight the passenger recalled looking forward at the 'float-type' fuel gauge, which she described as "bouncing up and down". Then, without warning, the engine ran down smoothly and stopped. The aircraft turned right, towards what the passenger described as a "big green lush field." The pilot transmitted a MAYDAY on the Henstridge frequency, reported the engine failure and gave his position as somewhere west of Stalbridge. He placed the aircraft in a glide and made an approach to a field near the village of Staunton Caundle. The passenger commented that the pilot appeared very calm and in control of the situation. As they neared the ground the passenger saw a set of telegraph cables and realised that they would not clear them. The aircraft struck the cables, causing it to decelerate rapidly and pitch nose-down. It impacted the ground nose first and then pitched over inverted.

Immediately on hearing the MAYDAY, the Air/Ground operator at Henstridge alerted the emergency services by telephone. A number of aircraft departed Henstridge to search for G-JUNG. It was located by the pilot of one of these aircraft after a short while and he passed the GPS coordinates of the accident site to the emergency services.

The pilot received instantly fatal injuries. The passenger, who had suffered serious spinal injuries, was trapped in the aircraft and had to be cut free by the emergency services before being airlifted to hospital by the Dorset Police Air Support Unit helicopter.

Weather

The METAR for Yeovilton (10 nm north-west of the accident site), recorded at 1350 hrs, gave the weather as: wind from 310° at 5 kt, greater than ten kilometres visibility, cloud overcast at 2,900 ft, temperature 19°C, dewpoint 14°C and a QNH of 1013 millibars.

Pilot's experience

The pilot had owned G-JUNG for over twenty years and as well as some flying on a range of other aircraft types, he is reported to have had several hundred hours experience on the accident aircraft. It was not possible to establish fully his recent flying experience, however, he had flown three flights on the previous day and a further three flights earlier on the day of the accident, all in G-JUNG.

The pilot had held a UK Private Pilot's Licence since 1975. His Single Engine Piston rating was valid until 13 August 2010. There was no record of the pilot holding a valid Radio Licence at the time of the accident.

Medical and pathological information

The pilot held a current Class 2 medical, with no restrictions. It was valid until 3 June 2009. Post-mortem examination revealed that he was a fit and healthy male who had suffered a single, significant head injury consistent with his head having struck the ground as a result of the aircraft pitching over inverted. Although he was wearing a helmet, it could not prevent the fatal injury.

The passenger suffered multiple cervical spinal fractures, requiring several weeks of hospitalisation and a prolonged recovery. The passenger had been firmly strapped in to the aircraft and was wearing a helmet designed to fit an aviation headset.

Aircraft description

The CASA 1-131E Jungmann was built under licence in Spain and was based on the original Bucker Bu-131 Jungmann. The construction of these Spanish-built aircraft began in 1941, with the aircraft then serving in the Spanish Air Force. The last CASA-built aircraft was manufactured in 1963.

G-JUNG was built in 1952 and was fitted with an ENMA Tigre G-IV-A2 in-line four-cylinder, air-cooled, piston engine. The engine had recently been fitted with an electric starter motor. This required an external power source and could only be used to start the engine with the engine cowls open. It was not routinely used to start the engine.

The fuel system incorporates a single fuel tank with a capacity of 82 litres. The tank is mounted in the forward fuselage, above and behind the engine. The tank has two outlets which can be selected by the pilot via a three-position selector, labeled 'CLOSED', 'AEROBATIC' and 'MAIN AND RESERVE'. When selected to MAIN AND RESERVE, fuel is fed from the lowest point of the tank, whereas in AEROBATIC, fuel is fed via a 'flop' tube which moves in response to 'g' forces, thus ensuring that the engine continues to be fed with fuel during aerobatic manoeuvres. Due to the height of the 'flop' tube inlet within the tank, the AEROBATIC setting should only be used when the fuel quantity is above approximately 20 litres. The fuel consumption of the engine is between 30 and 40 litres per hour, depending on power setting.

Fuel from either source is drawn to the engine by an engine-driven fuel pump, and is supplied from the fuel tank, via the fuel selector in the rear cockpit. The engine-driven fuel pump should produce a pressure of 150 gr/cm^2 (2.13 psi) at idle and 300 gr/cm^2 (4.26 psi) at 1,700 rpm. In the event of a failure of the engine-driven pump, a manually operated 'wobble' pump, located at the fuel selector, can be operated by the rear pilot to pump fuel to the engine.

The fuel quantity is indicated by a float-type gauge. The gauge is mounted on top of the fuel tank at the front of the aircraft. It consists of a float, which moves within an outer cylinder mounted inside the fuel tank. The float is connected to a bar which protrudes from the top of the fuel tank into a glass tube, enclosed by a cylindrical metal frame. The float moves in relation to the fuel level in the tank and the bar then moves respectively within the glass tube. The top of the bar is painted black. The height of the bar within the tube provides an indication of the quantity of fuel in the tank. When the tank is empty, the bar is out of sight. With the tank full, the bar is fully visible within the tube. For intermediate quantities, the fuel level is 'gauged' by reference to red lines marked on the metal cylinder.

A combined fuel and oil pressure gauge is installed in the rear cockpit. The fuel pressure gauge gives an indication of the fuel pressure at the engine-driven pump. The pressure is indicated in kg/cm^2 on a scale of 0 to 0.5 kg/cm^2 (7.11 psi) with 0.05 kg/cm^2 graduations.

The oil pressure gauge gives an indication of oil pressure in the engine oil system and is indicated in kg/cm^2. The gauge has a scale of 0 to 10 kg/cm^2 (142.23 psi) with 1 kg/cm^2 graduations.

A single drain mast on the underside of the aircraft is used to drain away fluids from the engine and fuel system. There are four fuel drains that come together in the drain mast, from various parts of the aircraft: the fuel vent, the fuel filler cap area, the fuel pump housing and the inlet manifold.

The aircraft was equipped with a VHF radio, mounted in the aft cockpit, to the left of the magneto switches.

Accident site (Figure 1)

The aircraft had come to rest inverted just inside the hedgerow of a field of light crops to the north of the village of Stourton Caundle. The only ground mark had been made by the spinner of the propeller, which indicated an impact angle of 45° beyond the vertical.

A set of telegraph cables ran alongside the Stourton Caundle to Stalbridge road; this road ran parallel to the hedgerow boundary of the accident field. The cables consisted of several small wires wrapped in a black insulation material and supported by a steel rod; the diameter of the cable was 10 cm. Telegraph poles, spaced at 50 m intervals, supported two sets of the telegraph cables which were mounted on the poles at a height of 6.5 m (22 ft) above the ground. The cables were in parallel, with one wire in front of the pole and the other behind. When struck by the aircraft, the telegraph cables had separated from the pole closest to the accident site; this pole had remained standing. The telegraph poles, both north and south of the accident site, had been uprooted. The cables had stretched to the extent that they were found lying on the hedgerow that bounded the accident site field. There was visible damage to the cable insulation and the internal wires.

The aircraft's lower left wing and aileron had become distorted with damage to the left front upright between the upper and lower left wing, and damage to one of the wing bracing wires. Black marks on the left lower wingtip and the damage to the structural upright were consistent with contact with the telegraph cables. There was also transfer of telegraph cable insulation material onto the number 1 exhaust stub of the engine.

Both main landing gears had contact damage and insulation material transfer which matched the damaged areas on the telegraph cables.

There was very little smell of fuel on the accident site. Fluid was leaking from the main landing gear shock struts which had been damaged by contact with the telegraph cables. There was some oil staining on the lower engine cowls, and oil had leaked from the engine whilst it was inverted.

Once the aircraft was upright, it became apparent that the fuel gauge mounted on top of the fuel tank had penetrated into the ground and the glass inside the gauge had fractured. Digging down into the ground around the gauge revealed a faint smell of fuel, but there was no evidence of significant fuel leakage. The vegetation around the fuel tank was flattened but had not suffered the characteristic 'burning' associated with a fuel leak. The site was visited on a few occasions over the weeks

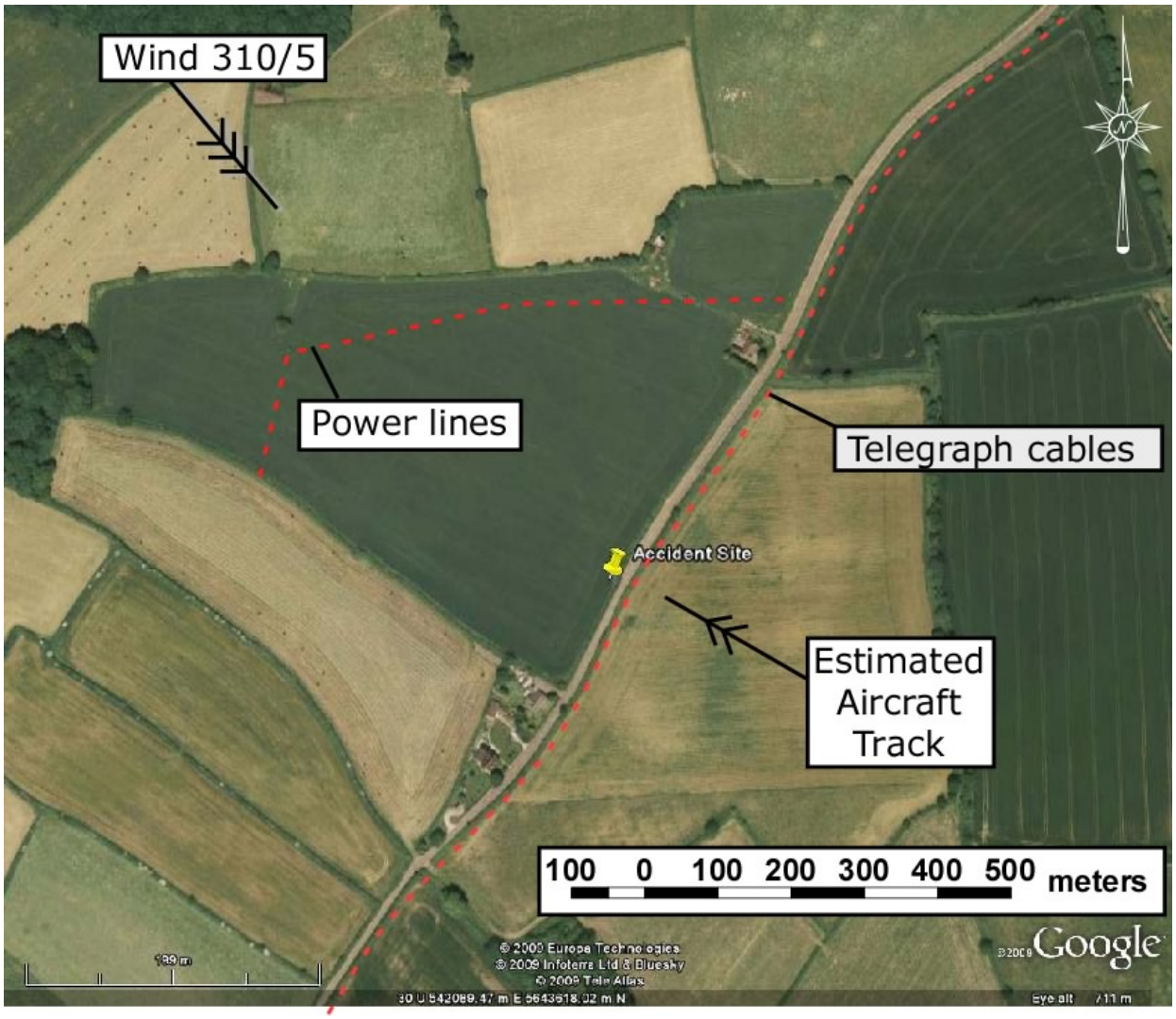

Figure 1

Accident location

following the accident and the vegetation remained unaffected. The fuel filler cap was found securely fitted.

The flying controls were inspected and found to be correctly installed, continuous and operated in the correct sense.

The upper wing structure had suffered damage as a result of the aircraft inverting. The upper wings had compressed against the top of the fuselage, with associated buckling of the wing to fuselage support struts and bending of the lower wings.

The propeller was undamaged, indicative of an engine that had stopped prior to the accident.

The damage to the aircraft was consistent with the aircraft being in a left sideslip as it approached the accident field, with the aircraft's first contact with the telegraph cables being at the lower left wingtip. This had caused the aircraft to yaw rapidly to the left, after which the cables caught on the main landing gear. This would have decelerated the aircraft, and once the stretch of the cables had reached their limit, its nose would have pitched down so that the aircraft struck the ground in an

attitude beyond the vertical. The aircraft then continued to pitch over into the inverted position.

Aircraft examination

All the fuel lines on the aircraft were inspected for condition and security; no defects were found. All the fuel unions were tight and the fuel lines had not ruptured. The fuel tank was still intact and although its upper surface had been distorted during the accident, it had not ruptured. The tank was almost empty, with only 750 ml of fuel remaining in the bottom of the tank. The fuel pickups within the tank were free from obstruction and the tank was clean, with no debris or foreign objects. The fuel selector was found selected to the MAIN AND RESERVE position and operated correctly, as did the 'wobble' pump.

The engine controls were connected and continuous, the throttle was full open, the mixture was in rich, the carburettor heat was set to COLD and the magneto switch was in the OFF position.

A test of the fuel gauge showed that it would indicate the fuel level, although at fuel levels below about 20 litres, the float would occasionally stick. Above this amount, the float was free to move and when disturbed would return to a level representative of the fluid level in the tank. A test of the fuel pressure and oil pressure gauges was satisfactory.

Engine examination

The engine was removed from the aircraft and sent to a specialist organisation for testing and detailed examination. It was placed on an engine test bed and was fitted with its original propeller. Several attempts were made to start the engine using the electric starter that was already fitted to engine, but the engine proved difficult to start. It was eventually started, but could only be kept running by pumping the throttle and operating the electric fuel pump on the engine test rig.

During this short engine run there were no signs of fuel leakage from the engine-driven pump or the manifold fuel drain. For the next engine run the engine-driven pump was bypassed and the fuel supply from the engine test rig was connected direct to the carburettor fuel inlet. Once the fuel was selected on, fuel started to leak out of the fuel manifold drain, indicative of the carburettor flooding. The engine started after only a couple of attempts with the electric starter and the fuel leak from the fuel manifold then stopped.

The engine ran normally and during the run the magnetos were checked and both were operating satisfactorily. The fuel consumption measured with the engine at 1,250 RPM was about 18 litres/hour. When full throttle was applied, oil started to leak out of the oil filter housing and smoke emanated from the oil breather, indicative of the crankcase becoming pressurised. The engine run was stopped and the engine was strip examined.

Prior to the engine examination, the compressions on the four cylinders were checked and were found to be low for cylinders 1, 3 and 4, with no compression on cylinder 2. A subsequent examination revealed that three of the four piston rings for cylinder 2 were seized. All four cylinders had signs of wear on their piston rings and in their cylinder barrels. The pistons and valves all exhibited carbon deposits consistent with the age of the engine.

The magneto timing was found to be correct, and the condition of the plugs was satisfactory. The oil filter was removed and found to be clean.

The fuel pump was removed from the aircraft. Its driveshaft was still intact and the pump was free to move. When tested it only produced 1.5 psi at full rpm, whereas it should produce 4.26 psi. An examination of the pump identified wear on the rotating blades and also on the bush at the top of the pump.

The carburettor was removed and during its removal the fuel filter was checked and found to be intact and clean. The unit was then subjected to a test of the float and needle assembly. This test was carried out at both a normal fuel inlet pressure and at a higher fuel pressure; in all cases the float operated as expected and the needle valve reseated, preventing flooding of the carburettor. A subsequent examination found no anomalies with the carburettor, although the needle valve showed signs of wear consistent with its age.

Aircraft and engine history

The aircraft had accumulated a total of 2,754 flying hours. The fuel system had been modified in 2001 by the fitment of a wobble pump and a fuel selector from a Christian Eagle aircraft.

The engine had completed 1,734 hrs and was last overhauled by the Spanish Air Force in 1984. Since then it had completed 436 hours.

The aircraft was maintained by the owner and was subjected to an annual Permit to Fly renewal inspection. The last inspection had been carried out on the 19 May 2009 in preparation for renewal of the permit for the next year. During this inspection the compressions were not checked using compression test equipment and so no figures were recorded, although, the compressions were 'felt' whilst turning the engine over via the propeller. An LAA inspector carried out the inspection in accordance with the Permit to Fly renewal schedule, which included an engine run. The aircraft passed the inspection for its permit renewal; however a permit renewal test flight had not yet been carried out. The current Permit to Fly was valid until 30 June 2009.

As the aircraft operated under a Permit to Fly, there was no specific time between overhaul (TBO) specified for the Tigre G-IV engine. In Spain, the recommended TBO for the engine is 450 hours. When the aircraft was operated by the Spanish military, engine overhauls were carried out in the region of every 200 to 300 hours.

Fuel tests

The 750 ml of fuel drained from the bottom of the fuel tank on G-JUNG was taken to a specialist laboratory, along with fuel samples taken from the bowser at Henstridge airfield. The sample from G-JUNG was consistent with Avgas 100LL, although it failed on vapour pressure, distillation 10%, residue and existent gum – all of which would be expected from a sample taken from the remains at the bottom of a fuel tank.

The Henstridge fuel bowser samples complied with the specification for Avgas 100LL, with no evidence of contamination.

Fuel supply checks

Eyewitnesses stated that G-JUNG was refuelled after the second flight of the day. A fuel receipt for 63 litres of Avgas was in the airfield records. Although no time was written on the receipt, a comparison of the arrival and departure times for aircraft that had refuelled before and after G-JUNG suggested that the eyewitness timing was correct.

