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AAIB Special Bulletins / Interim Reports

AAIB Special Bulletins and Interim Reports

This section contains Special Bulletins and Interim Reports that have been published since the last AAIB monthly bulletin.

ACCIDENT

Aircraft Type and Registration:	EC225 LP Super Puma, G-REDW
No & Type of Engines:	2 Turbomeca Makila 2A1 turboshaft engines
Year of Manufacture:	2009 (Serial no: 2734)
Date & Time (UTC):	10 May 2012 at 1114 hrs
Location:	20 nm east of Aberdeen
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 2 Passengers - 12
Injuries:	Crew - None Passengers - 2 (Minor)
Nature of Damage:	Salt water immersion
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	40 years
Commander's Flying Experience:	3,060 hours (of which 2,740 hours were on type)
Information Source:	AAIB Field Investigation

This Special Bulletin contains information about the helicopter's main gearbox (MGB) lubrication system and the results of an investigation into the indication of a failure of the emergency lubrication system, after it was activated by the crew. It follows publication of two earlier Special Bulletins on this accident, AAIB Special Bulletins S2/2012 and S3/2012.

This was the first occasion that the EC225 LP MGB emergency lubrication system had been operated in-service. One Safety Recommendation is made.

The investigation into the failure of the bevel gear vertical shaft in the MGB continues.

Background

The helicopter was on a scheduled flight from Aberdeen Airport to the Maersk Resilient platform, in the North Sea, 150 nm east of Aberdeen. On board were two flight crew and twelve passengers. The helicopter was in the cruise at an altitude of 3,000 ft, 34 nm east of Aberdeen Airport, when the flight crew were presented with indications of low pressure in the MGB main and standby oil lubrication systems. The crew activated the MGB emergency lubrication system and, following a subsequent warning indicating failure of that system, carried out a controlled ditching into the sea.

All the passengers and crew evacuated the helicopter into a life raft and were subsequently rescued. Two passengers sustained minor injuries.

Aircraft information

MGB certification requirements

The EC225 LP was certified against the Joint Aviation Regulations (JAR) 29, which require the helicopter to continue safe flight, at prescribed torque and main rotor speeds, for at least 30 minutes following the loss of the MGB lubrication system. This is achieved on the EC225 LP by the use of an emergency lubrication system that uses a mixture of glycol and water (called Hydrosafe 620) which cools and lubricates the MGB.

MGB lubrication

The MGB fitted to the EC225 LP is of a largely similar design to the MGB fitted to the AS332 L2, but has a 15% greater torque capability. The MGB oil pumps (main and standby) are driven by two pinion gears located on the lower part of the bevel gear vertical shaft. The MGB normally contains 22 litres of oil.

The MGB lubrication system includes two mechanically-driven oil pumps and a crew-activated emergency lubrication system (see Figure 1). The latter comprises: a bleed air supply from the left engine, a Hydrosafe 620 supply from an 11 litre reservoir, a series of small pipes around and inside the MGB, to deliver the Hydrosafe 620 in a spray, and monitoring and command systems on a dedicated Printed Circuit Board (PCB).

There is a vent on the side of the MGB through which Hydrosafe 620 mist, and potentially MGB oil, can pass.

When the emergency lubrication system is activated an electro-valve, called the P2.4 valve, opens and bleed air from the left engine enters the system, after passing through an air heat-exchanger. At the same time, an electric pump supplies Hydrosafe 620 from the reservoir. There are two similar sensors that monitor the pressure in the Hydrosafe 620 pipes and bleed air lines; these sensors are mounted on the MGB. A MGB EMLUB caption will illuminate if low pressure is detected in either the Hydrosafe 620 pipes or the bleed air lines. This warning is inhibited for approximately 30 seconds after the system is activated, to allow the system to reach a steady state.

The low pressure signal is generated by either the bleed air or Hydrosafe 620 pressure sensors if the pressure does not exceed a specified pressure value, p_{on}, when the system is activated, or the pressure subsequently falls below a specified pressure, p_{off}.
The specified range for p_{on} for the bleed air pressure sensor is between 0.6 and 1.0 bar (relative to ambient).

Using engine data, the bleed air from the left engine at the time of the accident would have entered the bleed air line at approximately 2.3 bar (absolute). This equated to around 1.4 bar (relative) due to the ambient pressure at an altitude of 3,000 ft.

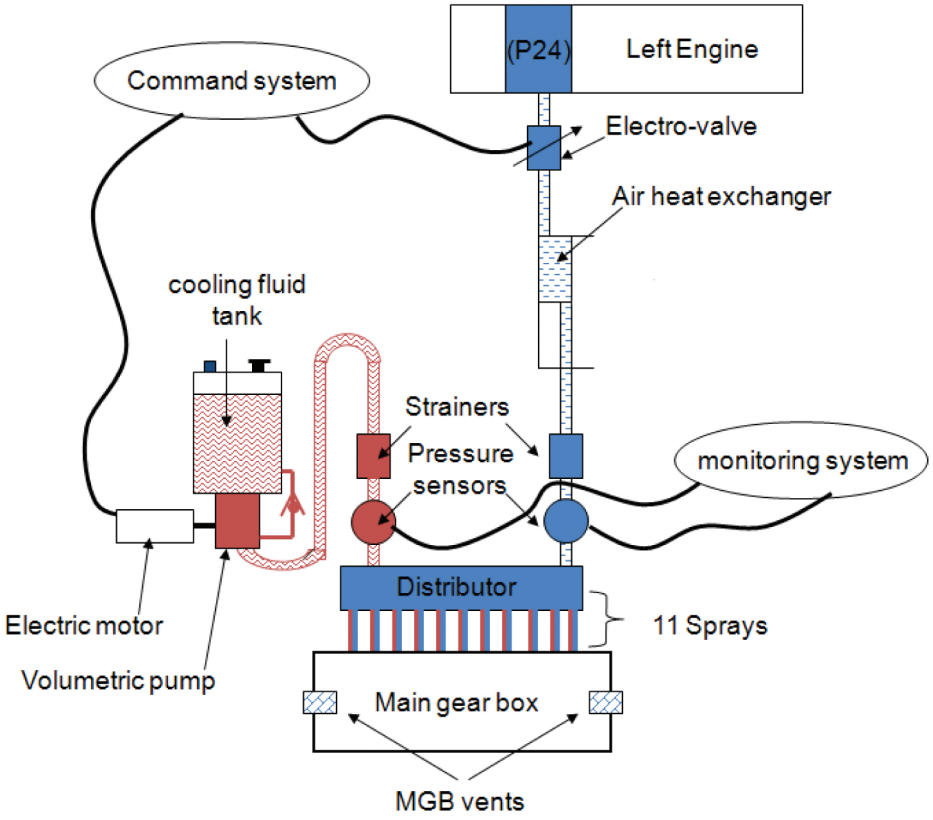

Figure 1

Schematic of the Emergency Lubrication System

Emergency lubrication system certification tests

The emergency lubrication system was certificated by the European Aviation Safety Agency (EASA). Certification included a test on a ground rig in which the oil was drained from a MGB and bleed air and Hydrosafe 620 were sprayed into the gearbox. The test demonstrated that there was no significant damage to the MGB after over 30 minutes of operation. Although the emergency lubrication sub-systems were tested individually, no test was carried out on the complete system, either on a test rig or installed on the helicopter type.