The airfield fuel bowser was owned by a major fuel supplier. The accuracy of the dispensing equipment

was confirmed at six-monthly intervals by a specialist contractor. The most recent calibration and maintenance visit was on 20 April 2009. At the end of this visit three samples of 20 litres each were drawn with no calibration errors. The calibration certificate was valid until October 2009. On 27 May 2009, an AAIB inspector observed two litres of Avgas being dispensed into a calibrated container. Although not as accurate as the six-monthly check, this would have shown if any gross errors had developed; no calibration errors were detected.

Pilot's choice of field

The field chosen by the pilot for the forced landing was of adequate size, in the light wind conditions prevalent, with a gentle upslope and low crop with a solid soil base. The only drawbacks to this field were the telegraph cables in the undershoot and a set of power lines transecting it 270 m further into the field, relative to the direction of approach.

Forced landings involving wire strikes

UK CAA occurrence databases were interrogated for wire strikes following engine failures to General Aviation fixed wing aircraft. A total of 14 events in the 19 years preceding this accident were found. This included three incidents during practice forced landing training which are included for completeness.

The accidents were grouped based on the worst injury sustained. Of these 14 accidents, five had resulted in no injuries and six in minor injuries at worst. One accident resulted in serious injuries and two involved fatalities.

Including this accident, a total of four accidents in 19 years involving forced landings into wires have resulted in serious or fatal injuries.

Analysis

General

The primary cause of the accident was the aircraft colliding with telegraph cables whilst carrying out a forced landing following an engine failure.

Engineering aspects

The engine did not stop because of a catastrophic failure, but one or more of a number of other possible factors may have been the cause.

When the engine was tested, the fuel pump was not able to deliver enough pressure to keep the engine running. It is possible that the engine had stopped due to insufficient fuel pressure caused by the wear in the fuel pump. Although the pilot could have theoretically kept the engine running by operating the 'wobble pump', this would have been impractical at such a low altitude. The difficulties encountered in starting the engine on the morning of the accident flight were most likely as a result of the low cylinder compressions.

At the accident site there was a lack of a smell of fuel and only 750 ml of fuel was drained from the intact fuel tank, leading to the possibility of engine stoppage from fuel starvation due to insufficient fuel on board the aircraft. However, the tank had been reportedly filled to full before the flight prior to the accident flight, and bowser records confirm that at least 63 litres of fuel were uplifted.

The reported fuel leak from the fuel drain shortly after refuelling could have been due to excess fuel in the filler cap and the loss of excess fuel from the tank through the vent line. However, this leak was not sustained and only two litres of fuel drained out over a period of about an hour. A siphon from the vent line would only

be sustained whilst the rigid vent line remained in fuel, so it would have stopped as soon as it was exposed to air. Therefore, two litres is a reasonable volume to have come from the vent. Had the observed fuel been draining from the inlet manifold as a result of flooding of the carburettor due to an unseated needle valve, then the leak would probably have been sustained for longer and more than two litres of fuel would have been lost in an hour.

The total time that the engine was running, following the refuelling from the Henstridge fuel bowser, was estimated to be about one hour, and in that time the engine would only have consumed about 30 to 40 litres of fuel. One possible explanation for the apparent lack of fuel is an in-flight fuel leak, but no evidence of this was found. Also, had all of the fuel leaked out in flight then the fuel gauge would not have been readable by the passenger, as the black band would not have been visible. The description by the passenger of the fuel gauge "bouncing up and down" immediately prior to the engine stoppage suggests that there was sufficient fuel on board.

The lack of fuel at the accident site could be explained by the possibility that the fuel leaked into the ground through the fractured fuel gauge, effectively injecting the fuel into the ground. However, when the soil around the area in which the fuel gauge was imbedded was disturbed, there was only a faint smell of fuel. It is possible that by this time much of the fuel had leached away into the soil.

The magneto switches were found in the OFF position, but other engine controls and the fuel selector were in positions that were not consistent with the expected positions when an engine is shut down in preparation for a forced landing.

The weather conditions at the time were such that carburettor icing could have been a possibility with moderate icing at cruise power and serious icing at descent power, Figure 2. The carburettor heat control was found in the COLD position.

Operational aspects

The weather conditions for the flight were ideal and the pilot was properly licensed, experienced and current on the aircraft type. The status of the pilot's radio licence is not considered relevant to this accident.

Wires are a recognised hazard to aircraft conducting forced landings. Telegraph and some power cables in the UK are mounted on wooden poles treated with a preservative, giving them a dark brown colour. In addition, they are often positioned in hedgerows and field boundaries, where the lack of contrast with natural flora makes them harder to see. Wire strikes during forced landings are, however, rare. In the UK, records show that only four such events have resulted in serious or fatal injuries in the last 19 years.

Conclusion

The accident was caused by the aircraft striking telegraph cables during an attempted forced landing following an engine failure. No single cause could be determined for the engine stopping. The hazards of unplanned off airfield landings are considerable, however, wire strikes during forced landings are fortunately relatively rare occurrences and therefore no Safety Recommendations are considered appropriate.

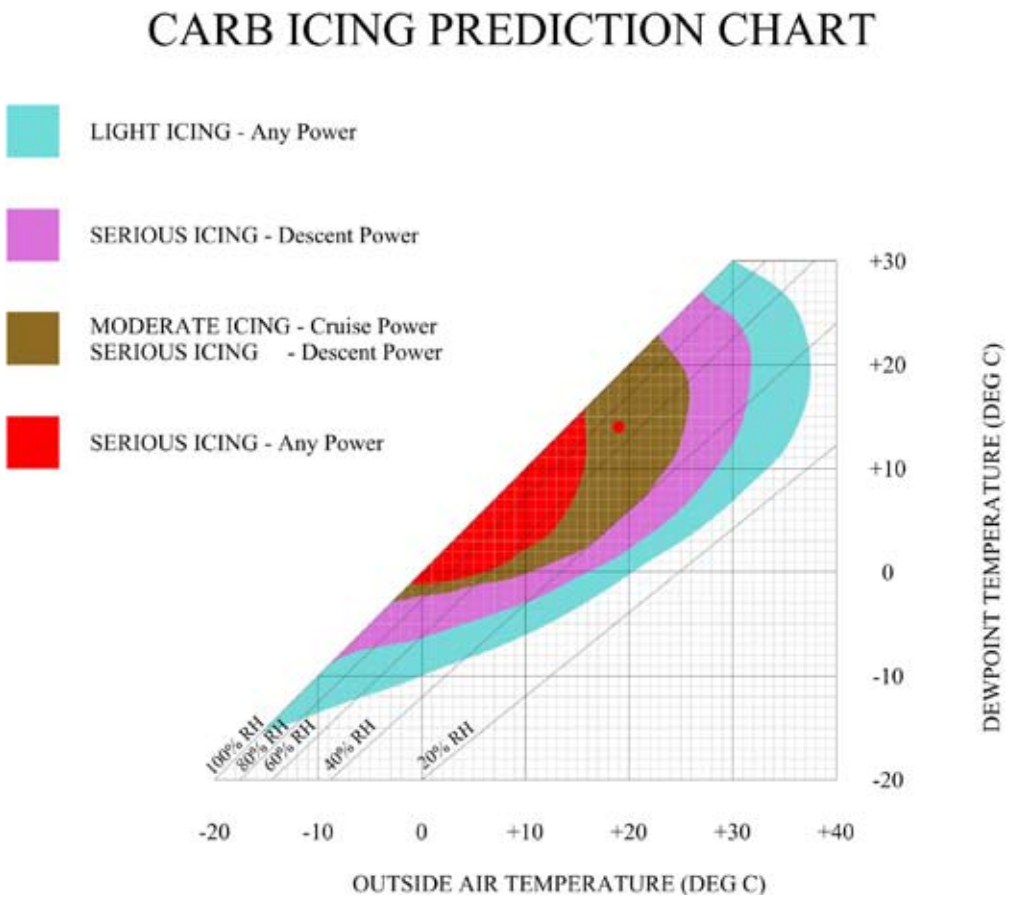

Figure 2

Carburettor icing prediction chart

SERIOUS INCIDENT

Aircraft Type and Registration:	i) Cessna 172M Skyhawk, G-BTMR ii) Diamond DA 42 Twin Star, G-PETS
No & Type of Engines:	i) 1 Lycoming O-320-E2D piston engine ii) 2 Thielert TAE 125-01 piston engines
Year of Manufacture:	i) 1975 ii) 2006
Date & Time (UTC):	26 October 2009 at 1215 hrs
Location:	Bagby Airfield, North Yorkshire
Type of Flight:	i) Private ii) Commercial Air Transport (Non-Revenue)
Persons on Board:	i) Crew - 2 Passengers - None ii) Crew - 1 Passengers - None
Injuries:	i) Crew - None Passengers - N/A ii) Crew - None Passengers - N/A
Nature of Damage:	i) None iI) None
Commander's Licence:	i) Private Pilot's Licence ii) Airline Transport Pilot's Licence
Commander's Age:	i) 71 years ii) 53 years
Commander's Flying Experience:	i) 620 hours (of which 351 were on type) Last 90 days - 19 hours Last 28 days - 6 hours ii) 6,471 hours (of which 213 were on type) Last 90 days - 62 hours Last 28 days - 41 hours
Information Source:	Aircraft Accident Report Forms submitted by the pilots

Synopsis

In the early stages of an aircraft's landing roll on Runway 06, the pilot observed another aircraft enter the grass runway and taxi along it in the same direction. The pilot of the landing aircraft applied maximum braking and the other aircraft vacated the runway on to a parallel taxiway. The crew in the taxiing aircraft were unaware of the landing aircraft until it drew level with them, still on the runway. The taxiing aircraft had landed on the reciprocal Runway 24 earlier in the day and the crew were taxiing for a departure from the same runway. They were also unaware that they were not receiving or transmitting radio calls until they checked their headset connections and recycled the radio.

Background

Bagby is an unlicensed airfield which has an air-to-ground (A/G) radio which is not always manned. Its main grass runway, orientated 06/24, is 710 m in length and the upslope on Runway 06 is 2.6%. The airfield's details on its website include the comment:

> *'in light and no wind conditions locals almost invariably land uphill and take off downhill….. Therefore be aware of mixed direction traffic.'*

The surface wind on the day was estimated to be from 300° – 330° at 8 kt and the conditions were CAVOK.

G-BTMR

G-BTMR flew into the airfield with two pilots on board, landed on Runway 24 and parked in the maintenance area on the north side of the airfield. About three hours later, the two pilots reboarded the aircraft, swapping seats and changing over the headsets, and taxied for a departure from Runway 24. The commander of the aircraft, in the right seat, operated the radio and, unable to obtain a radio check on the A/G radio frequency, made a blind call to advise other aircraft that they were backtracking along the Runway 24. He received no reply and heard not other radio transmissions. Before crossing the main runway from north to south, both pilots looked for but saw no traffic on Runway 06 and G-BTMR crossed the runway, making a short backtrack before vacating onto the parallel taxiway on the south side. Having travelled about 100 m along the taxiway towards the Runway 24 threshold, both pilots were surprised to see a DA 42 Twin Star, G-PETS, appear alongside them using Runway 06. They recycled the radio connections and established contact with the crew of the other aircraft.

G-PETS

The pilot of G-PETS reported that he was landing on Runway 06 and approximately 50 m into the ground roll, at an airspeed of about 60 kt, when he observed G-BTMR enter the runway from the north side at a 45° angle away from the runway direction. G-BTMR then taxied along the runway, away from G-PETS, before vacating onto the taxiway on the south side. The pilot of G-PETS applied maximum braking and attempted to call the other aircraft, but received no response. He estimated that the minimum separation between the aircraft was between 50 m and 75 m. The pilot reported making standard joining and circuit radio calls on the Bagby A/G radio frequency during the approach to land. The aircraft's landing, taxi and strobe lights were also ON.

Analysis

It seems likely that G-PETS was already at a very low level, if not actually on the ground, when the pilots in G-BTMR looked towards it. The aircraft may have been obscured by the sloping terrain or by part of their own aircraft structure. The commander of G-BTMR also considered that the lack of response to his radio calls and the expectation that Runway 24 was in use, as it had been earlier in the day, contributed to their failure to see the DA 42.

ACCIDENT

Aircraft Type and Registration:	Cessna F177RG Cardinal, G-AZVP
No & Type of Engines:	1 Lycoming IO-360-A1B6D piston engine
Year of Manufacture:	1972
Date & Time (UTC):	25 October 2009 at 1010 hrs
Location:	Derby Aerodrome, Derbyshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Propeller bent, damage to the underside of the front cowling and the landing gear doors
Commander's Licence:	Private Pilot's Licence
Commander's Age:	59 years
Commander's Flying Experience:	756 hours (of which 620 were on type) Last 90 days - 20 hours Last 28 days - 13 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

When the pilot initially lowered the landing gear, the green 'down-and-locked' light did not illuminate; this was due to a misaligned downlock microswitch on the left main landing gear. The pilot operated the emergency hand pump to manually extend the gear, on landing the nose leg collapsed. No other faults were found with the landing gear system and it is possible that during the manual extension there was insufficient pressure applied to fully lock down the nose leg.

History of the flight

After an uneventful flight the pilot entered the circuit for a landing at Derby. He operated the landing gear lever to lower the landing gear, however the expected green landing gear 'down-and-locked' light on the instrument panel did not illuminate. The pilot recycled the gear lever twice, but on both occasions the light remained extinguished. He then elected to lower the landing gear manually using the emergency hand pump. He operated the pump until there was a firm resistance to the pumping operation; the green light was still extinguished. Having turned onto the final approach, the pilot operated the manual pump again until he felt a firm resistance before concentrating on the approach. The approach and landing were normal and the landing was on the main wheels first. As the nosewheel touched down the nose leg collapsed and the aircraft then came to rest on the runway. The pilot was uninjured and he vacated the aircraft normally.

Landing gear system description

Retraction and extension of the landing gear is accomplished by a hydraulic system integrated with electrical control and indication circuits. There is one hydraulic actuator for the nose landing gear and one actuator that drives a gear system for both main landing gears. Hydraulic fluid is pressurised by an electrically-powered reversible pump and controlled by the landing gear selector mounted on the instrument panel. As the landing gear selector is moved to either the UP or DOWN position, the pump directs hydraulic fluid through a power pack control valve assembly to the landing gear actuators. Mechanical over-centre locks provide down locks for the nose landing gear and when a correctly adjusted landing gear is down-and-locked no hydraulic pressure is required to maintain it in that condition.

In the event of failure of the electrical hydraulic pump an emergency hand pump, located between the two front seats, is operated by the pilot to pressurise the hydraulic system manually to extend the landing gear. When the hand pump is operated, valves within the hydraulic system isolate the electrical pump from the system and therefore only direct the manual pressure to the landing gears for extension. To reinstate the normal hydraulic system requires the manual operation of a relief valve. According to the maintenance organisation that repaired G-AZVP following the accident, to ensure the gear is fully locked down, during manual extension, the hand pump is operated until a resistance is felt, after which it has to be operated further against this resistance until a 'clunk' or 'thud', heard and felt in the cockpit, indicates that the nose landing leg has locked in the down position.

A single green light, mounted on the instrument panel, illuminates when the landing gear is down and locked. Each of the three landing gears has a downlock microswitch operated by a microswitch target. All three microswitches have to be 'made' to complete the electrical circuit to illuminate the light.

Aircraft examination

When the aircraft was lifted from the runway, the nose landing gear was manually locked into position. Subsequent examination of the aircraft, by the maintenance organisation, revealed that the left main landing gear down-and-locked microswitch had moved out of position, thereby preventing the operation of the switch when the gear was locked down. The maintenance organisation examined the landing gear system and found no other defects with the system that would have contributed to the collapse of the nose landing gear leg.

Discussion

The reason for the lack of a green down-and-locked indication, when the pilot initially extended the landing gear, was due to the left main landing gear down-and-locked microswitch being out of position. Anecdotal evidence indicates that over-travel of the downlock microswitch target can push the microswitch out of its rigged position and that this can occur during a heavy or bounced landing.

Due to the lack of illumination of the green gear down-and-locked light, the pilot commenced a manual extension of the gear. The electrically-powered hydraulic system was operating normally, but the action of selecting the manual extension bypassed the electrical pump and the hydraulic pressure required for the gear extension was fully reliant on the pilot's operation of the hand pump. The pilot operated the manual hand pump until he felt resistance and it is likely that at this point the main landing gears had locked into position, but the nose landing gear was not fully locked down. According to the maintenance organisation, to lock fully the nose leg

into position required the operation of the hand pump beyond the initial feeling of the firm resistance, and to then continue pumping until a 'clunk' was heard and felt in the cockpit. In this case the nose leg had extended but had not locked into position, hence the reason the gear collapsed on landing.

ACCIDENT

Aircraft Type and Registration:	Grob G115E Tutor, G-BYUW
No & Type of Engines:	1 Lycoming AEIO-360-B1F piston engine
Year of Manufacture:	1999
Date & Time (UTC):	8 December 2009 at 0924 hrs
Location:	Peterborough (Conington) Airfield, Cambridgeshire
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Both wingtips and the left main landing gear leg
Commander's Licence:	Royal Air Force
Commander's Age:	42 years
Commander's Flying Experience:	2,671 hours (of which 359 were on type) Last 90 days - 45 hours Last 28 days - 25 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Following an uneventful flight, the student pilot began a glide approach toward Runway 28 at Conington Airfield. The approach was normal, however when the aircraft touched down there was a noticeable airframe vibration. The instructor took control of the aircraft and applied full engine power in an attempt to go-around. As the aircraft pitched up it rolled to the right, the instructor applied left aileron to compensate; he later described the aircraft's response as 'sluggish'. The aircraft then rolled and yawed slowly to the left.