Emergency lubrication system investigation

Early in the investigation, it was established that the bevel gear vertical shaft in the MGB had failed, which had interrupted the drive to both oil pumps. As a result of this failure and the loss of MGB oil pressure, the crew activated the emergency lubrication system. From the Cockpit Voice Recorder (CVR), it was determined that the MGB EMLUB caption illuminated 32 seconds after the crew activated the emergency lubrication system, and the time from activation to the failure of electrical power, after the aircraft ditched, was approximately 7½ minutes.

Hydrosafe 620 system

No evidence of any leaks in the Hydrosafe 620 system was found. The MGB sump was drained and was found to contain approximately 17 litres of liquid, of which approximately 1.5 litres was Hydrosafe 620, which is denser and of a different colour to the MGB oil. During a strip examination, evidence of glycol

was found throughout the MGB casing and on all the gears and bearings. There was no visual evidence of heat distress or damage to any of the components in the MGB.

The amount of fluid remaining in the Hydrosafe 620 reservoir was 7.8 litres, which, given that the reservoir holds 11 litres, would indicate that approximately 3.2 litres were used while the system was operating, if the reservoir was full. Using nominal flow rates for the pump, approximately 2.8 litres of Hydrosafe 620 would be used during 7½ minutes of system operation. Hence, there is evidence that the Hydrosafe 620 pump was operating normally from the time the system was activated until the aircraft ditched, when electrical power ceased.

If the MGB contained 22 litres of oil prior to the accident and approximately 3 litres of Hydrosafe 620 was sprayed into the MGB, then about 8 litres (25 minus 17) of fluid was probably lost through the vent. This would have been a combination of MGB oil and Hydrosafe 620 and, given that the latter comprises gycol and water, some of this was probably lost as water vapour.

Bleed air system

The connections for the components in the bleed air circuit were checked and appeared normal. No evidence of any leaks in the bleed air pipes was found, and pressure tests on the bleed air pipes and the heat exchanger revealed nothing abnormal. It was considered that it was unlikely that there were any leaks in the bleed air system.

The electrically operated P2.4 valve (which, when open, permits the flow of bleed air into the emergency lubrication system) was tested back-to-back with a new valve. The tests were made at a range of flow rates and pressures. Whilst the P2.4 valve was found to remain partially open when no pressure was applied, it performed in a similar way to the new valve at the representative flow rates and pressures. It was concluded that the valve was not a factor in the indication of failure of the system. The pressure loss across the P2.4 valve was measured at around 0.02 bar.

The bleed air heat-exchanger from G-REDW was tested back-to-back with a new unit, at a range of pressures and flow rates, and was found to perform in a similar manner to the new unit. The pressure loss across the heat-exchanger from G-REDW, at conditions that the manufacture believed were similar to those at the time of the accident, was approximately 0.3 bar. However, it was not possible to determine accurately the flow rate for the bleed air at the time of the accident and the loss could have been over 0.6 bar. Hence, there is a significant error margin in the estimate for the pressure loss across the air heat-exchanger.

Printed circuit board

The PCB, which controls and monitors the emergency lubrication system, was functionally tested and operated in accordance with the factory inspection test. The time delay, during which a failure warning is inhibited, was measured at 32 seconds. This was the same as the period of time between the crew's activation of the system and the illumination of the MGB EMLUB caption.

Bleed air and glycol pressure sensors

Both sensors were tested at the equipment manufacturer where the acceptance tests were originally carried out. Both sensors conformed to their respective acceptance tests. For the bleed air pressure sensor, p_{on} was measured at 0.68 bar.

Wiring for the emergency lubrication system

The wiring on the helicopter for the emergency lubrication system was checked as thoroughly as practicable. The continuity and insulation were found to be satisfactory.

Analysis

The evidence indicates that the emergency lubrication system had activated and remained operating for the remainder of the flight. Thus the system had given the crew a false warning of system failure. This warning resulted in the crew ditching the helicopter in the sea.

From the CVR, it was determined that the MGB EMLUB caption illuminated 32 seconds after the emergency lubrication system was activated by the crew. The time delay during which the warning is inhibited on the PCB was also measured at 32 seconds. As far as practicable, all the components of the emergency lubrication system were tested and nothing abnormal was found. The quantity of Hydrosafe 620 that remained in the reservoir and the quantity found in the MGB sump indicated that the Hydrosafe 620 was delivered correctly. Given that the emergency lubrication system appears to have cooled and lubricated the MGB successfully, from its activation until the aircraft ditched, it was concluded that its monitoring system gave a false indication of failure.

When the bleed air pressure sensor was tested, p_{on} was measured at 0.68 bar. The pressure at the input to the bleed air line would have been about 1.4 bar (relative), with the loss across the air heat-exchanger around 0.3 bar, but this could have been greater. There would also have been losses in other parts of the system upstream of the pressure sensor. The margins are small and the possible error bands are significant. It is possible, therefore, that the bleed air pressure sensor on G-REDW triggered the MGB EMLUB caption.

More importantly, the upper end of the specification for the bleed air pressure to trigger a low pressure input to the monitoring system is 1.0 bar (relative). Therefore, it was concluded that a bleed air pressure sensor at the top end of the specified tolerance could generate an MGB EMLUB caption, even though all the parts of the emergency lubrication system are operating within their specifications.

Safety Recommendation

This was the first time the MGB emergency lubrication system on the EC225 LP had been activated operationally and it has been determined that a pressure sensor that is within tolerance could generate an MGB EMLUB caption, even though the system is cooling and lubricating the MGB successfully. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2012-034

It is recommended that the European Aviation Safety Agency requires Eurocopter to review the design of the main gearbox emergency lubrication system on the EC225 LP Super Puma to ensure that the system will provide the crew with an accurate indication of its status when activated.

Published 17 October 2012

ACCIDENT

Aircraft Type and Registration:	EC225 LP Super Puma, G-CHCN
No & Type of Engines:	2 Turbomeca Makila 2A1 turboshaft engines
Year of Manufacture:	2007 (Serial no: 2679)
Date & Time (UTC):	22 October 2012 at 1425 hrs
Location:	In the North Sea, approximately 32 nm southwest of Sumburgh, Shetland Islands
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 2 Passengers - 17
Injuries:	Crew - None Passengers - None
Nature of Damage:	To be assessed following salt water immersion
Commander's Licence:	To be advised
Commander's Age:	To be advised
Commander's Flying Experience:	To be advised
Information Source:	AAIB Field Investigation

This bulletin provides initial information on the progress of the investigation.

Summary

The crew of the helicopter carried out a controlled ditching following indications of a failure of the main gearbox (MGB) lubrication system and, subsequently, a warning indicating failure of the emergency lubrication system. All passengers and crew evacuated the helicopter and were subsequently rescued without injury.

History of the flight

The aircraft was on a planned flight from Aberdeen International Airport to the West Phoenix drilling rig, approximately 226 nm to the north.

The crew reported that, whilst in the cruise at about 140 kt and 3,000 ft amsl with approximately 81% total torque applied, the XMSN (transmission) caption illuminated on the Central Warning Panel (CWP). They added that the M.P (main pressure), MGB.T (main gearbox oil temperature) and the S/B.P (standby oil pump pressure) captions on the Vehicle Management System (VMS) also illuminated and the main gearbox oil pressure indicated zero. The MGB.P (main gear box oil pressure) caption then illuminated on the CWP. The crew actioned the '*Total Loss of MGB (Main Gear Box) Oil Pressure*' checklist, which required the activation of the MGB emergency lubrication system (EMLUB). However, within a minute the MGB EMLUB caption illuminated on the CWP indicating that the emergency lubrication system had failed.

As a result of the MGB EMLUB caption illuminating, the crew carried out the '*Emergency Landing – Power ON*' checklist and successfully ditched the helicopter in the sea, close to a ship. The passengers and crew evacuated the helicopter and boarded two life rafts before being rescued and transported to the ship. There were no reported injuries.

The helicopter has been recovered from the sea and transported to Aberdeen for examination. The Digital Voice and Data Recorder (DVDR) and other items of avionics have been removed and transported to Farnborough for further analysis.

Composition of the investigation

The AAIB dispatched a team of investigators and support staff to Aberdeen. In accordance with established International arrangements the Bureau d'Enquetes et d'Analyses Pour la Securitié de l'Aviation Civile (BEA), representing the State of Manufacture of the helicopter, and the European Aviation Safety Agency (EASA), the Regulator responsible for the certification and continued airworthiness of the helicopter, were informed of the accident. The BEA appointed an Accredited Representative to lead a team of advisors from the BEA and Eurocopter (the helicopter manufacturer).

Helicopter information – lubrication of the main gearbox

The main gearbox lubrication system includes two mechanically-driven oil pumps and a crew-activated emergency lubrication system. The gearbox normally contains 22 litres of oil. The oil pumps (a main pump and a standby pump) are driven by the oil pump drive pinion located on the lower part of the bevel gear vertical shaft within the main gearbox. Vertical shafts of this type are fitted to all EC225 and some AS332 L1 and L2 helicopters. The bevel gear vertical shaft is manufactured from two sections welded together.

The emergency lubrication system includes an 11 litre tank, containing a mixture of glycol and water (Hydrosafe 620), and an electric pump. When activated, Hydrosafe 620 is pumped into a distributor, mixed with engine bleed air, and sprayed into the main gearbox. The spray is designed to provide a minimum of 30 minutes of main gearbox cooling and lubrication in the event of total loss of oil lubrication. The MGB EMLUB caption illuminates if the system fails.

Recorded data

The helicopter, in addition to carrying the DVDR, was also equipped with a Vibration Health Monitoring VHM) system that recorded vibration signatures from around the airframe, engines, main rotor gearbox and transmission; this information was recorded on a removable memory card. During the evacuation of the helicopter, the flight crew removed this memory card and the data it contains has been subject to an initial investigation.

The operator had last downloaded the VHM data card on Sunday 21 October at 1107 hrs (UTC). The memory card recovered from the helicopter, following the ditching, contained vibration data for two sectors flown that Sunday afternoon and also the two sectors flown prior to the accident flight on Monday 22 October. The data on the memory card did not contain vibration information from the accident flight but this information may be retained within some of the avionics still to be examined. It should be noted that the VHM uses an internal clock which is checked every 90 days and consequently the detailed timings stated below are provisional and subject to revision.

Vibration data prior to the accident flight was examined and the vibration signatures known as the MOD 45 indicator, which monitors the meshing frequency of the bevel gear and the MOD 70 indicator, which monitors the meshing frequency of the oil pump wheels, show some exceedances. These two indicators each have two alert thresholds; a lower threshold designated AMBER, and a higher threshold designated RED.

During the first two sectors, on Monday 22 October, the helicopter flew for approximately 3 hours 50 minutes. During the first sector, the MOD 45 indicator showed an increasing trend that then exceeded the AMBER trigger threshold followed, later during that sector, by an exceedance of the RED threshold. During the second sector three further data points were recorded, all above the RED threshold and increasing in magnitude. The MOD 70 data showed one exceedance; a value in excess of the RED threshold which occurred during the second sector at the same time as the final MOD 45 point. Indicators Kg and Kr, which are also associated with the bevel shaft and wheels, also showed increasing trends and exceeded their AMBER thresholds.

Data from the first two sectors flown on Monday 22 October was not downloaded by the operator and there was no requirement to do so.

Preliminary engineering investigation

The main gearbox was drained. An initial visual examination has identified a 360 degree circumferential crack on the bevel gear vertical shaft, in the vicinity of the weld that joins two sections of the shaft. Therefore, the main and standby oil pump gears were no longer being driven.

Related information

On 10 May 2012 there was an accident to an EC225 LP (G-REDW) in which the bevel gear vertical shaft failed. That investigation is ongoing and the manufacturer issued a Service Bulletin, which was subsequently mandated by Airworthiness Directive (AD 2012-0115E) and contained requirements applicable to EC 225 LP helicopters fitted with bevel gear vertical shafts of a certain part number and serial number. The requirement was to monitor, at set intervals, the MOD 45 and MOD 70 indicators. The vertical shaft (part number 332A32-5101-00, serial number M122) fitted to G-CHCN was not within the applicability of the AD.

Safety action taken

Based on these preliminary findings, the EASA and the helicopter manufacturer are urgently reviewing the effectiveness and scope of Airworthiness Directive AD 2012-0115E, AS332 ASB No 01.00.82 and EC225 ASB No 04A009 with a view to reissuing these to widen the applicability and modify the monitoring intervals.

Further investigation

A detailed engineering investigation of the helicopter is continuing with the full assistance of the helicopter

manufacturer and operator. In addition to a detailed analysis of recorded data, further work will also address the survival and search and rescue aspects. The AAIB will report significant developments as the investigation progresses.

Published 24 October 2012

AAIB Field Investigation reports

INCIDENT

Aircraft Type and Registration:	Airbus A340-313, 4R-ADG
No & Type of Engines:	4 CFM56-5C4 turbofan engines
Year of Manufacture:	2000
Date & Time (UTC):	5 February 2012 at 1113 hrs
Location:	London Heathrow Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 15 Passengers - 245
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	61 years
Commander's Flying Experience:	16,600 hours (of which 2,500 were on type) Last 90 days - 300 hours Last 28 days - 100 hours
Information Source:	AAIB Field Investigation

Synopsis

The aircraft started its takeoff from a runway intersection for which no regulated takeoff weight chart was available in the aircraft. The pilots calculated performance using a chart for a different runway which did not consider obstacles relevant to the runway in use. The takeoff and subsequent flight were completed without further incident.

History of the flight

The aircraft was scheduled to fly from London Heathrow Airport to Colombo International Airport, Sri Lanka and was departing from Terminal 4. The flight deck crew comprised the commander and co-pilot, and a cruise captain[1] who was not present on the flight deck during much of the pre-flight preparation.

The pilots expected to use the full length of Runway 09R for departure but, when the co-pilot requested ATC clearance, were asked if they could accept a departure

Footnote

[1] The role of a cruise pilot is to take the place of an operating pilot during part of the cruise phase of a long haul flight, thereby enabling the operating pilot to take rest.

from the SB7 intersection. The operating pilots discussed and accepted departure from this intersection.