It appeared to the instructor that the aircraft was not responding to control inputs, so he aborted the takeoff. The aircraft's left wing then contacted the runway, followed by the left mainwheel and then the right mainwheel, before the aircraft departed the runway surface to the right and came to rest. There was no fire. The student pilot and instructor were uninjured and they were able to exit the aircraft normally.

A subsequent examination of the aircraft did not reveal any pre-existing defects with the flying controls and the airframe vibration was determined to be due to nosewheel shimmy.

ACCIDENT

Aircraft Type and Registration:	Jodel DR1050 Ambassadeur, G-ATGE
No & Type of Engines:	1 Continental Motors Corp O-200-A piston engine
Year of Manufacture:	1960
Date & Time (UTC):	12 June 2009 at 2006 hrs
Location:	Belmont Road, Kilkeel, Co Down, Northern Ireland
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 2
Injuries:	Crew - 1 (Fatal) Passengers - 2 (Fatal)
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	53 years
Commander's Flying Experience:	1,022 hours (of which over 150 hours were on type) Last 90 days - 25 hours Last 28 days - 14 hours
Information Source:	AAIB Field Investigation

Synopsis

The aircraft was on the return leg of a flight to the Isle of Man with three people on board. Deteriorating weather meant the pilot was unable to land at his destination, so he diverted to a nearby airfield, which had a grass runway oriented north-south. The aircraft passed over the northern threshold of the runway heading west and began a tight turn to the right. During the turn the nose dropped, probably as a result of a stall, and the aircraft dived into the ground. The occupants were fatally injured and the aircraft was destroyed in the fire that followed.

History of the flight

G-ATGE departed Andreas airfield on the Isle of Man at 1920 hrs with three people on board for a flight to a private airfield, Mourne Flying Club, in County Down. The pilot had made the same return flight earlier in the day and it was reported that he was "just his normal self". The airfield is on a slope on high ground, at an elevation of 600 ft amsl.

At about 1945 hrs, the owner of the airfield called the pilot on the radio; it was drizzling and he wanted to pass on that information. The pilot acknowledged the call and said he was 18 nm away with an ETA of 2005 hrs. A few minutes later, the pilot transmitted that he was 9 nm away.

At the same time that the pilot reported his range as 9 nm, the owner of the airfield received a phone call from the owner of another private airfield, near Kilkeel.

This airfield is 2.5 nm south of the Mourne Flying Club, on lower ground near the coast. This grass runway is also oriented north-south and is at an elevation of 50 ft amsl. The owner, looking from his airfield, thought the weather at the Mourne Flying Club field looked poor and suggested that the pilot should be told that Kilkeel airfield was available for him to use. The owner of the Mourne Flying Club airfield did not suggest to the pilot that he should divert but, as the aircraft approached, the pilot transmitted that he had two miles to run and was diverting to the airfield near Kilkeel. The owner then relayed to the pilot a message from the owner of the Kilkeel airfield that the aircraft was clear to land, with the wind "down the runway". This message was not acknowledged.

The aircraft passed the northerly end of the runway heading west and began a "tight right hand turn" which, if flown through 270°, would have brought the aircraft onto a final approach for the runway. After a turn of approximately 240°, and as the aircraft turned towards the runway threshold, the "nose dropped" suddenly and the aircraft "went straight down into the ground nose first and immediately burst into flames". The aircraft was completely destroyed in the fire and the occupants were fatally injured.

Witness information

The owner of the Kilkeel airfield and another pilot were sitting in a caravan close to the touchdown point at the northern end of the grass airstrip. The weather had deteriorated rapidly from about "50 mile visibility to a hazy 3 nm in mist and drizzle". As the aircraft passed them heading west, the engine "spluttered" as the power was reduced. During the subsequent turn, the aircraft appeared "too high for the field and too close in". The height during the turn was estimated by these witnesses to be "about five aircraft wingspans", which would correspond to a height of about 100 ft agl, depending on the angle of bank.

A further witness saw the accident from his house, which was 130 m from where the aircraft came to rest. His attention was attracted by the engine "spluttering three times after which it went quiet". The aircraft was flying just below the cloud and continued normally for a short while, after which the "nose dropped and it dived straight into the ground".

Wreckage information

The aircraft was built in 1960 and the current owner had owned it since 2005. It had a current Certificate of Airworthiness and a recent Annual inspection.

Examination revealed that the combustible elements of the wreckage, lying close to the impact point, had been almost entirely destroyed by fire, with aluminium alloy sheet melted or softened and distorted by the fire. Steel components and more substantial aluminium alloy parts had survived. Small fragments of timber structure and transparencies were distributed sufficiently far from the wreckage site to remain unburnt.

The initial impact point was approximately 460 m from the threshold of the runway and took the form of a distinct impression in the firm, stony ground.

Structural integrity

Although the aircraft was effectively consumed by the fire, the remains of the left wing tip and navigation light, the aft part of the left aileron and a small section of left wing trailing edge, abutting the aileron, were identified. A section of right aileron, at the junction of the trailing edge and the tip, and the outer extremity of the right wing tip, with attached navigation light, was also found at the site. The left outer section of the tailplane, with

the tip of the elevator still attached, was identified, as was a portion of the trailing edge of the other elevator at the tip. Although nothing of the right tailplane survived, the presence of the tip of the elevator, which is hinged to the tailplane, indicated that the tailplane was structurally complete at impact. The rudder, (a single all-moving surface) was not identified but the aft navigation light (rudder-mounted) and a length of its electrical wiring were found in an area of ash, indicating that the rudder was present before the fire.

Metal components in the form of the airbrake torque tubes and ribs, together with the landing gear legs and wheels were present at the site. Control cables for ailerons, rudder and elevators were also identified in the wreckage area and appeared complete. Examination of the propeller revealed considerable evidence of rotation under power at impact.

Weather forecast

The weather forecast issued by the Met Office for the time of the flight is shown at Figure 1.

The flight took place predominately in area B1 where visibility was forecast to drop occasionally to 1,500 m in drizzle and mist. Isolated areas with visibility of 200 m were to be expected in coastal areas. Areas of broken stratus were forecast with bases between 300 ft and 800 ft amsl, although the base would be at ground level in any fog.

The nearest airports for which forecasts were issued were Belfast and Dublin and neither was forecasting poor conditions. It is not known whether the pilot saw these forecasts before his flight.

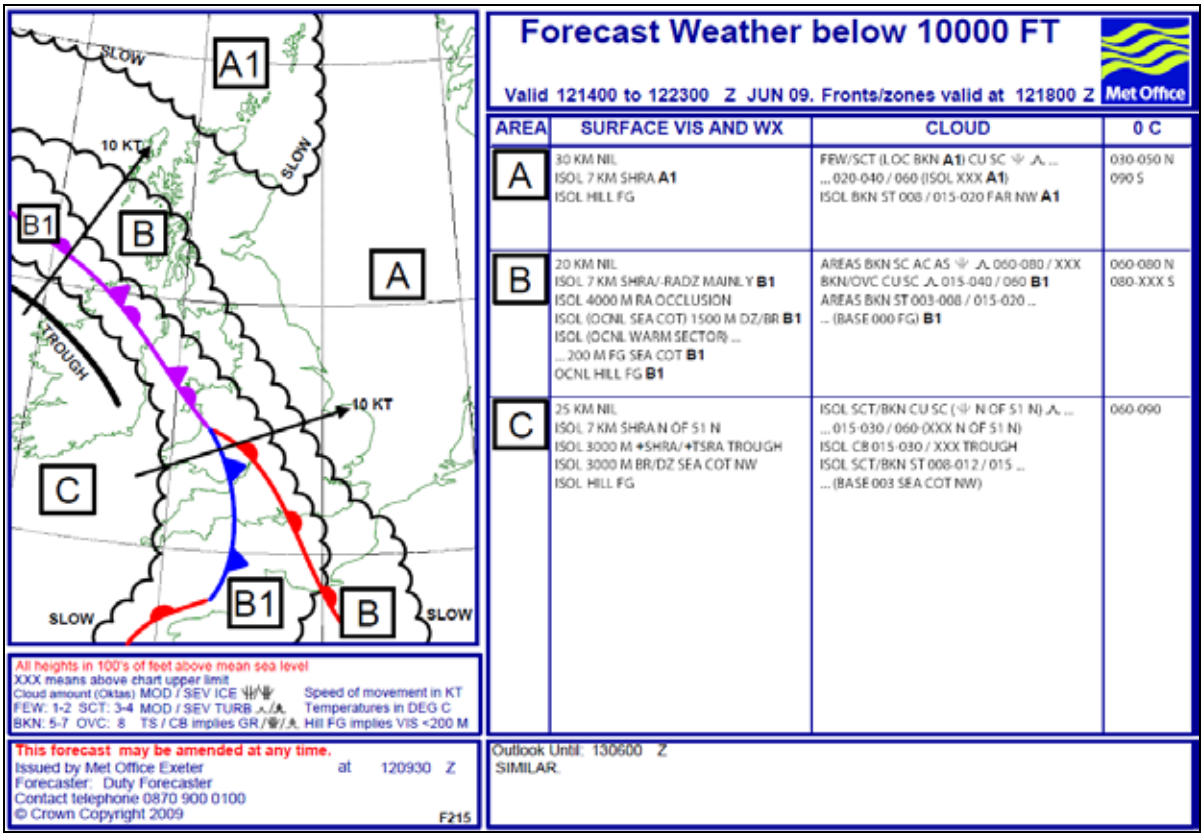

Figure 1

Met Office weather forecast valid at the time of the accident

Weather aftercast

The Met Office produced an analysis of the weather that was present at the accident site at the time of the accident. The report stated that:

> *'there is evidence that mist or fog, lying along or off the coast of the Irish Sea, may have extended inland to affect the area of the accident site. It is possible that very light drizzle was present. Low stratus is considered likely in the area. Best estimate is of bases 300 to 600 ft amsl with tops 500 to 1,000 ft amsl. Visibility may have varied anywhere in the range from below 200 m in hill fog up to 5,000 m in mist.'*

The general surface wind in the area was assessed to be from 130° to 140° at 12 to 14 kt. However, a wind observation five nautical miles west of the accident site suggested that local conditions were backing the surface wind to 100° or 110° and this could not be discounted for the accident site itself.

Further information

A pilot who had flown G-ATGE stated that reducing power to about 1,500 rpm on final approach led to the engine "rough running". It "sounded like the engine wanted to stop" although there was "no undue loss of power beyond that caused by the reduction in rpm". He also stated that the accident pilot would carry any rear-seat passenger on the right side of the aircraft.

Visibility from the pilot's seat in this model of aircraft is good because the canopy extends to just behind the rear seat. It is possible to look towards the centre of a right turn even from the left front seat with a rear-seat passenger on the right side.

The wreckage trail was so short that it could not be used as a reliable indication of the precise direction of travel prior to impact. The wreckage itself was 720 ft to the west of the runway extended centreline and was 1,500 ft, from the threshold. At this range, an aircraft on a 3° glidepath (for instance) would be about 80 ft above the touchdown point.

Analysis

The pilot was on the return leg of a flight to the Isle of Man, a trip that he had already made once that day. It is not known whether he considered the weather forecast for the area but the conditions had been suitable earlier and it is possible he assumed they would remain so. In the event, the weather deteriorated rapidly to give actual conditions close to the worst conditions forecast. It is likely that as he approached the airfield near Kilkeel he was flying in light drizzle, under a low cloud base. With very limited alternate options, is also possible that the pilot felt under pressure to land quickly due to the worsening weather.

The aircraft was seen to fly over the threshold heading west and begin a tight turn to the right, manoeuvring unusually low due to the low cloud. The pilot was flying from the left seat and it would have been difficult to judge his displacement from the approach path for at least the first 90° of the turn. After 90° of turn, the aircraft would have been heading approximately north and the runway might have become visible over the pilot's right shoulder. There is no evidence as to where the pilot was actually looking during the turn, but the aircraft was still over 720 ft from the approach path as it began to point at the runway.

Witness descriptions of subsequent events suggested that the aircraft stalled, causing its nose to drop and the aircraft to dive into the ground. The evidence suggested

that power was reduced in the final part of the turn, causing the engine to splutter but some spluttering at reduced power was considered normal for the particular engine in G-ATGE and the investigation did not consider it evidence of engine failure; evidence from the wreckage was that the engine was delivering power at impact which suggested that power was applied again before impact. It is probable, however, that power had been significantly reduced in the final turn, shortly before the aircraft stalled.

From the vantage point near the runway threshold, the aircraft appeared to the witnesses to be in a tight right turn, high for a normal approach and too close in, and the pilot would probably have reduced power to adjust to a better approach path. It is likely that, in the turn, the reduction in airflow over the wings, due to the reduction in power and airspeed, was sufficient to induce the stall.

ACCIDENT

Aircraft Type and Registration:	Jodel D18, G-JRKD
No & Type of Engines:	1 Aeropower VW 2074 cc piston engine
Year of Manufacture:	1995
Date & Time (UTC):	13 December 2009 at 1235 hrs
Location:	Old Sarum Airfield, Wiltshire
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Left main landing gear, propeller, lower cowling damaged and engine shock-loaded
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	21 years
Commander's Flying Experience:	627 hours (of which 3 were on type) Last 90 days - 62 hours Last 28 days - 17 hours
Information Source:	Aircraft Accident Report Forms submitted by the instructor and student pilot

The purpose of the flight was for the PPL holder in the left seat to demonstrate his ability to fly the aircraft before flying unaccompanied; a flying instructor occupied the right seat. Both pilots had tailwheel flying experience. The weather was fine with a north-easterly wind between 5 and 8 kt.

Following fast taxi practice and two aborted takeoffs, a circuit was flown to a successful landing. A second circuit was flown and the instructor reported that the approach was stable but the wind was slightly gusty. The landing was "bumpy" and to the right of the centreline. The pilot applied full power to go around, but the aircraft "leapt into the air at a very low airspeed", drifting to the right. The right wing dropped and contacted the ground.

The instructor reported that he intervened but was only able to close the throttle and attempt to minimise the damage to the aircraft. The left wing then dropped and struck the ground, the left main landing gear collapsed and the propeller struck the ground. He commented that the aircraft had been neither tracking straight, nor under full control when the power was applied to go around.

ACCIDENT

Aircraft Type and Registration:	Mooney 201 M20J, N321KL
No & Type of Engines:	1 Lycoming IO-360 SER A&C piston engine
Year of Manufacture:	1981
Date & Time (UTC):	28 December 2009 at 1500 hrs
Location:	Stapleford Aerodrome, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to propeller, aerials and abrasions to the underside of the fuselage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	46 years
Commander's Flying Experience:	351 hours (of which 10 were on type) Last 90 days - 11 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Following a pre-flight inspection, during which a small quantity of water was found in the left fuel tank, the aircraft took off and the landing gear was retracted. At about 50 ft the engine lost power and the pilot made a forced landing on an adjacent grass runway but had insufficient time to lower the landing gear. Subsequent maintenance activity identified a loose-fitting filler cap on the left fuel tank and a significant quantity of water also present in that tank and throughout the fuel system. No water was found in the right fuel tank. Since its previous uneventful flight the aircraft had been parked outside for about three weeks during which the weather conditions had included snow and rain.

History of the flight

During the pre-flight inspection, the pilot noticed that the fuel sample from the left fuel tank contained a small amount of water. Two further samples were taken before the pilot judged that the fuel was clear of water. No water was evident in the sample taken from right fuel tank. He started the engine with the right fuel tank selected, before switching to the left tank prior to taxi. The pilot allowed the engine temperature to normalise before the engine power checks were completed and the aircraft lined up for takeoff from Runway 22L at Stapleford. The takeoff appeared normal and the landing gear was retracted but at a height of about 50 ft the engine suddenly lost power. The stall warning activated and the pilot pitched the aircraft nose down,

during which the engine was felt to surge before losing power again. The pilot closed the throttle and elected to land back on the runway, but there was insufficient time to extend the landing gear. The aircraft touched down on the adjacent grass Runway 22R and, following a ground slide of approximately 100 metres, came to a stop with 170 metres of runway remaining. The uninjured pilot vacated the aircraft through the cabin door. The aircraft sustained damage to the propeller, underside-mounted aerials and abrasions to the lower fuselage.

Pilot's comments

The pilot stated that some weeks prior to the accident, the aircraft had been flown to Thurrock Aerodrome where the aircraft's annual inspection had been carried out. At the same time, sections of the aircraft were repainted, including the area around the left fuel tank filler port. The aircraft was then parked outside for about ten days. On 4 December 2009 the pilot arrived to reposition the aircraft to Stapleford Aerodrome. The left fuel tank was visually confirmed as being empty and 50 litres of fuel were uploaded. The pilot recalled carrying out a water drain check of both fuel tanks and that he found no evidence of water. He also recalled that the flight to Stapleford Aerodrome was conducted on the right fuel tank. The aircraft remained parked outside until the accident flight on 28 December 2009. Weather conditions in the weeks prior to the accident had included both rain and snow.

Following the accident, the aircraft was recovered to a maintenance organisation where the left fuel tank filler cap was found to be incorrectly fitted. The pilot stated that almost immediately after the accident he had visually checked the left fuel tank quantity, but could not recall finding the left tank filler cap loose or if he had then replaced the cap correctly. Both fuel tanks were drained and the contents examined. In addition to about 50 litres of fuel in the left tank, that tank also contained about 500 ml of water. Water was also found throughout the fuel system, up to the fuel injectors. A very small amount of water was recovered from the right fuel tank.

It was not possible to determine why the pilot's pre-flight inspection had failed to identify the presence of the significant quantity of water that was subsequently found in the left fuel tank. A search of the AAIB and CAA databases for this aircraft type revealed four events between 1984 and 2002 relating to contamination of fuel tanks with water. The aircraft manufacturer's Service and Maintenance Manual contains the following relevant warning:

> *'Water can enter the fuel tank through a loose fitting or damaged cap. This should be corrected as soon as possible.'*

ACCIDENT

Aircraft Type and Registration:	Nord NC854S, G-BGEW
No & Type of Engines:	1 Continental Motors Corp A65-8 piston engine
Year of Manufacture:	1950
Date & Time (UTC):	20 September 2009 at 1130 hrs
Location:	Whistlers Farm, Tangley, Hants (Approx 4 miles North of Andover)
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Fatal) Passengers - 1 (Fatal)
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	60 years
Commander's Flying Experience:	299 hours (of which 55 hours were on type) Last 90 days - 4 hours Last 28 days - 3 hours
Information Source:	AAIB Field Investigation

Synopsis

After taking off, the aircraft was seen to climb over rising ground with a nose-high attitude. Approximately 90 seconds later, at a height of between 250 ft and 300 ft agl, 1.5 nm to the west of the airfield, it departed from controlled flight and struck the ground in a steep nose-down attitude whilst rotating to the left. A post-impact fire ensued and the aircraft's structure was largely consumed. The aircraft's exhaust system was found to be in poor condition and the post-mortem examination revealed that the pilot's blood contained an elevated level of carbon monoxide.

History of the flight

The pilot and passenger had arrived separately by car at Bourne Park, a private grass airfield near Andover and it is believed that they intended to fly to a private strip near Swindon before flying on to Popham. Two witnesses saw some or all of the pre-flight activity at the airfield. The pilot appeared in good spirits and took time conducting the routine pre-flight activities; one witness stated that he appeared to be explaining things about the aircraft to the passenger. The aircraft was seen by a witness to depart to the west, towards rising ground,[1] apparently taking off normally sometime between 1115 hrs and 1130 hrs.

Footnote

[1] The ground to the south of the climbout path was lower than the ground to the west of the airfield. In addition, the fields along the aircraft's track offered opportunities for a precautionary landing.

Various eyewitnesses reported seeing the aircraft after it took off. One witness saw it at a height of about 100 ft to 150 ft agl approximately 0.75 nm west of the airfield, tracking west and in a nose-up attitude. This witness, who had some flying and gliding experience, described the aircraft as rapidly dropping a wing to the left, recovering, then dropping a wing to the right, before recovering again. The engine noise sounded constant and the aircraft passed out of sight to the west.

Another witness, 1.2 nm west of the airfield, was unsure of the aircraft's height but described the aircraft as being much lower than normal and with the nose "up". The engine noise was constant, though seemingly running at low speed, and "it wasn't coughing or spluttering". The witness reported no change in the note of the engine until the aircraft went out of view.

A group of witnesses, outside of a property approximately 1.5 nm from the airfield, and some 200 m from the accident site, saw the aircraft fly almost directly overhead from east to west at about 250 ft to 300 ft agl. The engine sound was described as "running smoothly though without any thrust or power." They watched as the aircraft started a left turn before it suddenly turned and descended rapidly to the left. The aircraft descended out of sight behind a line of trees before they heard a loud noise, and saw a rising plume of smoke.

Medical information

Post-mortem reports stated that both occupants sustained severe injuries resulting from a relatively high speed impact and the associated deceleration forces. The accident was not survivable.

Toxicology analysis revealed unusually high levels of carbon monoxide in both occupants; 24.7% COHb and 9.0% COHb for pilot and passenger respectively. Although levels of 10% COHb can be found in a heavy smoker, it was determined that the pilot was not a smoker and, therefore, the significance of the elevated carbon monoxide levels in his blood could not be discounted[2].

Aircraft description

The Nord NC.850 (originally produced as the Aérocentre NC.850), from which the NC854S was developed, was a light aircraft developed in France in the late 1940s for use by French aeroclubs but which also saw military use as an airborne observation post. It is a high-wing, strut-braced monoplane with a fully enclosed two seat cabin (side by side configuration). The landing gear is fixed and of tailwheel configuration. The fuselage construction is welded tubular steel, the wings have a metal structure and the entire aircraft is skinned in fabric (Figure 1). A brief history of the type is shown below:

NC.850 - prototype with single tail and Mathis G4F engine (1 built)

NC.851 - version with Minié 4DA engine (9 built)

NC.852 - version with Regnier 4EO engine (2 built)

NC.853 - major production version with twin tails and Minié 4DC.30 engine (29 built)

NC.853S - NC.853 built by Nord (95 built)

NC.853G - NC.853 fitted with *aile flottante* system (1 converted)

NC.854 - NC.853 with Continental A65 engine (2 built, plus many converted from NC.853)

Footnote

[2] It was reported that the source of the carbon monoxide was unlikely to have originated from the pilot's house, as a serviceable CO detector was fitted in the kitchen, or the pilot's car, as no symptoms of CO poisoning have been reported by other users of the car.

Figure 1

A further development of the type, the 856A, was fitted with a 135 HP engine, and is listed as having a maximum climb rate of 984 fpm.

Wreckage examination

The aircraft struck the ground with a high rate of descent and negligible horizontal velocity, pitched approximately 50° nose down and rotating in yaw to the left with sideslip to the right. This was consistent with it having been in a spin, or incipient spin, to the left.

The impact caused substantial crumpling of the steel-tube fuselage structure around the cockpit, wing attachments and in the region immediately aft of the cockpit. The cylindrical fuel tank mounted 'cross-ship' immediately behind the seats was ruptured. An extremely intense post-impact fire engulfed the whole aircraft and destroyed all of the aluminium alloy components in and around the forward fuselage and cockpit, including much of the flying control operating systems in that area. All of the steel flying control cables survived the fire, however, and it was possible to establish from these, and from other steel components, that all primary flight controls were intact and connected at the time of impact. Critical parts of the wing flap operating system were destroyed completely by the fire and therefore it was not possible to establish the status of these components prior to impact. However, nothing was found in the wreckage to suggest that any malfunction of the flap system had occurred prior to the accident. The remnants of the flap surfaces were at positions consistent with their having been fully retracted at impact.

The throttle setting at impact could not be determined reliably. However, shattered fragments of propeller blade were projected large distances from the impact point within a narrow region aligned with the plane of the propeller disc, consistent with the propeller having been rotating at high speed. The engine power at impact was sufficient to fracture the hub portion of the propeller during the subsequent engagement between the stump of the broken blade and the ground, before the engine

itself impacted the ground. Evidence from the propeller therefore suggested that the engine was operating at high power at the time of the accident.

Post-accident disassembly of the exhaust system revealed significant deterioration and de-lamination of the four gaskets at the exhaust pipe/engine cylinder interface on each cylinder. The surfaces adjacent to the gaskets did not appear to have been exposed to the intense post-impact fire. Some gaskets displayed evidence of carbon deposits consistent with 'blow-by', indicating that exhaust gases may have been escaping whilst the engine was operating, Figures 2 and 3.

Further inspections revealed deformation of three of the four engine cylinder exhaust pipe flanges. The deformation observed seemed inconsistent with impact damage when the aircraft's attitude and orientation in the final moments of flight were taken into consideration, and it is possible that such deformation may have been introduced by over-tightening of the joints during routine maintenance.

Figures 4 & 5 display exhaust pipe flanges from the aircraft wreckage from two separate engine cylinders, showing the flange without deformation, and one of the three with deformation, respectively.

Flange curvature will prevent a gasket from making an effective seal, exposing it to the high temperatures of the exhaust gas stream. This may explain why the exhaust gaskets were found to be in such a poor condition. It is not known how long these particular gaskets had been fitted to the aircraft.

Guidance from the Light Aircraft Association (LAA) in relation to exhaust system maintenance stipulates that:

> *'Exhaust systems must give complete sealing; flanges, gaskets and air intake sealing must be regularly examined and maintained…Should a component be inaccessible for a thorough visual inspection or hidden by non-removable parts, remove the component and check for possible leaks.'*

Figures 2 & 3

Exhaust gaskets removed from the accident aircraft

Figures 4 & 5

Two of the exhaust flanges removed from the accident aircraft

Taking into consideration the difficulty experienced in accessing the gaskets during post-accident examination, it is probable that they were not readily accessible for visual inspection during normal maintenance.

Aircraft documentation

The aircraft's documentation, maintained by the owner-pilot, recorded recent work to crop the wooden fixed-pitch propeller from a diameter of 72" to 70", in an attempt to improve the aircraft's marginal climb performance, by increasing the engine's maximum achievable speed from 2,100 rpm to 2,300 rpm. Correspondence in the files indicated that the propeller had been cropped professionally by a specialist and that the work had included re-varnishing and balancing. Log book entries dated 2 August 2009, record this modification and that a post installation test flight of 1:05 hrs duration had taken place. The correspondence also showed that no prior application had been made to the LAA for the required technical approval for the propeller modification, because the owner had, until 4 August (when it was apparently drawn to his attention), been unaware of the requirement to do so. A retrospective application was made on 5 August, supported by the flight test results, and approval was granted by the LAA on 26 August 2009.

The aircraft's documentation suggested that when it was built in 1950, the engine then installed was a Minié 4DC30, which produced around 80 HP. In 1963, this engine was replaced by a Continental C90 14F, which delivered a nominal 95 HP, and this in turn was replaced in 1975 by the Continental AA65-8 installed at the time of the accident. This engine delivers a nominal 65 HP. In 2004, prior to the pilot taking ownership of the aircraft, modifications were carried out that included installation of a battery, generator, starter motor, and an electrical fuel pump. Over its lifetime, therefore, the aircraft underwent a net reduction in power of the order of 15 HP, together with a weight increase of the order of 25 lbs.

Pilot experience

The pilot started flying in 1989 and was issued with his licence in 1991 after 81 hours of flying. He completed an IMC rating in 1998 by which time he had accrued 193 hours. In December 2004, with a total flying experience of 238 hrs, he purchased the accident aircraft and almost all of his subsequent flying was on this aircraft. He had flown about 48 departures from Bourne Park, where the aircraft had been parked in the open since August 2005[3].

Footnote

[3] The aircraft had recently been parked in a hangar, when space became available.

Meteorology

The Met Office provided an aftercast of the likely weather conditions prevalent at the time of the accident, as follows:

> Surface wind of 010°/5 kt, temperature 17°C dewpoint 11°C, visibility of 15 km with no cloud below 2,000 ft, QNH was 1023 mb. The 1,000 ft wind was considered to be 030°/10 kt.

Weight and balance

It was not possible to calculate the aircraft's actual takeoff weight and balance data due to the extensive post-crash fire. An estimate of the weight is outlined below.

The aircraft maximum takeoff weight (MTOW) was 1,342 lbs and its declared empty weight was 844 lbs. The pilot's weight at his last medical was 187 lbs. Based on post-mortem weights, the passenger was slightly lighter than the pilot and a dressed weight of 176 lbs has been assumed, which also allows for any personal items carried. The pilot had prepared a number of sample load-sheets and these allowed between 20 lbs and 40 lbs for the aircraft flight bag, assumed to contain documents, tie downs, small tools and some metallic components which were recovered from the wreckage. Using these weights, the aircraft's zero fuel weight was about 90-93% of its MTOW; this would have left between 95 lbs and 115 lbs available for disposable load. The fuel tank was capable of holding approximately 100 lbs of fuel. The extent of the post-crash fire suggested that a large fuel load was being carried.

Propeller modification

The correct LAA flight test schedule had been completed following modification of the propeller and was conducted by the pilot at an aircraft AUW of 1,222 lbs. On the day, he reported the conditions as 23°C, a QNH of 1022 mb and achieved a climb rate of 400 fpm for the first minute, 350 fpm for the next three minutes, followed by 300 fpm for the fifth minute. This modification met the LAA requirements and was approved by them on 26 August 2009.

Previous LAA annual flight test reports.

The LAA required that flight tests were conducted at no less than 90% of the aircraft's maximum permitted gross weight. They make available a six page guide describing how to conduct the flight test. All of the flight tests conducted on the accident aircraft had been recorded at or above this 90% requirement. (Table 1)

Date	Weight, lbs (% of MAUW)	OAT, deg C	Pressure, mb	Time to climb 1,000 ft, secs, (fpm)	Airspeed, mph	Engine speed, rpm
Jun 2009	1325 (98)	20	1018	257 (233)	55	2100
May 2008	1292 (96)	17	1018	180 (333)	60	2050
Mar 2007	1226 (91)	15	1023	172 (348)	62	2050
Dec 2005	1293 (96)	5	998	188 (319)	58	2050
Aug 2004	1264 (94)	21	1016	250 (240)	53	2050
Aug 2003	1214 (90)	21	1021	161 (372)	55	2000

Table 1

Review of other data by the LAA

The LAA retains annual climb performance data for other Nord 854s on the UK register (four aircraft). These figures show stall speeds in the range of 45-50 mph, climb speeds of 62-65 mph and average 1,000 ft climb times of 180 seconds (333 fpm).

The LAA provided a copy of a "*Fiche de Navigabilite No 5*" for the Nord series aircraft. This document dated, 1955, amended in 1957 and 1958, bears the mark of the "Secretariat General a l'Aviation Civile". It is in French, and appears to consist of performance data for a range of Nord types. For the Nord 854S it lists '*Vz 2 m/s de 0 a 360m'*. This implies a climb rate of 393 fpm up to 1,100 ft.

Analysis

The aircraft was seen by various witnesses between the departure airfield and the accident site flying in a nose-high attitude. The first witness, positioned approximately 0.75 miles from the airfield, estimated the aircraft's height at 150 ft agl at a point where the ground was approximately 50 ft above airfield elevation. Thus, the aircraft was making a height gain of about 250 ft per mile. The final group of witnesses estimated the aircraft's height at about 250 ft agl shortly before the accident, which occurred 1.5 nm west of the airfield, where the local ground was about 125 ft above the airfield. Thus, when the aircraft departed from controlled flight, it had climbed approximately 375 ft since take off. By the time the accident occurred, the aircraft was estimated to have been airborne for 90 seconds, giving an approximate mean rate of climb of 250 fpm and a mean groundspeed of around 60 mph.

On 26 August 2009, after the propeller had been modified, the aircraft apparently achieved an average climb of 350 fpm when test flown by the pilot, and this broadly compares with the French document indicating 393 fpm for a new aircraft, and the mean of the historical figures for this aircraft held by the LAA, of 307 fpm.[4] Therefore the estimated performance on the accident flight is not significantly different to the theoretical performance of the aircraft, although the apparent slightly lower rate of climb could possibly be accounted for by the high nose up attitude of the aircraft reported by the witnesses.

The witness's description of the aircraft's departure from controlled flight suggests a stall and incipient, or full, spin to the left, as the aircraft descended out of sight. This was consistent with the analysis of the wreckage which indicated that the aircraft was pitched steeply nose down and yawing to the left at impact. A loss of control at approximately 250 ft agl would have offered little or no prospect of recovery in the height available.

The aircraft performance under test conditions was similar to the performance that appears to have been achieved on the accident day. This relatively poor climb performance could have been further compromised by any number of factors, for example, downdrafts in the lee of trees or terrain. However, the ground to the south of the climb-out path was lower and it may have been that the pilot was reluctant to make a turn at such a low height. It is not known if the poor state of the exhaust system could have impaired the power output of the engine, and hence the climbing performance of the aircraft.

Between the departure point and the accident site, with the exception of the wooded area near one of the witnesses, the terrain was generally suitable

Footnote

[4] Caution must be used in assuming a mean of these figures as the sample size (seven flights) is very low and the variance between the figures (from 233 to 372 feet per minute) is relatively large.

for an off-airfield landing with some fields offering excellent prospects. Therefore, if the pilot had become concerned about the progress of the flight, there was ample opportunity to have made a precautionary landing. Should this have resulted in aircraft damage, it probably would have been less likely to involve the non-survivable forces generated in a near vertical impact resulting from a spin.

Although it cannot be ruled out that the carbon monoxide found in both occupant's blood originated from another source, it is likely that it originated from an exhaust leak, or leaks, at the exhaust pipe/engine cylinder interface, where all four gaskets and three of the pipe flanges were found to be in very poor condition. It is possible that the exhaust gasses may have passed from the engine bay into the cockpit by either mixing with the slipstream around the cockpit, or by passing through various small apertures in the firewall. It was the opinion of the pathologist that a COHb level of 24.7% in the pilot would have resulted in a severe headache, nausea and a feeling of grogginess to the extent where the pilot's judgement and performance may have been compromised. Thus, his decision making ability to opt for a precautionary landing or to change track towards lower ground, and/or his ability to interpret his instruments correctly, could have been impaired.

The pilot seemed committed to continue to climb over the rising ground, and he would have been faced with the situation that the aircraft was climbing imperceptibly, relative to the ground. This may have led him to believe that he had no other option but to attempt to continue flying along the original path, rather than turn towards lower ground or manoeuvre for a precautionary landing, whilst at a low height and, probably, at low speed.

A spin related loss of control would be the expected outcome of a stall at full power. Due to the scale of the post crash fire, other possibilities that could lead to such a stall, such as a misreading air speed indicator, could not be ruled out.