A RTOW chart for departure from SB7 was not available in the aircraft so the commander referred to a chart for a similar length runway at another aerodrome. The crew did not recall which aerodrome they used for this calculation. The commander calculated the takeoff speeds and the flexible temperature (T_{Flex})[2] and the co-pilot checked the calculations. The pilots entered the resulting information directly into the Multi-function Control and Display unit (MCDU).

The co-pilot suggested that, rather than carrying out a flexible takeoff, they should use full power for takeoff. After a further discussion, the crew elected to carry out the planned flexible temperature takeoff. The crew could not remember the takeoff speeds calculated or the exact T_{Flex} used and there was no requirement under EU OPS 1 for the crew to record this information. However, the commander indicated that he thought the T_{Flex} that they used was in the "low to mid thirties". The remainder of pre-flight preparation proceeded normally.

The aircraft lined up on Runway 09R via the SB7 intersection and the takeoff commenced. The aircraft was observed by the aerodrome controller (ADC) and, as it became airborne, by a photographer who was just outside the airport perimeter. The ADC assessed that the aircraft lifted off significantly closer to the end of the runway than he would expect and the photographer thought that the aircraft was noticeably lower than normal during the initial climb. Both operating pilots considered that the takeoff was in line with their expectations and experience. The cruise captain, who was sitting on the jump seat, thought that the acceleration was slightly slow and suggested applying full power; however, neither operating pilot reported hearing this suggestion and the takeoff was achieved using flexible thrust.

The remainder of the flight to Colombo proceeded without further incident.

Footnote

[2] The pilot can use flexible takeoff power when the actual takeoff weight is lower than the maximum permissible takeoff weight for the actual temperature. The maximum engine thrust, and therefore the maximum permissible takeoff weight, decreases when temperature increases, so it is possible to assume an environmental temperature at which the actual takeoff weight would be the limiting one, thereby achieving a reduced thrust for takeoff. This temperature is called *'flexible temperature'*.

Weight and balance

The aircraft takeoff weight and CG were 245,160 kg and 30.5% MAC[3] respectively; both were within normal operating limits.

Meteorology

The ATIS, recorded five minutes after the aircraft took off, indicated surface wind from 010° at 4 kt, varying between 320° and 060°, visibility greater than 10 km, few cloud at 1,000 ft, broken cloud at 1,300 ft, temperature +2°C, dewpoint 0°C and QNH 1028 hPa with, temporarily, scattered cloud at 1,400 ft.

Airfield information

At the time of the incident, the departure runway was 09R. The airport operator was expecting to initiate low visibility procedures (LVP) and Taxiway S, between SB7 and S11, was closed as a normal part of the preparation for such operations. Crews departing from Terminal 4 were offered the option of departing from the SB7 intersection or, if the aircraft required a longer runway, then they could be required to cross to the north of Runway 09R for departure. A chart of the airfield showing the SB7 intersection and the section of taxiway closed is shown in Figure 1.

Footnote

[3] Mean area chord.

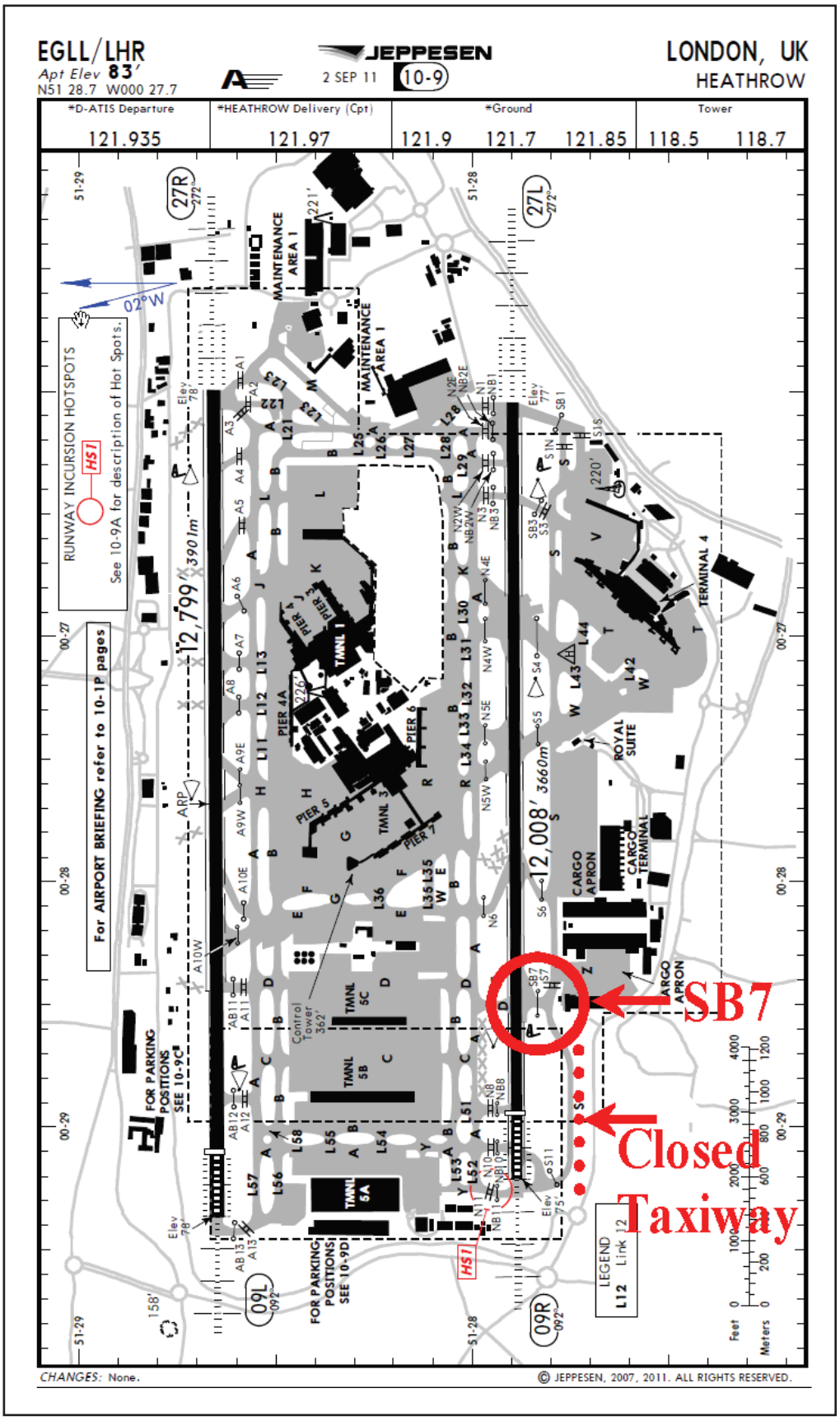

Figure 1

Heathrow Airport chart

Performance calculation

The airline instructs its pilots in two methods of calculating takeoff performance. The first method involves the use of regulated takeoff weight (RTOW) charts. Each chart is unique to a particular runway and separate charts are required for a takeoff from different intersections on the same runway. Separate charts are available for the different engine options of A340 aircraft operated by the airline. The second method involves the use of quick reference tables (QRT) in the Flight Crew Operating Manual (FCOM). These tables are generic and enable the crew to determine the takeoff performance at an airport for which no takeoff chart has been established. The tables allow runway length, slope and pressure altitude, wind and obstacles to be considered. The instructions for their use state:

> *'The determination of flexible temperature is possible only when there is no obstacle on the flight path.'*

The investigation calculated that the takeoff run required for the aircraft, based on the conditions at the time of the incident and the weight and configuration, was 2,268 m and the required maximum T_{Flex} was 38°C. The declared takeoff run available was 2,854 m.