ACCIDENT

Aircraft Type and Registration:	Piper PA-25-235 Pawnee, G-BETM
No & Type of Engines:	1 Lycoming O-540-B2B5 piston engine
Year of Manufacture:	1976
Date & Time (UTC):	29 October 2009 at 1004 hrs
Location:	Sutton Bank Airfield, North Yorkshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to left landing gear
Commander's Licence:	Private Pilot's Licence
Commander's Age:	63 years
Commander's Flying Experience:	806 hours (of which 324 were on type) Last 90 days - 7 hours Last 28 days - 5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Immediately after touchdown, following a normal glider aerotow flight, the pilot heard a "bang" from the left side of the aircraft and thought the noise was associated with the landing gear. He then switched the magnetos to OFF and attempted to hold the left wing off the ground for as long as possible. However, as the aircraft slowed the left wing dropped and its tip contacted the damp grass runway surface; the aircraft slowly turned through 180° before coming to rest. The pilot vacated the aircraft without difficulty.

Post-accident inspection revealed the eye-end attachment lug on the left landing gear damper unit had failed; such a failure allows the landing gear to be unrestrained and pivot outboard. It was evident from the fracture surfaces that the eye-end had been cracked for some time before finally failing on this landing. The pilot reported that the aircraft was used exclusively for aerotowing operations and averaged some six flights per hour from a grass runway.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-140 Cherokee, G-BCJN
No & Type of Engines:	1 Lycoming O-320-E3D piston engine
Year of Manufacture:	1974
Date & Time (UTC):	5 November 2009 at 1600 hrs
Location:	Bristol International Airport
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Both propeller tips, nose gear axle and torque link bumper block damaged
Commander's Licence:	Student
Commander's Age:	48 years
Commander's Flying Experience:	38 hours (of which 33 were on type) Last 90 days - 36 hours Last 28 days - 21 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The student pilot returned to land at his home airfield following a first solo navigation exercise. He reported that his airspeed on final approach to the runway was too high, resulting in the aircraft bouncing first on the main landing gear, then onto the nose gear. The pilot initiated a go-around and completed a circuit before attempting a second approach. This time the approach was low and fast, resulting in several bounces before the pilot again rejected the landing. At this point his instructor telephoned the air traffic controller and relayed advice to the student. A third attempt was also rejected after a fast approach and bounced landing. At the request of the instructor, air traffic control then provided continuous instruction to the pilot, who managed to land safely. The aircraft had suffered structural damage as a result of the sequence of bounced landings, but the pilot was uninjured. It was unlikely that the damage incurred had any significant effect on the aircraft's performance during the repeated go-arounds.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-140 Cherokee, G-BEEU	
No & Type of Engines:	1 Lycoming O-320-E2A piston engine	
Year of Manufacture:	1973	
Date & Time (UTC):	27 October 2009 at 1245 hrs	
Location:	Panshanger Airfield, Hertfordshire	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A Others - 1 (Serious)
Nature of Damage:	Nose gear damaged and wings pierced by a fence post	
Commander's Licence:	Commercial Pilot's Licence	
Commander's Age:	26 years	
Commander's Flying Experience:	460 hours (of which 180 were on type) Last 90 days - 150 hours Last 28 days - 40 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The aircraft impacted the aerodrome boundary after the takeoff was aborted following an apparent loss of engine power.

A man walking a dog along a footpath outside the airfield perimeter fence, stated that he was struck by the aircraft, which ran over and trapped the dog and caused him serious injury. The uninjured pilot and instructor vacated the aircraft without assistance.

History of the flight

The student and instructor were conducting touch-and-go landings on Runway 29 at Panshanger. On the fifth landing the aircraft touched down at approximately the mid-point of the runway, whose grass surface was wet. The instructor stated that when he applied power to take off again the aircraft became airborne but the engine "hesitated". He aborted the takeoff and applied brakes but was unable to stop the aircraft before it crossed a ditch and impacted a fence at the aerodrome boundary.

Damage to the aircraft

The aircraft, though not substantially damaged, sustained several punctures from the fence posts and a bent propeller. Impact with the ditch and fence and collapse of the nose landing gear disrupted the engine air intake assembly to the extent that the maintenance organisation that inspected it after the accident was unable to determine what might have caused the engine to hesitate.

Discussion

Loss of engine power

AAIB reports of accidents involving loss of engine power in similar circumstances have identified carburettor icing as a possibility. The report[1] of an accident involving an aircraft with a similar engine model noted that it is susceptible to rich cut in certain circumstances, particularly if the throttle is opened abruptly with carburettor heat selected.

Notices warning the public

Panshanger aerodrome is licensed by the CAA in accordance with Article 128 of the Air Navigation Order. A condition of this licence is that any public right of way crossing or bordering the landing area shall be:

> *'adequately sign-posted with notices warning the public of danger from aircraft.'*

Signs indicating the presence of Panshanger aerodrome are placed at intervals along the fence that borders the end of Runway 29. The licence document does not define 'adequately' in this context but Civil Aviation Publication (CAP) 168 – *Licensing of Aerodromes* describes the process by which CAA inspectors will visit an aerodrome and determine the extent to which the aerodrome, its facilities, equipment and operational organisation meet the licensing requirements.

Footnote

[1] Report of the accident to G-BAKV, reference EW/G2006/09/04, published in AAIB Bulletin 2/2007.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-161 Cherokee Warrior II, G-WFFW
No & Type of Engines:	1 Lycoming O-320-D3G piston engine
Year of Manufacture:	1981
Date & Time (UTC):	2 December 2009 at 1557 hrs
Location:	RAF Lyneham, Wiltshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to propeller, nose leg, lower engine cowlings and a wingtip
Commander's Licence:	Private Pilot's Licence
Commander's Age:	42 years
Commander's Flying Experience:	144 hours (of which 85 were on type) Last 90 days - 1.5 hours Last 28 days - 0 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot was carrying out circuits using Runway 24, which has a paved surface 2,387 m long and 46 m wide. After completing two successful touch-and-go landings the pilot entered a right-hand circuit for a third approach. The wind on his previous landing was reported as 160º at 9 kt, which equated to a crosswind component of 9 kt. While downwind for his third approach the wind was reported as 150º at 10 kt, which equated to a left crosswind of 10 kt. During this approach the pilot flared slightly high and had to lower the nose to maintain his target airspeed of about 60 KIAS. He reported that the aircraft "touched down positively" and then began to slew sideways and turn 45º to the left. He tried to correct by applying right rudder but the aircraft departed the runway surface to the left and came to rest in the grass after striking airfield equipment, including the PAPI lights and Runway Hydraulic Arrestor Gear (RHAG).

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-181, N2405Y
No & Type of Engines:	1 Lycoming O-360-A4M piston engine
Year of Manufacture:	1985
Date & Time (UTC):	10 April 2009 at 1123 hrs
Location:	Near Steep, Petersfield, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Fatal) Passengers - 1 (Fatal)
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	47 years
Commander's Flying Experience:	225 hours on type since August 2006 Last 90 days - 16 hours Last 28 days - 7 hours
Information Source:	AAIB Field Investigation

Synopsis

The pilot had planned a flight from Panshanger to Jersey. The weather forecast was poor, with two fronts expected to be positioned along the route at about the time of the flight. The weather forecast for Jersey was also poor and it was uncertain whether the pilot would be given a Special VFR clearance through the Channel Islands Control Zone. The pilot took off but after 47 minutes the aircraft flew into low cloud covering a ridge of high ground north of Petersfield. About 10 seconds later the aircraft flew into trees just below the ridge line and broke up.

It is likely the pilot succumbed to '*get-there-itis*' in making his decision to take off. It is probable that, as the weather deteriorated on his route, he ran out of '*escape routes*' before inadvertently entering cloud.

History of the flight

The pilot planned to fly from Panshanger aerodrome to Jersey with one passenger. The route would take them to the overhead of Wycombe Air Park, direct to Portsmouth and then NEDUL, the reporting point to the west of the Isle of Wight. From there the route followed the track of Airway R41 to ORTAC, the reporting point at the boundary of the Jersey CTR and London FIR. The final leg was from ORTAC direct to Jersey. The distance was 188 nm, which would take about 1:45 hr in still air at the flight planned speed of 110 kt. The most restrictive controlled airspace on the route as far as the Isle of Wight was the London TMA with a base of 2,500 ft amsl. Figure 1, derived from GPS on board the aircraft, illustrates the flight.

The aircraft took off at 1037 hrs from Runway 29 at Panshanger and entered a climbing right turn to set heading from overhead the airfield. The pilot contacted Farnborough Radar (north) at 1049 hrs and requested a traffic service. He reported that he was at 1,200 ft on the QNH and was told he could only be given a basic service at that altitude. At 1056 hrs the aircraft was 3 nm to the east of Wycombe Air Park turning towards Portsmouth and ATC instructed the pilot to contact Farnborough Radar (west). There was no response and, after four further attempts, at 1059 hrs the controller asked another aircraft to relay the instruction. The pilot of N2405Y heard the relayed instruction and changed frequency.

At 1100 hrs, the pilot of N2405Y contacted Farnborough Radar (west) and was given a basic service. At 1105 hrs, the aircraft was just south of Wokingham and the controller asked if the pilot could route to the east of Farnborough to avoid departing traffic. The pilot complied with the request. The controller informed the pilot that the Blackbushe Aerodrome Traffic Zone (ATZ) was active but the pilot did not hear properly and asked for the transmission to be repeated. The controller repeated the information but the word 'Blackbushe' was indistinct and sounded more like 'Farnbushe'. The pilot acknowledged that the Farnborough ATZ was active. At 1106 hrs he turned onto a heading that would have taken him through the Blackbushe traffic pattern and over the western end of Farnborough's Runway 24. At 1108 hrs, the controller suggested that the pilot turn to the north east to avoid the Blackbushe ATZ. The pilot turned west to remain clear of the ATZ before turning east towards the town of Farnborough. At 1111 hrs, the controller asked whether the pilot could see Farnborough Airport, to which the pilot replied that he could not. One minute later, he reported flying past the end of Runway 24 at 1,000 ft. The controller responded by saying that the departing traffic had just passed ahead of N2405Y, left to right, at about 1 nm.

The aircraft continued south from Farnborough Airport until it passed south of Farnham, where it turned onto a track of about 210°M to close onto the planned track, which was about 5 nm to the west. At 1122 hrs, the controller suggested that the pilot contact either Goodwood Information or Solent Radar and the pilot said he would contact Solent Radar. There was no record of the pilot contacting any ATC agency after Farnborough.

The aircraft continued heading about 210°M over the low ground towards Petersfield. It crashed at 1123 hrs into trees on the northern, heavily wooded, slope of a ridge of high ground, running broadly east-west, close to a landmark known as Shoulder of Mutton Hill.

Witness information

Two days before the flight, the pilot spoke to one of the instructors at his flying club about his planned flight. He said that the long range weather forecast for the route did not look good and would probably preclude the flight. He said he would plan the route in case the forecast proved to be incorrect.

At about 1000 hrs on the day of the flight, the pilot spoke briefly with another pilot and was asked if he had seen the weather forecast, which showed two closely-spaced fronts moving east across his proposed route. The pilot of N2405Y said he had seen the fronts on the forecast and thought he could avoid them. He said he had about 30 hours of instrument training towards his IMC rating and had recently practised many holding procedures and an ILS at Southend. The pilot's instructor later stated that the pilot had about seven hours of formal training towards the IMC rating

and the instructor believed that the remaining hours claimed were probably obtained during private flights with friends acting as safety pilots.

Two witnesses saw the aircraft about 10 seconds before the crash. Each noted that the aircraft rocked its wings but flew a substantially straight course. One of the witnesses stated that the engine sounded normal. The other said that the aircraft "wasn't flying very high. In my opinion, it was flying around 50 metres or less above the ground. It flew into the fog. I heard a bang around 10 seconds later. The fog covered the top and a large part of the mountain where the accident took place".

A witness was walking very close to where the aircraft crashed. He said there were "showers of drizzle; it was cloudy but still". The visibility under the cloud was quite good but there was a low cloud base. The cloud base altered but he calculated from his map that it "hung around 220 metres, sometimes lower" above sea level.

Recorded data

Information from ATC tapes and radar records is incorporated into the history of the flight.

A Garmin GPSmap296 was recovered from the accident site and was downloaded successfully. The active route recorded in the unit was from Panshanger aerodrome to Jersey and the flight history showed only one flight on the 10 April 2009 (Figure 1).

The track started at 1027:35, showed a takeoff at 1037:10 hrs and ended at 1123:39 hrs. The unit was set up to provide alarms relating to airspace proximity and the alarm records showed that 30 events were recorded on 10 April 2009. Of those events, the majority would have been considered routine 'nuisance' alerts. The route took the aircraft near to a number of ATZs or controlled airspace and most alerts reflected proximity, not infringement, and would be expected.

There were three 'Inside Airspace' alerts which were triggered after the aircraft left the planned route at the request of ATC. The first was when the aircraft entered the Blackbushe ATZ and it was coincident with the air traffic controller's suggestion that the pilot turn north-east. The aircraft flew west but then turned back towards Farnborough, at which point there was a second alert. The final alert was triggered when the aircraft entered the Farnborough ATZ. These alerts were consistent with the pilot trying to position himself to the east of Farnborough.

As well as the track, Figure 1 shows the altitude of the aircraft and the elevation of the ground below it. After the aircraft took off at 1037 hrs, it climbed to 2,000 ft amsl. It then carried out a slow descent to 1,000 ft amsl from 1040 to 1050 hrs. For the next 10 minutes, the aircraft flew at between 800 and 1,200 ft amsl corresponding generally to between 600 and 1,000 ft agl but at 1102 hrs it crossed a ridge at 460 ft agl. The aircraft climbed back to 2,000 ft amsl over the next five minutes but descended back to 1,000 ft amsl by 1110 hrs. For the next 12 minutes, the aircraft remained at 1,000 ft amsl, crossing one ridge at approximately 330 ft agl. Just after 1122 hrs, the aircraft began to descend to 750 ft amsl with an average rate of descent of 200 feet per minute. As the aircraft began its slow descent, the ground below it started to rise gently but in the last 10 seconds before impact the ground rose sharply.

The aircraft ground speed averaged approximately 90 kt during most of the flight. During the final gentle descent it accelerated and stabilised at approximately 100 kt, which was consistent with descents earlier in the flight.

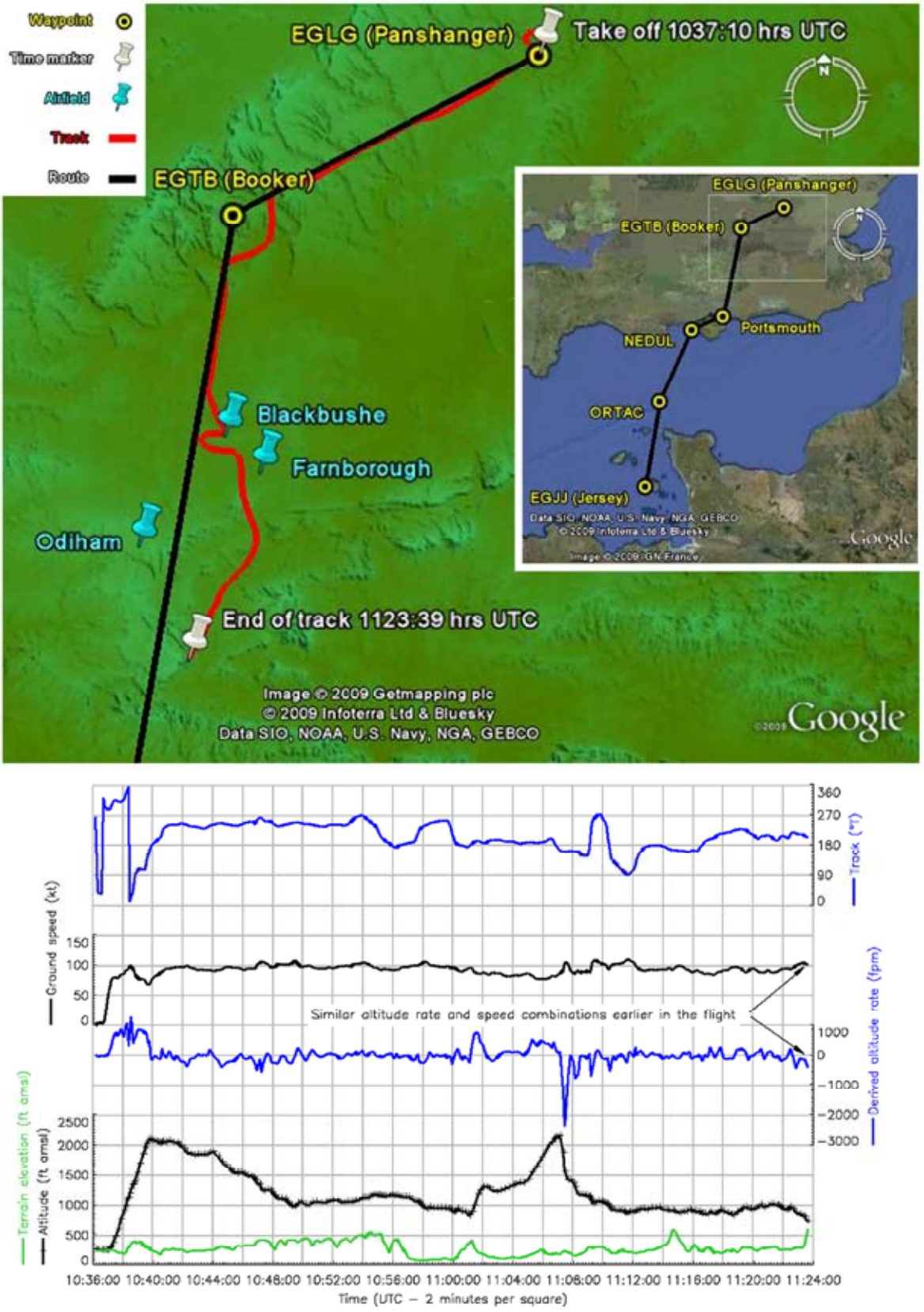

Figure 1

Last flight recorded in the GPS, N2405Y

Accident site and wreckage information

The aircraft impacted trees situated just before the summit of the ridge, on a southerly track, at a point some 15 ft below the tops of the trees and 40 ft above local ground level. The altitude of the impact point was approximately 675 ft above sea level and some 280 ft above the terrain on the aircraft's approach to the rising ground.

An elliptical zone of debris ranged along the track from the impact point, across the ridge and down the wooded south-facing slope beyond, extending a total distance of 120 metres. Debris on the ground between the initial tree strike and the summit of the ridge comprised pieces of broken tree only. The aircraft's debris began on the ridge itself, with the wings, flaps and ailerons having separated from the fuselage. The engine and propeller were found, still attached to the fuselage, some 60 metres further down the slope. The engine had been driven upwards into, and had pushed back, the firewall, causing deformation of the cabin sidewalls and a shortening of the cabin space. Pieces of engine cowl and miscellaneous debris from the cabin, including seat headrests and mounts for GPS units, were scattered beyond the nose impact point. The furthest items in the debris zone, comprising a single headrest and the nose landing gear strut and wheel, lay separately some 20 metres beyond the fuselage remains.

All of the aircraft's extremities, together with all flying control surfaces and associated parts, were identified at the crash site at positions in the debris trail consistent with the aircraft having been intact at the point it entered the trees.

The altimeter, which was undamaged and appeared not to have been disturbed by the impact, was found set to a pressure setting of 1002.5 mb. The throttle and mixture controls were found in the fully forward position, the carburettor heat control lever was set to COLD, and the flap actuating horns were both in the 'flaps fully retracted' position. Assessment of each of these controls suggested that they were not likely to have moved significantly during the impact. Propeller cuts through branches and tree limbs were identified in debris close to the fuselage remains, including one very clean cut at an oblique angle through a 15 cm diameter tree trunk - indicative of high engine power.

The wreckage was recovered from the hillside and taken to the AAIB at Farnborough for further examination. No evidence was found of any prior structural or mechanical failure that could have caused or contributed to the accident.

Impact conditions

The aircraft's path through the trees was consistent with a track of approximately 200°M at a climb angle of about 5°. The pattern of tree impact damage to the wing leading edge structure was consistent with it having been substantially wings-level when it entered the trees.

It was evident, both from the distribution of the aircraft's debris and from the pattern of damage it sustained, that both wings had been torn from the fuselage during the initial part of its swath through the tree-tops approaching the summit of the ridge. Thereafter the fuselage followed an essentially ballistic trajectory before impacting the downward-sloping ground on its right side and coming abruptly to rest. The trajectory followed by the fuselage, from the point where it crested the ridge of the hill to its final impact with the ground, implied a horizontal velocity at the ridge of the order of 60 kt after the loss of the wings by its initial passage through the trees. It follows that the

aircraft's speed upon first entering the trees would have been substantially greater than 60 kt.

In summary, the physical evidence was consistent with the aircraft having been in wings-level climbing flight when it entered the trees, at cruising speed or thereabouts and with the engine developing significant power.

Pathologist's report

The pathologist, widely experienced in aviation accidents, reported that both the pilot and passenger died of multiple injuries, which were consistent with having been sustained in the impact. None of the injuries would, in either case, have necessarily been immediately fatal but were such that it is unlikely that even immediate medical attention would have altered the outcome.

The pathologist further commented that there was evidence that the passenger was wearing a three-point harness and that the pilot was wearing his lap belt; it was uncertain whether the pilot had also been wearing his shoulder harness. In the experience of the pathologist, the injuries to both occupants were towards the less severe end of the spectrum of injuries seen in fatal aircraft crashes and that this was one of very few fatal light aircraft accidents where the provision of secondary restraint systems, such as airbags, might have had the potential to aid survival.

Aircraft and maintenance history

The aircraft was manufactured in 1985 and was registered and operated in the United States until July 2003, when it was exported to the United Kingdom. Following import into the UK, it was re-registered with the US FAA to a trust created on behalf of the new owners, a group of three persons of which the deceased pilot was one. It was subsequently maintained in accordance with FAA requirements, and certified by FAA-licensed engineers based in the UK.

The most recent log book entry, dated 7 April 2008, certified the satisfactory completion of an annual inspection, valid under FAA rules until the end of April 2009. The tachometer readout at the time of the accident indicated that it had flown a total of some 88 hours since that time - a figure that was broadly consistent with entries made in the journey log maintained by the owner group. Notwithstanding the FAA maintenance regime's '100 hr' inspection cycle, the operator of the aircraft's home-base airfield required all US-registered aircraft based at his field to undergo interim 'oil-change' inspection at 50-hour intervals. The journey log entries implied that this non-mandatory inspection had been carried out on or about 8 August 2008, a nominal 50 hours after the annual inspection.

In summary, the aircraft's documentation showed that following its importation into the UK it had been regularly maintained in accordance with FAA requirements, commensurate with its US registration.

Pilot's experience

The investigation did not have access to the pilot's logbook and the hours used to show the pilot's experience were obtained from the aircraft's technical log.

Weather forecast

The weather forecast for below 10,000 ft amsl issued by the Met Office for the period of the flight is shown at Figure 2.

The worst weather expected for the route was isolated areas with visibility of 3,000 m in heavy rain or thunderstorms. Isolated areas of 2,000 m visibility in

mist were forecast over the sea and coastal areas. Areas of scattered or broken stratus were forecast with bases between 300 and 800 ft amsl. The tops of the cloud were forecast to be above 10,000 ft amsl.

The forecast for Jersey, valid between 0600 and 1500 hrs, was for a surface wind from 160° at 12 kt, visibility 9 km in light rain, scattered clouds at 500 ft aal and broken cloud at 1,500 ft aal. Temporarily, the visibility was forecast to be 3,000 m in moderate rain with broken cloud at 500 ft aal. Jersey Airport is at an elevation of 277 ft.

Weather aftercast

The Met Office produced an analysis of the weather at the time of the accident. The surface analysis for 1200 hrs is shown at Figure 3.

The aftercast stated in summary that:

> *'It is evident that, whilst varying in time and space, cloud cover over the general area of the site was low. FEW to BKN stratus, base 300 FT to 1200 FT AMSL is estimated to have prevailed across the area and this would have covered the hills and high ground in the area. The area was affected by generally moderate rain or drizzle, which through direct evidence is reported as being between 5000 M and 12 KM. Isolated heavy rain or drizzle is evidenced on the radar, and empirically this might be expected to reduce visibility to 3500 M – though there is no direct evidence of this. Visibility in cloud, and hill fog, is likely to have been below 200 M and given the low cloud base such visibility would have been extant over hills and high ground above 300 FT AMSL.'*

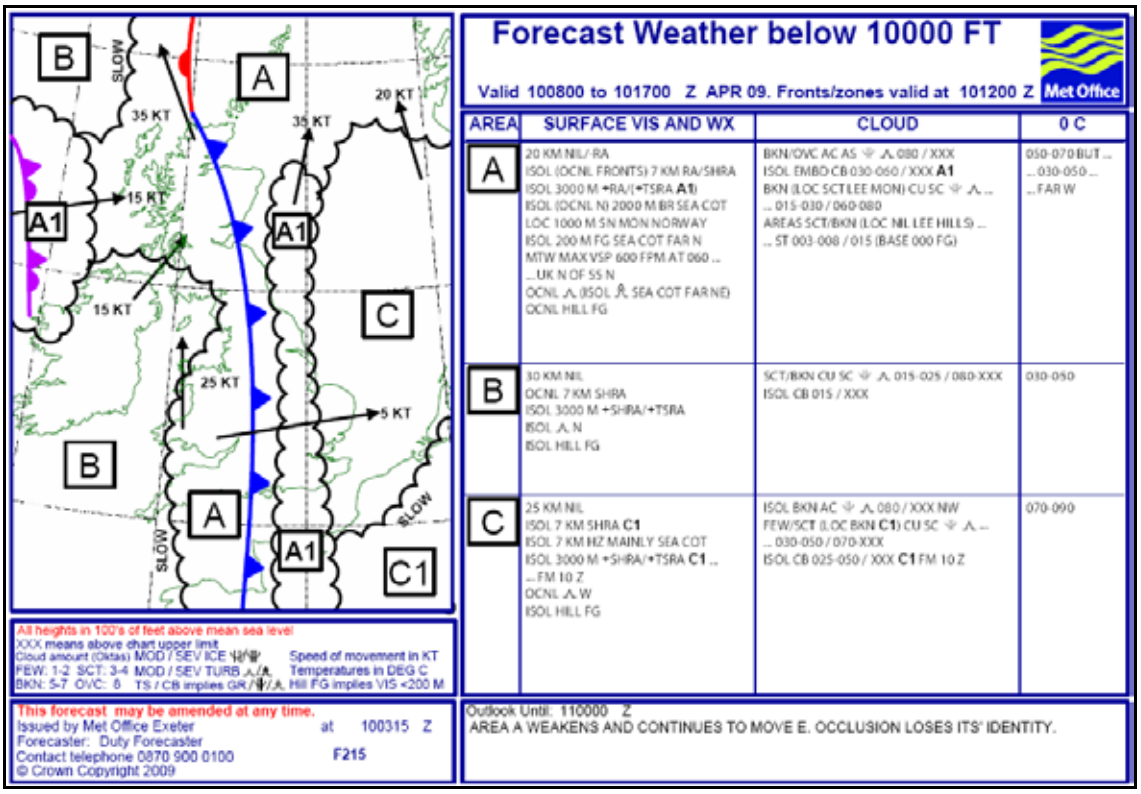

Figure 2

The forecast weather below 10,000 ft

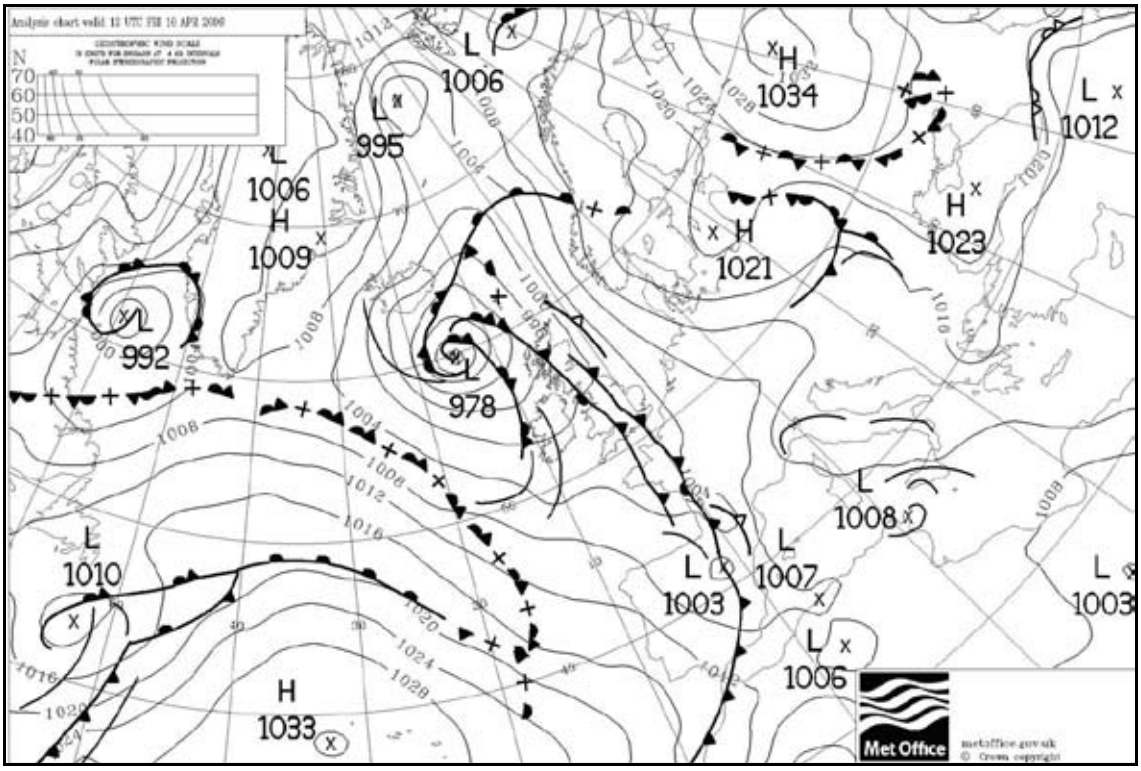

Figure 3

Synoptic situation at 1200 hr

Actual weather report at Jersey

The actual weather reported at Jersey at 1220 hrs was wind from 270° at 4 kt, visibility more than 10 km in light rain, few clouds at 200 ft aal and broken cloud at 3,500 ft. Temporarily, the visibility was 5,000 m in moderate rain with broken cloud at 500 ft aal.

Procedures at Jersey

The UK Air Information Publication (AIP) entry for Jersey airport contains information and instructions for pilots visiting the airport. Aircraft flying to Jersey must pass through the Channel Islands Control Zone (CTR), which is Class A airspace. Aircraft not operating under IFR must be in receipt of a Special VFR clearance and the AIP states:

> *'Special VFR clearance to operate within the CTR, for the purpose of proceeding to or from an aerodrome within the Zone, will not be granted to an aircraft if the reported visibility is less than 3 km or the reported cloud ceiling is less than 600 ft at the aerodrome concerned.'*

VMC minima

The VMC minima applicable to flights flown in Class G airspace below 140 kt and 3,000 ft are: visibility of 1,500 m, clear of cloud and in sight of the surface. The Air Navigation Order prohibits flight closer than 500 ft to any person, vessel, vehicle or structure. For practical purposes, this means that a flight should only be continued if the cloud base is greater than 500 ft above the local ground or obstruction level at a given point.

Ground elevation under the planned route varied but, apart from the section across the Thames Valley, it was generally above 250 ft amsl. There were two sections of the route where the ground was above 500 ft amsl. There was also a ridge of high ground perpendicular to the planned route and over which the flight would have to pass where ground elevation was sometimes over 800 ft amsl.

CAA Safety Sense Leaflet 1 – General Aviation Good Airmanship

The CAA leaflet on general aviation '*Good Airmanship*' contains a section on weather which states:

> *'Get an aviation weather forecast, heed what it says and make a carefully reasoned GO/NO-GO decision. Do not let 'Get-there/ home-itis' affect your judgement and do not worry about 'disappointing' your passenger(s). Establish clearly in your mind the current en-route conditions, the forecast and the 'escape route' to good weather. Plan an alternative route if you intend to fly over high ground where cloud is likely to lower and thicken.'*

Analysis

The weather forecast issued by the Met Office suggested that the weather along the pilot's route would be poor, with cloud bases between 300 and 800 ft amsl. In order to fly the route as planned and remain VMC while observing the '500 ft rule', a cloud base of at least 750 ft amsl was required for much of the route. Two areas required a cloud base of 1,000 ft amsl and the ridge of high ground required a cloud base of 1,300 ft amsl.

The departure at 1036 hr implied an ETA at Jersey of about 1215 hr. The weather forecast valid for the airport at that time included the possibility of 3,000 m visibility and broken cloud at 500 ft aal. These conditions, if extant when he approached Jersey, might have prevented ATC from issuing a Special VFR clearance, in which case the pilot would not have been able to continue to his destination.

In summary, the weather forecasts for the route and destination cast doubt on whether the pilot would have been able to complete his flight and the aftercast indicated that the weather encountered on the flight was similar to that forecast. In addition, the weather reported at Jersey at the flight's ETA suggested that a Special VFR clearance might not have been available.

Two days before the accident, the pilot had acknowledged that the weather might preclude the flight and yet on the day the weather forecast did not dissuade him from taking off. It is possible, from his comments regarding his training for an IMC rating, that he thought he was well prepared, whereas he was actually required by his licence to maintain VMC throughout the flight, regardless of that training. Pilots who hire aircraft from a flying club are bound by the rules of the club, which might include different weather limits for VFR navigation flights to reflect different experience levels. Pilots who own their own aircraft must rely on self-discipline when there is no external moderation of their decision to fly. It is probable that, in making his decision to take off, the pilot succumbed to the '*get-there-itis*' referred to in the CAA Safety Sense leaflet.

Once airborne, the pilot flew the majority of the route between 1,200 and 1,000 ft amsl, with the last 14 minutes flown essentially level at 1,000 ft amsl. The aircraft's height above ground level varied as the elevation of the terrain over which it flew varied. On one occasion, its height over a ridge was about 330 ft.

This was consistent with the pilot flying just below a substantially level cloud base to maintain clear of cloud and to maximise terrain clearance. If this was the case, the descent towards the ridge was likely to have been in response to the cloud base lowering from about 1,000 ft amsl to about 720 ft amsl, as reported by the witness at the accident site.

The CAA leaflet refers to establishing an '*escape route'* to good weather. This applies both before takeoff and when actually encountering poor weather during flight. It is possible that the wing rocking observed by the witnesses coincided with the pilot's uncertainty about the limited options available to him. It was at this point that the aircraft entered cloud.