The airline did not provide any guidance concerning alternative means of obtaining performance data if neither of the above procedures could be used.

Recorded information

A delay in the notification of this incident to the AAIB meant that the data from the takeoff had been overwritten on the flight data recorder (FDR). The operator provided the AAIB with the optical disk from the aircraft's quick access recorder (QAR); however, problems with the QAR system also meant that no flight data had been written to the disk. An analysis of the Heathrow ground movement radar did, however, indicate the approximate position at which the aircraft became airborne. The distance from intersection SB7 to this position was 2,650±50 m.

The takeoff data entered into the MCDU is not recorded by the FDR or QAR.

Analysis

The pilots did not have access to RTOW charts for a takeoff from the SB7 intersection of Runway 09R. In the absence of these charts the pilots calculated the takeoff performance using a RTOW chart for a different runway of comparable length. Data derived from a RTOW chart for a different runway may not be correct because obstacles affecting the runway in use are not considered.

If the crew had used the QRT method of calculating the takeoff performance they would have been required to carry out a full thrust takeoff as obstacles were present in the Runway 09R takeoff path.

It is possible that the aircraft was operated in accordance with the requirements for performance class A aircraft, which requires that the takeoff distance and run required should not exceed the takeoff distance and run available. The commander recalled that the approximate T_{Flex} used for the takeoff was less than the maximum allowable, and it is probable that the thrust used was sufficient to meet performance A requirements. However, the method used by the crew to obtain the performance data was not in accordance with the airline training.

Takeoff performance data was not recorded, and the crew could not recall the data they calculated. Therefore, it was not possible for the investigation to check the validity of the data used.

Safety action

The crew entered the takeoff speeds and flexible temperature directly into the MCDU during the takeoff performance calculation and did not record this data separately. Without this information, the investigation could not check the validity of the performance calculation carried out. EC 859/2008 Annex III OPS 1.1060 defines the information to be recorded on the operational flight plan but there is no requirement to record the output of the takeoff performance calculation. The completeness of the investigation was restricted by the lack of this essential data and this problem could apply to any future investigation where the calculated takeoff data may be of interest. Therefore, in order to assist future safety investigations involving takeoff performance, the following Safety Recommendation is made:

Safety Recommendation 2012-030

It is recommended that the European Aviation Safety Agency introduce a requirement for fixed wing operators holding an Air Operator Certificate to record takeoff speeds and, where they are variable, thrust and configuration settings used for takeoff and retain this information with the Operational flight plan.

Any change of regulation because of this Safety Recommendation would only apply to operators subject to EASA regulations. The operator of this aircraft was not. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2012-131

It is recommended that the International Civil Aviation Organization introduce a standard or recommended practice for fixed wing aeroplanes to record the flight management system takeoff performance data entries on the flight data recorder during the takeoff phase. The data should be retained in the operator's flight data analysis programme.

As a result of this incident the airline instructed its pilots that takeoffs must not be commenced without relevant takeoff data. It specifies that a customised RTOW chart can be obtained from the dispatch centre or, if no RTOW chart can be obtained, then the QRT may be used if accurate obstacle data is available.

Conclusion

The aircraft departed from an intersection for which no performance data was available in the aircraft. The performance calculation, using a chart for a different runway, did not consider obstacles relevant to the runway in use. The operator has provided additional guidance on the procedure its pilots should follow in these circumstances.

SERIOUS INCIDENT

Aircraft Type and Registration:	Dornier 328-100, DO328, G-BWWT
No & Type of Engines:	2 Pratt & Whitney Canada PW119B turboprop engines
Year of Manufacture:	1995 (Serial No: 3022)
Date & Time (UTC):	22 March 2012 at 0955 hrs
Location:	Norwich International Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 3 Passengers - 24
Injuries:	Crew - None Passengers - None
Nature of Damage:	Runway edge light broken
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	59 years
Commander's Flying Experience:	20,175 hours (of which 2,800 were on type) Last 90 days - 24 hours Last 28 days - 14 hours
Information Source:	AAIB Field Investigation

Synopsis

The pilot became visual with the runway at about 1 nm, with the aircraft about ½ nm south of the centreline after levelling at MDA from an NDB/DME approach to Runway 09 at Norwich. The aircraft subsequently touched down tracking towards the right edge of the runway. The aircraft's right main landing gear went onto the grass and broke a runway edge light but the subsequent go-around and landing were uneventful.

History of the flight

G-BWWT was on a scheduled flight from Manchester International Airport to Norwich International Airport and the sector was uneventful until the final part of the approach. Before descent the crew received the ATIS that stated the visibility was 4 km in haze and the wind was from 110° at 07 kt. The commander, who was pilot flying (PF), subsequently briefed for radar vectors to the final approach for an NDB/DME approach to Runway 09. The co-pilot, who had gained his captaincy seven months before the incident, was the pilot monitoring (PM). Figure 1 shows the NDB/DME approach plate to Runway 09, with flight path overlay.

The aircraft descended to 2,000 ft amsl heading 120°M and established on the inbound bearing of 088°. At this point the aircraft was configured for landing and the landing checks had been completed. The aircraft then intercepted the nominal 3° descent path at 5.8 nm using the autopilot's (A/P) vertical speed mode. During the later part of the approach, while still above MDA, the

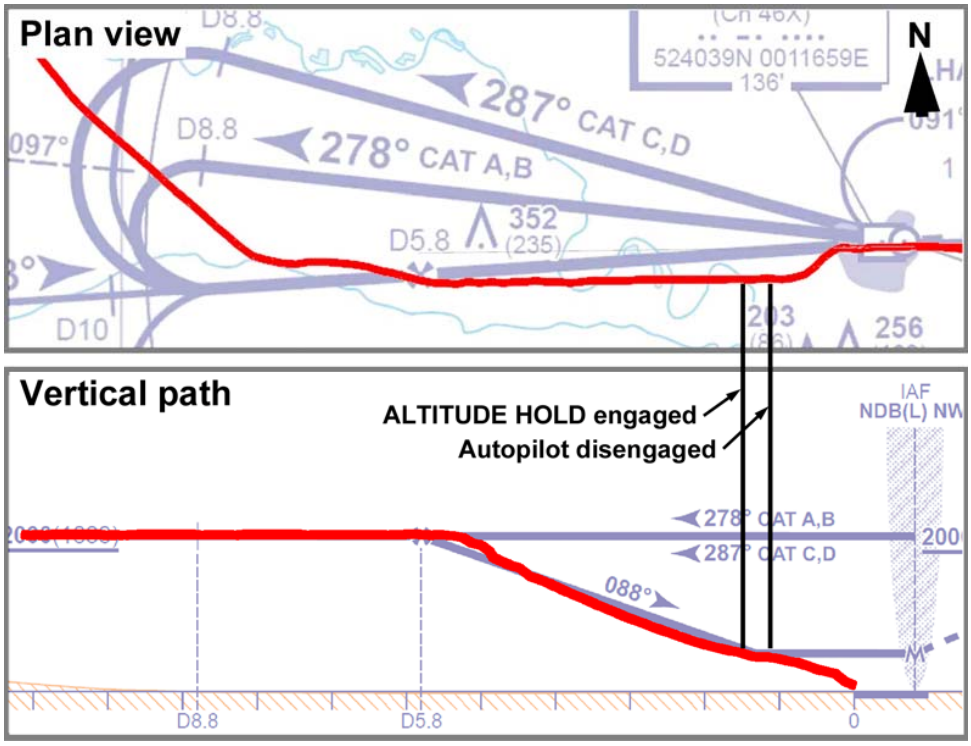

Figure 1

Excerpt from NDB/DME approach plate, Runway 09 at Norwich, with flight path overlay

commander could see the ground and was aware of his position due to his local area knowledge.