The evidence from witnesses and examination of the wreckage indicates that the aircraft was serviceable prior to impact and it appears that the aircraft hit trees, below the ridge line, climbing at about 5°. It is likely that, having entered cloud and lost all visual references, the pilot initiated a climb because he knew the aircraft was probably close to the ground. His actions were too late, however, for the aircraft to clear the ridge.

ACCIDENT

Aircraft Type and Registration:	Rand KR-2, G-DGWW
No & Type of Engines:	1 HAPI Magnum 75 piston engine
Year of Manufacture:	1992
Date & Time (UTC):	14 December 2009 at 1422 hrs
Location:	Near Beeston Castle, Tarporley, Cheshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Extensive
Commander's Licence:	Private Pilot's Licence
Commander's Age:	64 years
Commander's Flying Experience:	658 hours (of which none were on type) Last 90 days - 0 hours Last 28 days - 0 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

At a height of approximately 700 feet above ground level, the engine stopped for a second time during the flight. The pilot carried out a forced landing, but as the aircraft approached the selected field, it clipped the top of a row of trees, causing the aircraft to pitch over and crash-land, coming to rest inverted just beyond the trees. The aircraft was extensively damaged but, due to his harness and local strengthening of the aircraft's structure, the pilot sustained only minor injuries. The weather at the time of the flight was such that there was a serious risk carburettor icing at any power setting.

History of the flight

The aircraft had just been flown uneventfully by the owner for approximately 40 minutes, after which he briefed the pilot, who was about to fly this type of aircraft for the first time. As part of the briefing, the owner mentioned that he had experienced some carburettor icing during his flight.

After refuelling the aircraft to full, the pilot took off from Liverpool (John Lennon) Airport, intending to initially assess the general handling characteristics of the aircraft. En route towards Chester and clear of the Liverpool zone, the pilot applied carburettor heat a number of times but noticed no icing effects.

Once clear of the zone, the pilot flew some slow-speed manoeuvres with a low power setting and carburettor heat on. After completion of the manoeuvres he

selected carburettor heat off and increased the power; however, the engine ran rough and then stopped. The altitude at this point was approximately 1,300 ft amsl. The aircraft descended to about 900 ft before the pilot was able to restart the engine. He then climbed back to 1,300 ft at full power and radioed Liverpool to get clearance to re-enter the zone for a return back to the airfield. Moments later, the engine again ran rough, and despite application of carburettor heat and leaning of the mixture, the engine failed to respond and eventually stopped. The altitude was now about 1,000 ft (or between 700 and 800 feet agl) so the pilot selected a field for a forced landing and further attempts to restart the engine failed. He then tightened his four-point harness.

As the aircraft approached the selected field, it clipped a row of trees causing the aircraft to pitch over and crash-land, coming to rest inverted just beyond the trees. The aircraft was extensively damaged but the rear fuselage and a strengthening frame just aft of the cockpit remained largely intact thus leaving a gap, where the canopy had been, between the structure and the ground. The pilot undid his harness and vacated the aircraft through this gap, having suffered only minor injuries. During construction of the aircraft the owner had added extra strengthening to the structure aft of the cockpit and also to the four harness hard points.

No detailed examination of the engine or engine systems was carried out. The pilot stated that he was aware of the potential for carburettor icing during the flight. An assessment by the Meteorological Office of the conditions at the time of the accident estimated that the temperature and humidity were about +3ºC and 80% respectively, which placed the risk of carburettor icing as '*Serious icing – any power*' based on the CAA's carburettor icing probability chart in their Safety Sense Leaflet 14.

INCIDENT

Aircraft Type and Registration:	Reims Cessna F150M, G-BDFZ
No & Type of Engines:	1 Continental Motors Corp O-200-A piston engine
Year of Manufacture:	1975
Date & Time (UTC):	8 September 2009 at 0930 hrs
Location:	Wombleton Airfield, North Yorkshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Aircraft damaged beyond economic repair
Commander's Licence:	Private Pilot's Licence
Commander's Age:	65 years
Commander's Flying Experience:	186 hours (of which 15 were on type) Last 90 days - 2.5 hours Last 28 days - 2.5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

After touchdown on Runway 28 the aircraft was caught by a gust of wind, causing it to veer to the right, into a ploughed field. The nosewheel dug into the soil, causing the aircraft to pitch over inverted. The pilot, who was wearing a lap and diagonal belt, was uninjured. The wind at the time was from 200° at 12 kt.

ACCIDENT

Aircraft Type and Registration:	Reims Cessna F172M Skyhawk, G-BCZM
No & Type of Engines:	1 Lycoming O-320-E2D piston engine
Year of Manufacture:	1975
Date & Time (UTC):	22 January 2010 at 1630 hrs
Location:	Bodmin Airfield, Cornwall
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Engine mount fractured
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	69 years
Commander's Flying Experience:	4,572 hours (of which 4 were on type) Last 90 days - 3 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft was in the latter stages of a practice approach to Runway 31, from which the pilot intended to carry out an overshoot to preserve the grass surface. The weather was good, with a surface wind from 340° at 12 kt. At a height of about 20 ft, with full flaps selected and an airspeed of 65 kt, the aircraft began to sink unexpectedly towards the up-sloping runway. The pilot applied full power and lowered the nose to maintain airspeed and avert a stall. He then pulled back on the control column, to arrest the descent, but the aircraft landed firmly, nosewheel first, and bounced back into the air. The engine and airframe were still responding normally, so the pilot completed an uneventful circuit and landed without further incident. A subsequent engineering investigation revealed that there was a fracture in the lower cross member of the engine mount, which was probably attributable to a hard landing on the nose landing gear.

The pilot concluded that a downdraft may have caused the aircraft to sink and that his response was probably too great, given the proximity of the runway surface.

ACCIDENT

Aircraft Type and Registration:	Tecnam P2002-JF, G-CDTE
No & Type of Engines:	1 Rotax 912-S2 piston engine
Year of Manufacture:	2005
Date & Time (UTC):	15 October 2009 at 1250 hrs
Location:	Old Sarum Airfield, Wiltshire
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Wings, cowling, propeller, nosewheel
Commander's Licence:	Student
Commander's Age:	37 years
Commander's Flying Experience:	34 hours (of which 7 were on type) Last 90 days - 7 hours Last 28 days - 7 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

During takeoff from the grass airfield, the aircraft swung left despite the application of full right rudder. It left the runway, crossed a road and collided with two parked vehicles.

History of the flight

The student was undertaking circuit consolidation training and had completed several circuits with his instructor. The instructor briefed the student for a solo circuit consolidation detail, left the aircraft and the student taxied to the holding point for grass Runway 06. The wind was calm, the visibility was over 10 km and there was no cloud. The student reported later that the ground felt very bumpy and that he was "conscious to protect the nosewheel". He lined up on the left side of the runway because the right side was out of use. He applied power and "significant right rudder" but the aircraft pulled slightly left. He recalled applying full right rudder but the aircraft began a "violent left turn" and passed from the marked runway onto the grass beyond. He closed the throttle while maintaining full right rudder and the aircraft straightened but still did not turn right. The aircraft was travelling at "significant speed" as it passed over a kerb and onto the perimeter road.

A car was parked behind a lorry on the far side of the road. The left wing of the aircraft hit the driver's door of the car just before the nose hit the rear right corner of the

lorry. Following the impact sequence, the aircraft had rotated 90° to the left, the nose gear leg had collapsed through deformation of the yoke, and the right wing had wedged itself underneath the side of the lorry (see Figure 1). The student was unhurt and vacated the aircraft over the left wing in the normal manner.

Information from the pilot

The pilot thought that the rudder was ineffective during the takeoff run despite the application of "maximum pressure" to the rudder pedal. He stated that the aircraft was travelling at "a speed where rudder input would have certainly caused movement to the right". Consequently, he believed that there must have been a mechanical failure such that the rudder pedal did not control the rudder. This might have been due to the nose gear collapsing, either while taxiing or at the start of the takeoff roll, or might have been because of a failure in the rudder control system.

The pilot reported that he normally held the control column slightly aft of neutral during takeoff to protect the nose gear and recalled using exactly the same technique on the accident takeoff as during his previous takeoffs from the same runway. He believed that the "violent" onset of the swing to the left was consistent with component failure rather than a progressive increase in yaw. Subsequently, he felt the nose wheel "bouncing and skidding" on the grass and thought that the aircraft was "close to being airborne".

The pilot looked subsequently at markings left by the nose wheel just as the aircraft began its rapid swing and thought that they suggested the nose wheel was skidding. Figure 2 shows the tracks left later by the aircraft as it approached the road.

Information about the aircraft

The owner stated that a feature of this aircraft type is that with full power selected and the control column aft of neutral, the nose wheel can lift from the runway before the rudder is capable of controlling the tendency of the aircraft to yaw left. He reported that the nose gear leg had been replaced approximately five months before the

Figure 1

Figure 2

accident. The rudder pedals were connected to the nose wheel for steering on the ground.

Information from the loss adjuster

The AAIB discussed the damage to the aircraft with the loss adjuster who inspected the aircraft on behalf of the insurance company. He considered that had the nose gear failed early in the takeoff through deformation of the yoke, the tyre was likely to have tried to dig itself into the grass surface rather than roll over it. Any yawing tendency due to the damage was likely to have been to the right if the nose wheel was still able to turn. The deformation of the yoke was consistent with an aircraft rotating left.

Analysis

The tyre marks shown in Figure 2 were left by the aircraft shortly before the impact and, had the nose gear already collapsed, the marks would be consistent with the damage already done. The marks left by the nosewheel were intermittent and more pronounced than those left by the main wheels. The intermittent nature of the marks supported the possibility that the pilot held the control column slightly aft of neutral during the takeoff run, in accordance with his normal technique, thereby causing the nosewheel to lift intermittently from the ground during the takeoff.

There were two possibilities as to why the nosewheel marks were more pronounced: the nose gear had already collapsed or the nosewheel was pointing right, due to the application of full right rudder, and was skidding on the grass. The pilot reported that the violent nature of the swing was consistent with failure of the nose gear, suggesting that the failure caused the swing. However, the nature of the deformation to the yoke would have tended to turn the nose to the right had the nosewheel still been free to rotate. If it was not free to rotate, it seemed likely that the nose would have tried to dig itself into the runway surface, which would probably have left more

significant marks in the grass than were observed. The deformation to the yoke was consistent with an aircraft rotating left and it was possible that the damage was caused by the rapid swing to the left while the nosewheel was pointing to the right. However, if this was the case it was the swing that caused the failure rather than the other way around. On balance, the evidence did not tend to support the possibility that nose gear failure caused the aircraft to swing uncontrollably.

If the nosewheel had lifted intermittently during the early stages of the takeoff run, it would explain the lack of directional control because neither the nose wheel nor the rudder would have been effective at controlling the yaw. With full rudder applied, each time the nosewheel contacted the grass it would have skidded and the marks on the ground seemed consistent with a skidding nosewheel. Had the nose gear been undamaged before the collision, the damage to the yoke observed afterwards was consistent with the impact sequence.

The pilot believed that the rudder pedals were not controlling the rudder because the aircraft did not turn right in response to pressure applied to the right pedal. The AAIB did not inspect the aircraft and it was not possible to establish the integrity of the rudder control system after the collision. It was also not possible to determine the actual speed achieved by the aircraft during the attempted takeoff and, therefore, whether the rudder should have been effective. Consequently, the investigation was unable to eliminate the possibility that the rudder did not move in response to the pressure applied at the rudder pedal.

ACCIDENT

Aircraft Type and Registration:	Robinson R22 Beta, G-TOMM
No & Type of Engines:	1 Lycoming O-360-J2A piston engine
Year of Manufacture:	2002
Date & Time (UTC):	12 October 2009 at 1508 hrs
Location:	Redhill Aerodrome, Surrey
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Significant damage to main rotor blades and tail boom severed
Commander's Licence:	Student
Commander's Age:	39 years
Commander's Flying Experience:	28 hours (of which 28 were on type) Last 90 days - 5 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Having completed a training flight with his instructor, the student, for his second solo flight, was cleared to fly three solo circuits. The instructor stated that the wind was light and variable and, having vacated the helicopter, observed that the circuits were flown accurately. The student, to conclude the lesson, repositioned and landed the helicopter on the apron. The student stated that, upon touchdown, he had lowered the collective fully before setting the friction adjustment. The instructor briefly turned away, before he heard the helicopter's engine noise increase.

The student recalled that as he moved his left hand to set the cyclic friction the helicopter started to shudder, move and began to rotate to the right. He attempted to control the rotation using pedal and confirmed that the collective was fully down. However, the helicopter began to lift and the student, believing that it was going to topple onto its side, pitched the cyclic forward. Having rotated approximately three times, the helicopter hit the ground nose first. The main rotor blades struck the ground and also severed the tail boom. The helicopter settled onto its skids as the student shut down the engine by turning the ignition switch key. He was uninjured and exited through the cabin door. The helicopter was damaged beyond economic repair.

ACCIDENT

Aircraft Type and Registration:	Robinson R44 Astro, G-WEMS
No & Type of Engines:	1 Lycoming O-540-F1B5 piston engine
Year of Manufacture:	2000
Date & Time (UTC):	15 November 2009 at 1610 hrs
Location:	Shobdon Airfield, Herefordshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - 1 (Minor)
Nature of Damage:	Aircraft damaged beyond economic repair, damage to hangar and other helicopters
Commander's Licence:	Private Pilot's Licence
Commander's Age:	48 years
Commander's Flying Experience:	1,016 hours (of which 8 were on type) Last 90 days - 18 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Whilst touching down close to a hangar, the helicopter started to oscillate and the pilot lost control. It rolled onto its right side and the hangar, and some helicopters inside, were also damaged by flying debris. The pilot and passenger were uninjured.

History of the flight

The pilot was returning to Shobdon after a short flight which had included a landing away and a shutdown. It was agreed with Shobdon Air/Ground radio that he would join for an approach to Runway 27 'grass' on the north side: the approach was normal and the helicopter came to a hover 30 metres past the threshold. Shobdon Radio then called to advise that an aircraft would be taxiing for takeoff from Runway 27 'hard', so the pilot hover-taxied past this aircraft and turned right towards the north and the landing pads outside the helicopter's base hangar, although it appears he intended to stop on the wide concrete apron in front of the hangar.

As it settled onto the apron, the pilot reports that the helicopter entered a violent oscillation, "shaking in all directions" before falling onto its right side and shedding large sections of its main rotor blades. Still under power, the stubs of the blades drove the helicopter sideways until it came to rest against the hangar doors. The pilot shut the engine down and evacuated the helicopter with his passenger through the shattered windscreen

on the right side. Neither had been injured apart from very minor whiplash. The doors and roof of the hangar had been badly damaged by flying debris and a Twin Squirrel helicopter inside the hangar sustained a broken windscreen; a further helicopter was slightly damaged.

The pilot was unable to account for the perceived oscillations and loss of control. The wind was light and variable from the west and he had not been so close to the hangar that the rotor blades might have made contact. Unfortunately, there were no eyewitnesses to the actual touchdown, although several people heard the subsequent crash and rushed outside to assist. The pilot did, however, mention that his very low hours on this helicopter type as Pilot in Command (0.7 hours) may have been a factor.

ACCIDENT

Aircraft Type and Registration:	Fournier RF4D, G-AWEK
No & Type of Engines:	1 Rectimo 4AR-1200 piston engine
Year of Manufacture:	1968
Date & Time (UTC):	30 January 2010 at 1620 hrs
Location:	Chichester (Goodwood) Airfield, West Sussex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Nosewheel and undercarriage
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	43 years
Commander's Flying Experience:	9,000 hours (of which 550 were on type) Last 90 days - 120 hours Last 28 days - 60 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Shortly after touching down from a post-restoration check flight, the landing gear retracted and the aircraft came to rest on its lower fuselage. The incident was attributed to insufficient tension in the landing gear lever trigger spring which, allowed the lever to move out of the DOWN position, causing the landing gear to retract.

ACCIDENT

Aircraft Type and Registration:	Grob G102 Astir CS77, G-CFSZ
No & Type of Engines:	Not applicable
Year of Manufacture:	1979
Date & Time (UTC):	13 June 2009 at 1619 hrs
Location:	Ratley, Warwickshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Fatal) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Gliding Silver Badge
Commander's Age:	64 years
Commander's Flying Experience:	479 hours (of which 96 were on type) Last 90 days - 24 hours Last 28 days - 10 hours
Information Source:	AAIB Field Investigation

Synopsis

In weak thermal conditions, the glider did not maintain sufficient height to continue on to the intended destination. It departed controlled flight at low altitude, whilst positioning for a field landing, and struck the surface with a high rate of descent. The pilot suffered fatal injuries.

History of the flight

The pilot intended to fly cross country from Aston Down Airfield, Gloucestershire, to Husbands Bosworth Airfield in Leicestershire, approximately 60 nm to the north east, and return without landing. The glider was winch launched at 1334 hrs and flew to Husbands Bosworth, thermalling[1] several times enroute and operating at an average altitude of approximately 4,000 ft. The outbound leg seems to have been uneventful.

Shortly after turning at Husbands Bosworth, the glider thermalled again before setting course to the southwest. During several subsequent thermalling manoeuvres the glider reached a maximum altitude of 4,248 ft and at 1553 hrs continued in a southerly direction towards Banbury, descending at an average rate of 170 fpm.

Footnote

[1] When thermalling the pilot attempts to fly the aircraft within a thermal, a rising mass of air that has been warmed more than the surrounding atmosphere.