At the MDA of 580 ft amsl[1] the commander levelled the aircraft by selecting ALT HOLD on the A/P's mode control panel. "A few seconds later" he became visual with the runway and was, by his estimation, about ¾ nm south of the centreline. The co-pilot could not see the runway as it was obscured by the aircraft's structure. The commander, believing he could land off the approach, disconnected the autopilot and manoeuvred the aircraft to line up with the runway centreline. The aircraft crossed the runway threshold with right bank applied, tracking towards the right-hand edge of the runway and touched down, firmly. As the aircraft touched down, or possibly just before, the co-pilot called "go-around"; this was flown by the commander without event.

ATC subsequently offered the crew an approach to either Runway 09 or Runway 27. Due to the light wind they elected to fly an ILS approach to Runway 27; the subsequent approach and landing was uneventful. After landing the crew noticed a broken runway edge light near to the Runway 09 threshold and assumed their aircraft had broken it after their first approach; they reported this to ATC.

The commander informed the operator of the incident by telephone soon after the aircraft came onto stand and subsequently filed a MOR. The incident was reported to the AAIB the following day; as a result of the aircraft having flown after this incident the CVR had been overwritten.

Subsequent engineering inspection found no damage to the aircraft.

Footnote

[1] 560 ft amsl published minima +20 ft for a continuous decent final approach.

Airfield inspection

The airfield was inspected by the airport operator and the AAIB. Tyre marks from G-BWWT were found on the runway and grass, with a broken lens from a runway edge light. Tyre tracks from the right landing gear wheels are shown at Figure 2.

Crew's comments

Commander

The commander later commented that the forward visibility during the approach was reduced as a result of flying towards the sun. He added that it was poor judgement on his part to fly the unstable manoeuvre after he became visual with the runway.

At 1000 hrs on 22 March 2012, the sun's elevation was 32.3° and its bearing was 143.2°T.

Co-pilot

The co-pilot stated that this was his first time in the right seat since gaining his captaincy and it was decided between the flight crew that the commander would be PF as the co-pilot "wanted to get used to the different perspective from the right seat again."

The co-pilot added that he had been "slightly concerned" during the manoeuvre but had confidence in the commander's ability and so did not interject. He had not called 'go-around' before the aircraft was over the runway, despite it being unstable, as he thought the commander was going to line up with the centreline and land safely.

Figure 2

Photograph of runway excursion by right main landing gear

Recorded data

Flight recorders

The aircraft was fitted with an FDR and a CVR but the CVR evidence was over-written before the AAIB had been notified of the incident. The FDR recording captured the event flight, including the first approach, shown in Figure 3.

The recordings showed that the A/P was engaged with a lateral mode of HEADING SELECT for the whole approach. The A/P pitch mode transitioned from ALT HOLD to VERTICAL SPEED for the descent but at approximately 460 ft aal switched back to ALT HOLD. After a further 10 seconds the autopilot was disengaged and control inputs to correct the aircraft's position were initiated. This is considered to be the point at which the crew became visual with the runway.

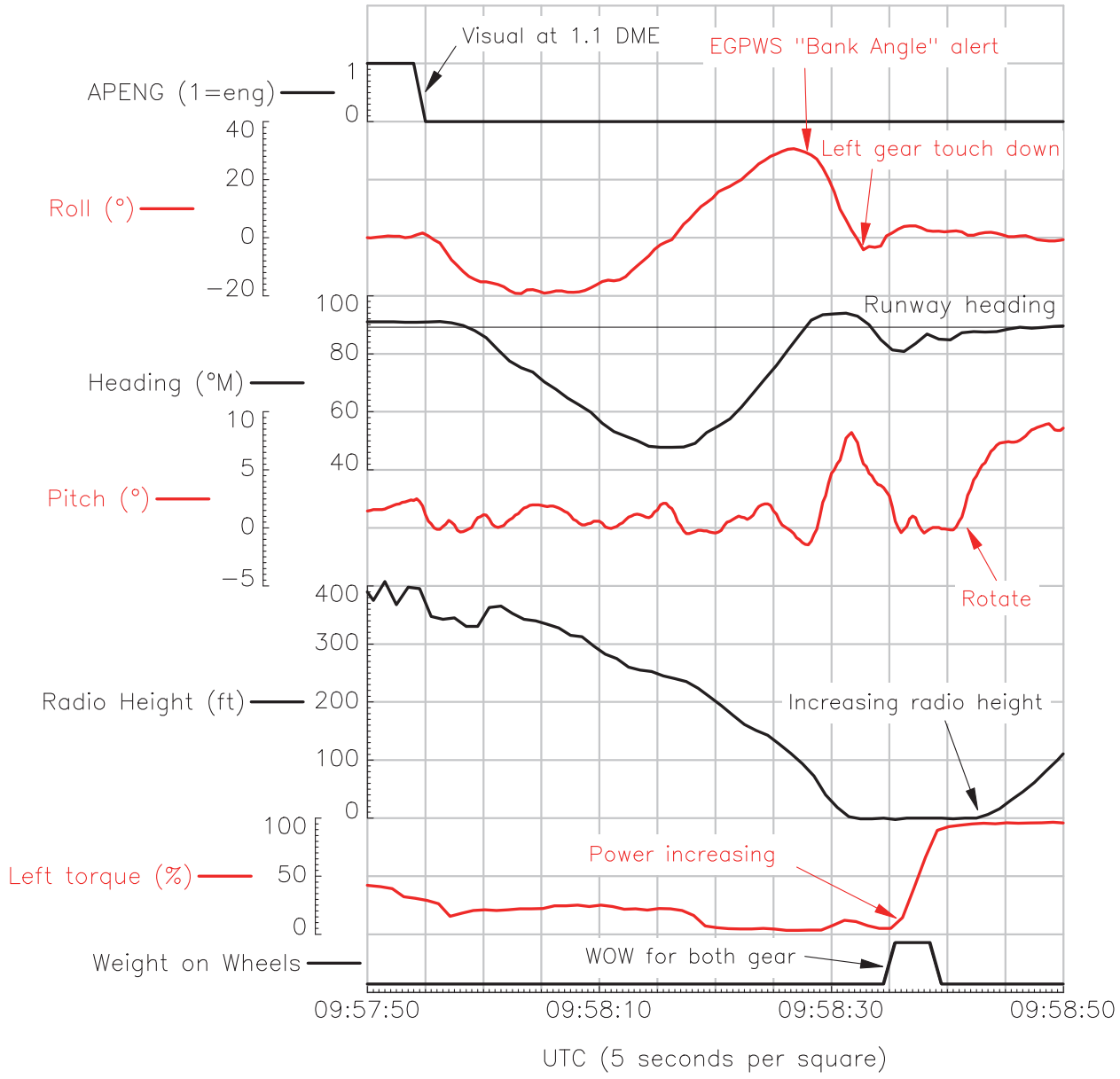

Figure 3

FDR plot of final approach

The aircraft then banked left 19°, at about 330 ft aal, followed by a right bank of 30°, at about 110 ft aal, which was transitioning to a left bank at the point of touchdown. The data indicated that the left gear touched down first with the aircraft on a heading of 093°M, to the right of the runway heading but turning towards it. Approximately two seconds later the right gear touched down and the heading was 081°M, to the left of the runway heading with the engine torque values starting to increase. Four seconds later the 'weight-on-wheels' parameter and pitch attitude indicated liftoff and the radio altimeter showed positive height after a further four seconds.

Radar and RT

NATS Radar data provided good positional information of the event approach, down to the runway elevation. This showed that the final approach descent started in the vicinity of the final approach fix location for the NDB approach procedure. The vertical profile of the descent approximately matched that of the procedure. However, the aircraft track paralleled the runway centreline (with an offset of approximately 0.4 nm until about 1.1 nm from the threshold) rather than converging with it.

Norwich radar and ATC recordings are reflected in the history of the flight.

EGPWS

An EGPWS was fitted which recorded a 'bank angle' audio alert that was not captured on any other available recording. The EGPWS also recorded one-second samples of key parameters for 20 seconds prior to the alert and 10 seconds after.

The 'bank angle' alert occurred as the aircraft radio height reduced from 84 ft to 53 ft and right roll angle reduced from 28° to 25.3°, one second after a peak of 29.5° of right roll.

Operator's Operation's Manual – stabilised approaches

Part B of the operators Operations Manual (OM) states:

> *'2.7 Actions in the event of flight path deviations*
>
> *2.7.1.7 The time of greatest risk is on landing because of the nature of the rapidly changing situation. Either pilot should, therefore, not hesitate to call for a go-around at any stage of an approach. It is clearly preferable to do a go-around than to have a serious incident or worse on landing.*
>
> *2.15.2 STABILISED APPROACH*
>
> *(e) …. stabilised approach will also permit easier assessment of crosswind, reducing the likelihood of lateral deviations which might require excessive bank angles at low altitude to correct, and in turn making a non-deviating touchdown on the runway centreline more likely.*
>
> *(h) A non-precision approach which requires an intermediate level-off, is, by definition, not stabilised. All non-precision approaches should, therefore, be flown using the CDFA [continuous descent final approach] techniques described at 2.16.2 [see below].*
>
> *(i) To summarise: an approach is stabilised when the aircraft is on the correct flightpath in the landing configuration requiring only small adjustments to maintain it, speed is within 10 kts of normal approach speed, power as appropriate and not less than 10% TQ and all briefings and checklists complete. A visual approach should be wings level by 500 ft, and a circling approach wings level by 300 ft.*

2.15.3 VISUAL CALL FOR PRECISION INSTRUMENT APPROACHES

If the required visual reference is not obtained by either pilot, HP [the handling pilot, PF] may continue the approach to DA, when an immediate go-around must be initiated.... When, at or before DA, the HP has the required references and decides to land, he will call 'VISUAL – LANDING'.

2.16 Instrument Approaches - Non Precision

2.16.1.1 The decision to Land or Go Around, at MDA, will be made by the HP. Calls and responses should be as for CAT 1 precision approaches, [see 2.15.3 above]

2.16.2 CONTINUOUS DESCENT FINAL APPROACH – CDFA

2.16.2.1 GENERAL PROCEDURES

All non-precision approaches are to be flown using CDFA techniques. This, basically, involves a continuous descent, stabilised approach from the final approach fix to either go-around at the DA or land.

2.16.2.4 A Stabilised Approach will never have any level segment of flight at DA(H) (or MDA(H) as applicable). This enhances safety by mandating a prompt go-around manoeuvre at DA(H) (or MDA(H)).

2.16.2.6 Non-Precision Approach With DME

Upon reaching the DA (published MDA + 20ft), the decision is made to land or go-around.'

Operator's Operation's Manual – preservation of recorded data

Part A of the OM states:

*'Following an **accident** [AAIB bold], the Company will, to the extent possible, preserve the original recorded data from the FDR and CVR pertaining to that accident...'*

There was no published procedure, for crews to follow after a serious incident, including the location of the appropriate circuit breakers to pull, to ensure that the FDR and CVR data were preserved.

CAA Safety Notice - preservation of recorded data

CAA Safety Notice SN-2011/011, '*Prevention Of The Loss Of Recordings From Cockpit Voice And Flight Data Recorders'* was issued on 17 August 2011 to all Air Operator Certificate (AOC) holders. It stated:

'4 Action to be Taken

4.1 AOC operators and CAMOs should ensure that robust procedures are prescribed in the relevant Operations Manuals and Continuing Airworthiness Maintenance Expositions to ensure that CVR/FDR recordings that may assist in the investigation of an accident or incident are appropriately preserved and are available for production and use. They should also ensure that, where relevant, documents which present the information necessary to retrieve and convert the stored data into engineering units are kept. In this context, an incident is an occurrence subject to mandatory reporting, i.e. a Mandatory Occurrence Report. After confirming that such robust procedures either already exist within AOC operators' Operations Manuals or that

amendments to said Operations Manuals have been proposed, operators should advise their assigned Flight Operations Inspector (FOI) of this information and CAMOs should advise the relevant CAA Regional Office.

4.2 Action should also be taken to raise awareness of flight crew and maintenance staff of such procedures.'

The operator commented that they were aware of this notice and that its OM could provide better guidance to crews in the event of a serious incident to ensure recordings are preserved.

Analysis

At the time of the incident the operator's OM stated:

'All non-precision approaches should, therefore, be flown using the CDFA techniques described.

Upon reaching the DA (published MDA + 20ft), the decision is made to land or go-around.

If the required visual reference is not obtained by either pilot, HP [handling pilot, PF] may continue the approach to DA, when an immediate go-around must be initiated.'

The commander however, selected ALT HOLD at the MDA, contrary to the standard operating procedures

The co-pilot believed that the commander was visual with the runway when he selected ALT HOLD, despite the commander not using the standard call of "VISUAL-LANDING". The co-pilot could not see the runway when the commander disconnected the autopilot and assumed that the commander was using ALT HOLD to adjust the approach path. However, given that the commander's call was non-standard, the co-pilot should have confirmed with the commander that he was visual with the runway.

The OM stated:

'A visual approach should be wings level by 500 ft, and a circling approach wings level by 300 ft.'

In this case the aircraft had 30° of right bank when it was at about 100 ft aal and its approach was unstable. A 'go-around' should have been called by the co-pilot by this point but he believed the commander would be able to land on the runway safely during the major part of the unstable manoeuvre after the autopilot was disconnected, despite the amount of bank being used at low altitude.