At 1605 hrs, at an altitude of 2,300 ft, the glider began manoeuvring, as though attempting to thermal once more, but descended to an altitude of 1,900 ft. The descent continued as the glider tracked southwest until, at 1613 hrs, at an altitude of 1,500 ft, the pilot attempted a further thermalling manoeuvre. The glider exited this manoeuvre after seven complete turns at an altitude of 1,200 ft, approximately 800 ft above local terrain.

From the exit of the final thermal attempt, the glider flew south towards the village of Ratley and in the general direction of Edgehill gliding site, 3 nm away. As it did so, it flew over rising ground which formed part of a north facing escarpment. Over the eastern edge of Ratley the glider turned right, at a height of between 200 and 300 ft, onto a track of approximately 030°. Several witnesses saw it flying at low level, probably less than 200 ft above local terrain, before making a sharp left turn. During this turn the nose of the glider dropped and its subsequent flight path was obscured from view by trees.

Witnesses went immediately in the direction of the last sighting and found that the glider had crashed on sloping ground at the head of a shallow valley. The pilot was fatally injured. Police and an air ambulance attended shortly afterwards.

Wreckage information

The aircraft struck the ground on approximately the opposite heading to that which it was on when it was last seen in the air. At the instant of impact, it was pitched steeply nose down and banked slightly left, with significant rotational momentum, consistent with an incipient spin to the left.

The aircraft was structurally intact and all flying controls were connected when it struck the surface. However, it was not possible to establish the positions of any of the flying controls at the moment of impact. The main wheel gear operating lever in the cockpit was gated into the DOWN position, consistent with an intention to land.

Externally, the aircraft appeared to be largely intact, except for an impact fracture of the rear fuselage immediately forward of the base of the fin. Internally, however, the fuselage structure, as far back as the wing trailing edge, together with the wing attachments and associated structure, the cast-aluminium fuselage frames, and most of the flying control system cranks and levers were extensively dislocated and broken apart by the forces generated at impact.

In summary, detailed examination of the wreckage revealed no evidence of any pre-impact defect or malfunction of the aircraft structure or flying controls.

Recorded information

The glider was equipped with a GPS receiver which was coupled to a glider data logger which recorded position and pressure altitude every four seconds. The recording was successfully downloaded at the AAIB.

Meteorological information

Weather conditions along the route were generally good. The wind was from the southwest at 10 to 15 kt and there was scattered cloud with a base at approximately 4,300 ft agl. Visibility was in excess of 10 km and there was no precipitation. Pilot reports indicated that there was an area of spreadout[2] moving northeast along the route that may have been over the Banbury area at the time of the accident.

Footnote

[2] A term used by glider pilots to describe conditions in which cumulus cloud formations have coalesced to form a continuous cloud layer. This tends to reduce thermal activity by preventing solar radiation from reaching the ground.

Geography

Ratley is located at an elevation of approximately 680 ft amsl, near the crown of a north facing escarpment. North-east of the village, in the direction of the accident site, the ground is level over a distance of approximately 300 m then descends into a shallow valley aligned north-south. Viewed from the air, from a height of 500 ft, there are several fields that appear free from obstruction but, on closer inspection, only one of these, forming the flat area north-east of the village, has a relatively smooth surface. Landing diagonally across this field in a south-westerly direction (and therefore into wind) would provide a maximum ground run of 280 m. The track of 030° flown by the glider immediately before its final turn corresponded to a left hand downwind leg for this field.

North of the escarpment, the ground descends steeply to a plain within which there are several fields which would have had an into-wind dimension that was greater than 300 m. On exiting the final attempt at a thermal manoeuvre, the pilot would not have seen these fields unless he looked over his right shoulder.

Pilots operating from Edgehill gliding site, who were familiar with local conditions, stated that south-westerly winds flowing over the ridge north of Ratley could result in downdrafts.

Medical and pathological information

The pilot held a valid UK NPPL[3] Medical Declaration. Post-mortem examination showed that he died of multiple injuries sustained during the impact. There was no evidence of natural disease which could have caused or contributed to the accident and toxicology revealed no evidence of drugs or alcohol. The accident was considered to be non-survivable and it is unlikely that any additional or alternative restraint would have saved the pilot's life.

Aircraft information

The flight manual for the glider states that warning of the stall occurs between 32 and 35 kt depending on wing loading and is characterised by "shuddering" of the tail unit. It states that, during a stall, it is:

> *'possible to make turns up to an angle of bank of 20° without the wing dropping away.'*

The flight manual also states that on entry to a spin the nose of the aircraft will drop in the direction in which rudder is being applied.

Techniques for landing out

The Chief Flying Instructor (CFI) of the gliding club of which the pilot was a member emphasised the importance of selecting several possible landing sites when within 2,000 ft of the ground and that, having decided on a landing field, the turn onto the final approach track should not be made at a height of less than 300 ft. He noted that the workload associated with handling an aircraft, whilst deciding where to land, could increase dramatically as height decreased.

The CFI judged that, from the height at which the glider crossed the ridge north of Ratley, it would not have been possible to land at Edgehill and that it is unlikely the pilot intended to do so. Pilots from Edgehill concurred with this view.

Previous occurrences

Information provided by the British Gliding Association (BGA) indicates that in the UK, since 1987, there have been a total of 637 field landing accidents reported, of

Footnote

[3] National Private Pilot's Licence

which 342 have resulted in substantial damage to or total destruction of the glider involved. Of these, 33 have resulted in serious injury and four in fatalities.

Between 1974 and 2008 there were 226 occurrences resulting in serious injury of which 54 involved field landings. In the same period there were 124 fatal accidents, 10 of which involved field landings. Approximately half of all such accidents have been attributed to late selection of a landing field.

In its review of gliding accidents in 2008 the BGA reported that there had been 19 field landing accidents, including 3 which involved a stall or spin. The review commented:

> *'Landing on any surface at minimum speed with the wings level is preferable to a stall and spin.'*

It noted that pilots should:

> *'avoid flying over unlandable terrain unless able to glide clear and select a field in time to fly a full circuit.'*

Analysis

Information recovered from the data logger indicated that the pilot was able to navigate the aircraft and maintain height successfully until 1553 hrs, when he was on the homeward leg, 15 nm south of Husbands Bosworth Airfield. Throughout the next 26 minutes, despite two thermalling attempts, the glider lost height and was eventually too low to continue with the intended flight.

The pilot seems to have positioned the aircraft downwind for what may have appeared to be a suitable landing field, being the longest field free of obstacles immediately visible ahead of the aircraft at the conclusion of the final thermal attempt. There were, in fact, larger fields at a lower elevation to the north of the ridge but these may not have been readily apparent to the pilot, who was faced with making a quick decision at a low height. Eyewitness accounts indicate that the glider then made a sharp left turn, which the pilot may have initiated in an attempt to turn onto a final approach track for the selected field. The glider was less than 200 ft above local terrain and possibly too low to complete a controlled turn. During this turn, the glider was seen to manoeuvre in a manner consistent with entry into a stall. Shortly afterwards, it struck the ground with a high rate of descent.

There was no evidence of any mechanical defect on the glider or of the pilot suffering from a medical condition that could have contributed to the accident. However, there were reports of atmospheric conditions that might have resulted in weaker thermal conditions in the area of Banbury. Shortly before the end of the flight, as the glider crossed the ridge north of Ratley, it may have encountered a localised descending air mass, as a result of the south-westerly wind. It is most likely, therefore, that the loss of height was due to a lack of thermal activity exacerbated towards the end of the flight by local downdrafts.

ACCIDENT

Aircraft Type and Registration:	Mainair Blade 912, G-CBDP
No & Type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2001
Date & Time (UTC):	13 February 2010 at 1414 hrs
Location:	Runway 25, Carlisle Airport, Cumbria
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Right mainwheel and strut detached, nosewheel assembly collapsed. Propeller broken and wings punctured.
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	59 years
Commander's Flying Experience:	348 hours (of which 198 were on type) Last 90 days - 4 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The accident occurred upon landing on Runway 25 at Carlisle Airport, Cumbria in clear weather, low wind conditions and with good visibility. The pilot reported that he flared too late, resulting in heavy contact between the runway and the right mainwheel which then became detached from the aircraft. The nose of the aircraft then came down hard, resulting in the sideways collapse of the nosewheel assembly. The propeller also broke and some pieces damaged the material of both wings. The aircraft subsequently skidded along the runway for a short distance. The pilot, who was uninjured, vacated the aircraft unaided.

ACCIDENT

Aircraft Type and Registration:	Pegasus Quantum 15-912, G-BYPB
No & Type of Engines:	1 Rotax 912 piston engine
Year of Manufacture:	1999
Date & Time (UTC):	20 February 2010 at 1200 hrs
Location:	Redlands Airfield, Wiltshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Severe damage to trike unit
Commander's Licence:	Private Pilot's Licence
Commander's Age:	48 years
Commander's Flying Experience:	3,781 hours (of which 8 were on type) Last 90 days - 4 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft is a flex-wing microlight. Having completed a local flight, the aircraft returned to Redlands Airfield, where it was established on final approach for grass Runway 24R. The approach was uneventful until shortly before landing when the pilot realised that the aircraft was positioned to one side of the runway centreline and slightly low. The pilot stated that as he tried to correct for the low approach, rather than push the control bar away from him, he had pulled the control bar towards him, resulting in a sudden pitch down. The aircraft landed heavily on the runway before coming to a stop. The aircraft trike was severely damaged. Neither the pilot nor his passenger sustained injury; both were wearing protective helmets and were restrained by a lap and diagonal belt and full harness respectively.

The pilot had flown 3,772 hours on fixed-wing aircraft and nine hours on flex-wing microlights. The pilot considered that when under pressure to correct the aircraft's flight path near to the ground, he had inadvertently reverted to the pitch control characteristics of a fixed-wing aircraft.

ACCIDENT

Aircraft Type and Registration:	Rans S6-ES Coyote II, G-CYOT
No & Type of Engines:	1 Jabiru 2200 piston engine
Year of Manufacture:	2008
Date & Time (UTC):	15 October 2009 at 1450 hrs
Location:	Southery airstrip, Norfolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Nose leg collapsed, damage to one propeller blade, left main landing gear and wing tips
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	43 years
Commander's Flying Experience:	86 hours (of which 13 were on type) Last 90 days - 19 hours Last 28 days - 13 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and telephone inquiries by the AAIB

Synopsis

The aircraft had just become airborne when the engine lost power. A forced landing in a field resulted in a ground loop and collapse of the nose landing gear.

History of the flight

The aircraft had undergone a 25-hour service at Southery airstrip. The owner planned to take a friend on a brief local flight before refuelling and returning to his home base in Wiltshire. He checked the fuel both in the tanks and gascolator for water and, after starting the engine and allowing it to warm to 50°C, he completed the pre-flight checks including magneto checks and a brief run-up to full power.

The takeoff roll was normal and the pilot rotated the aircraft at 45 kt, however, a few seconds after liftoff, at a height of 20-30 ft, the engine "coughed", ran roughly and lost power. The airspeed rapidly decayed and the left wing dropped, so the pilot applied corrective rudder and lowered the nose, now realising that a forced landing was inevitable. The aircraft had turned to the left, crossing a deep drainage fen which ran parallel and close to the runway edge, and the pilot elected to land in a ploughed field just beyond the fen rather than risk crossing it again to land back on the runway.

After switching off the engine and instructing his passenger to brace for impact, he did not have enough airspeed to flare the landing and the aircraft struck the

ground nosewheel first, collapsing the nose landing gear leg. As the underside of the engine cowling struck the ground, the left wingtip also touched, spinning the aircraft through 180°. It came to rest some 15 metres after the nosewheel impact and the pilot and passenger evacuated normally without injury, having turned off the fuel and all electrical switches.

During examination of the aircraft after the accident, it was noticed that the rubber tube which mounted the carburettor to the engine had sheared in two. This struck the pilot as unusual since, to his knowledge, ground impacts resulting in carburettor detachment usually involve the tube pulling off intact. A pre-existing split in the tube, resulting in an over-lean mixture would be consistent with the reported malfunction of the engine.

The pilot suggests that overtightening of a jubilee clip might have damaged the rubber. It was also noted that the carburettor was equipped with a heating system which utilises hot engine oil to warm the body and prevent icing. This system increases the weight of the carburettor and, when used on a different model of aircraft, an additional stay is used to compensate for the extra weight. G-CYOT was not equipped with this additional support.

INCIDENT

Aircraft Type and Registration:	Thruster T600N 450, G-EVEY
No & Type of Engines:	1 Jabiru Aircraft Pty 2200A piston engine
Year of Manufacture:	2001
Date & Time (UTC):	26 October 2009 at 1330 hrs
Location:	Near Newtownards Airfield, Northern Ireland
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Propeller detached
Commander's Licence:	Private Pilot's Licence
Commander's Age:	61 years
Commander's Flying Experience:	3,385 hours (of which 3,000 were on type) Last 90 days - 40 hours Last 28 days - 36 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The student had just climbed the aircraft to the circuit height of 700 ft, turned downwind and was throttling the engine back to cruise power, when a rumbling noise was heard from the front of the engine. Approximately ten seconds later the propeller detached from the engine. The instructor took control and completed a successful forced landing in a field which he often used for practice engine failures after takeoff. There were no injuries and the aircraft suffered no further damage. Subsequent examination revealed evidence of extensive fatigue crack propagation in the propeller attachment bolts (Figure 1), which eventually failed in ductile overload, causing the propeller to detach.

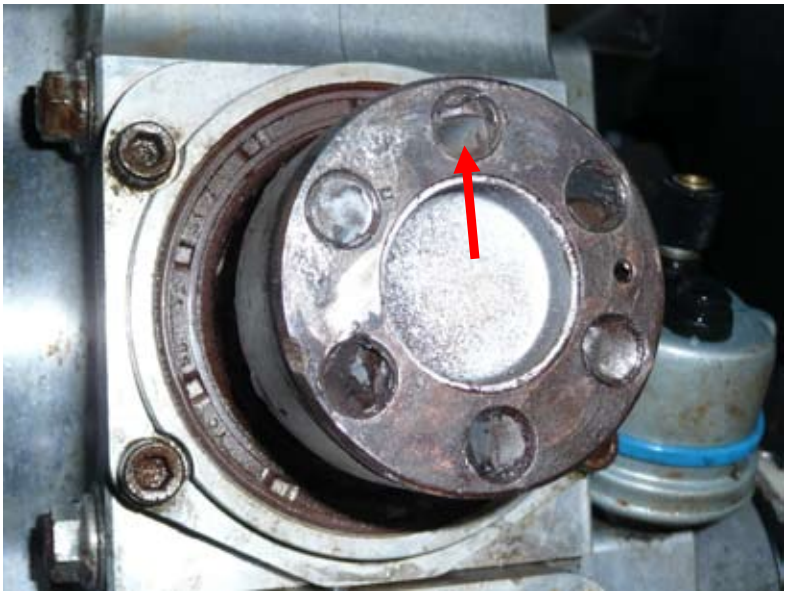

Figure 1

View on propeller mounting flange showing failed bolts with evidence of fatigue propagation (arrowed)

BULLETIN ADDENDUM

AAIB File:	EW/G2009/03/04
Aircraft Type and Registration:	Hawker Hurricane 2B, G-HHII
Date & Time (UTC):	11 March 2009 at 1139 hrs
Location:	North Weald Airfield, Essex
Information Source:	Additional information provided by the maintenance organisation

AAIB Bulletin No 7/2009, page 12 refers

It was reported in this bulletin that the incident was attributed by the pilot to a defect in a brake control valve which had caused the brakes to be partially applied prior to landing. Since the publication of the bulletin, the AAIB has been advised of the results of further troubleshooting work undertaken by the maintenance organisation.

The braking system was subjected to detailed inspection and extensive testing, which proved satisfactory. In addition, the dual relay valve was removed from the aircraft for independent testing; no faults were found. Despite this further testing it has not been possible to identify the cause of the reported partial brake application. The aircraft has since flown several hours with no further braking problems.

BULLETIN CORRECTION

AAIB File:	EW/G2009/09/20
Aircraft Type and Registration:	Piper PA-38-112 Tomahawk, G-BOMO
Date & Time (UTC):	24 September 2009 at 1052 hrs
Location:	Swansea Airport
Information Source:	Aircraft Accident Report Form

AAIB Bulletin No 2/2010, page 92 refers

This report incorrectly refers throughout to the pilot as female. The pilot was male.

FORMAL AIRCRAFT ACCIDENT REPORTS ISSUED BY THE AIR ACCIDENTS INVESTIGATION BRANCH

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.

2009

1/2009 Boeing 737-81Q, G-XLAC,
Avions de Transport Regional ATR-72-202, G-BWDA, and
Embraer EMB-145EU, G-EMBO
at Runway 27, Bristol International Airport
on 29 December 2006 and
on 3 January 2007.

Published January 2009.

2/2009 Boeing 777-222, N786UA
at London Heathrow Airport
on 26 February 2007.

Published April 2009.

3/2009 Boeing 737-3Q8, G-THOF
on approach to Runway 26
Bournemouth Airport, Hampshire
on 23 September 2007.

Published May 2009.

4/2009 Airbus A319-111, G-EZAC
near Nantes, France
on 15 September 2006.

Published August 2009.

5/2009 BAe 146-200, EI-CZO
at London City Airport
on 20 February 2007.

Published September 2009.

6/2009 Hawker Hurricane Mk XII (IIB), G-HURR
1nm north-west of Shoreham Airport, West Sussex
on 15 September 2007.

Published October 2009.

2010

1/2010 Boeing 777-236ER, G-YMMM
at London Heathrow Airport
on 28 January 2008.

Published February 2010.

AAIB Reports are available on the Internet
http://www.aaib.gov.uk