Safety actions

The operator later stated that they would be reviewing their standard operating procedures to reduce the risk of a repeat of this incident. Particular attention would be given to the sections of the Operations Manual, and other documents, on stable approaches, the retention of recordings after an incident and the need to notify the AAIB in a timely manner. They would also consider fitting flight data monitoring to their aircraft.

Conclusion

In this incident, the commander, who was the PF, was not visual with the runway at MDA and, in accordance with the company operating manual, should have initiated a go-around. Instead he levelled the aircraft in the hope of gaining visual references with the runway. When he did gain this visual reference the aircraft was not in a position to land without applying significant angles of bank at low level. This resulted in the aircraft touching down and tracking off the runway, with the right landing gear leaving the paved surface.

AAIB correspondence reports

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

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

The accuracy of the information provided cannot be assured.

ACCIDENT

Aircraft Type and Registration:	Cessna 172P Skyhawk, G-CDMM
No & Type of Engines:	1 Lycoming O-320-D2J piston engine
Year of Manufacture:	1982 (Serial no: 172-75124)
Date & Time (UTC):	23 September 2012 at 1030 hrs
Location:	Glenforsa Airfield, Isle of Mull
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Minor) Passengers - None
Nature of Damage:	Substantial damage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	49 years
Commander's Flying Experience:	274 hours (of which 74 were on type) Last 90 days - 12 hours Last 28 days - 11 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft had flown from Oban Airport to Glenforsa Airfield on the Isle of Mull. Having obtained the wind at Glenforsa, which was reported as 120° at 12 kt, but with some "rotor winds", the pilot made an overhead pass at 300 ft along grass Runway 07 to assess the conditions; they were considered to be "fine". The pilot rejoined the circuit and observed another aircraft land successfully. Having confirmed that the wind direction and speed were unchanged, the aircraft was positioned to land on Runway 07. The approach was uneventful but, as the aircraft was about to land, it encountered a gust causing it to touch down heavily before bouncing. The pilot applied engine power to arrest the subsequent descent, but a further strong gust caused the aircraft to briefly climb before it stalled and landed heavily on the nosewheel, which detached. The nose leg dug into the soft ground, which tipped the aircraft forward and it came to rest inverted. The pilot sustained minor injuries and the passenger was unhurt. The aircraft was severely damaged.

ACCIDENT

Aircraft Type and Registration:	Jodel D112, G-BHNL
No & Type of Engines:	1 Continental Motors Corp A65-8F piston engine
Year of Manufacture:	1963 (Serial no: 1206)
Date & Time (UTC):	22 September 2012 at 1130 hrs
Location:	MOD Airfield at Thorney Island, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Substantial to wings, propeller and cowling
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	68 years
Commander's Flying Experience:	613 hours (of which 61 were on type) Last 90 days - 13 hours Last 28 days - 9 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft had just touched down at Thorney Island on Runway 01 in a crosswind: the reported wind was 90º at 9 kt. The pilot used the wheel landing technique[1] to land in order to "maintain direction" during the ground roll. Initially, directional control of the aircraft was maintained but, as it slowed and the tail was lowered, the aircraft swung "violently" to the right, into wind. The pilot overcorrected with left rudder which caused an opposite swing and veer to the left. He reported that an "uncontrollable oscillation" then developed and the aircraft collided with a wooden post and the fencing that boarded the left side of the concrete runway. The pilot, who was uninjured, made the aircraft safe before vacating.

Footnote

[1] There are two techniques to landing tailwheel aircraft: one is to land on all wheels simultaneously, known as a three-point landing, where the aircraft is effectively stalled onto the ground; the other is the wheel landing where the touchdown is made with the aircraft in an approximately level attitude and the tailwheel held clear of the runway – this technique results in a higher final approach airspeed, beneficial in turbulent or crosswind conditions.

ACCIDENT

Aircraft Type and Registration:	Piel CP301A Emeraude, G-AYEC
No & Type of Engines:	1 Continental Motors Corp C90-14F piston engine
Year of Manufacture:	1958 (Serial no: 249)
Date & Time (UTC):	18 August 2012 at 1055 hrs
Location:	2 nm south of RAF Waddington, Lincolnshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Main wing spar cracked, damage to engine, propeller and cockpit area
Commander's Licence:	Private Pilot's Licence
Commander's Age:	63 years
Commander's Flying Experience:	511 hours (of which 472 were on type) Last 90 days - None Last 28 days - None
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot became distracted during his pre-flight inspection of the aircraft and did not check the fuel state. The aircraft subsequently took off with an almost empty fuel tank and the engine stopped running soon after. The pilot carried out a forced landing and, although the aircraft was badly damaged, he escaped serious injury.

History of the flight

On 13 May 2012, the aircraft suffered a propeller strike whilst taxiing to depart from RAF Waddington. This necessitated the aircraft remaining at RAF Waddington, while repairs and a detailed engine inspection were carried out. On 18 August 2012, with the work completed and a Permit Flight Release Certificate issued, the pilot (the same as on the day of the earlier incident) prepared to fly the aircraft back to its home base.

The pilot conducted a thorough inspection of the aircraft and the engine installation, while it was still inside the hangar, but became distracted during the process and did not check the fuel state. A further distraction occurred after engine start, when he had to shut down in order to discuss the return of a security pass with station personnel. When the pilot subsequently taxied the aircraft to Runway 21 for takeoff, he thought he had completed all necessary checks. In fact, the aircraft's fuel tank was almost empty and its engine stopped running soon after takeoff.

The pilot carried out a forced landing in a field of crops. Although the aircraft inverted and was substantially damaged, he was wearing a four-point harness and escaped serious injury. The cockpit area was partially crushed but he was able to kick out the passenger door and escape from the wreckage. The emergency services were alerted and were quickly on scene.

The pilot attributed the accident entirely to human factors, having been distracted more than once during his pre-flight preparations. Additionally, he was not in current flying practice, as he had not flown since the aircraft was damaged more than three months earlier.

ACCIDENT

Aircraft Type and Registration:	Samba XLA, EI-JIM
No & Type of Engines:	1 Jabiru 330 piston engine
Year of Manufacture:	2006
Date & Time (UTC):	18 August 2012 at 1330 hrs
Location:	Chatteris Airfield, Cambridgeshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to landing gear, wings and tailplane
Commander's Licence:	Private Pilot's Licence
Commander's Age:	55 years
Commander's Flying Experience:	1,172 hours (of which 498 were on type) Last 90 days - 23 hours Last 28 days - 18 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft, which was visiting from Ireland, flew from Duxford to Chatteris with the pilot and a passenger on board. The weather was fine, with a surface wind at Chatteris estimated at 230° at 4 kt. When the pilot contacted the airfield by telephone beforehand, he was informed that it was a busy parachuting airfield, given a frequency to call on arrival, and advised to consult a flight guide for airfield information.

On arrival at Chatteris, the pilot made radio contact with a parachute jump aircraft and delayed his join until being informed that all parachutists had landed. The pilot positioned for landing on the grass Runway 23, which was listed in a commercial flight guide as being 11 m wide. Just before touchdown, the aircraft's right wing contacted vegetation to the right of the runway, causing it to yaw through 180° and depart the runway about 200 m from the threshold. In his report, the pilot stated that the wing had struck vegetation over 1 m high, and that the runway strip was in fact only mowed to a width of about 6 m. The aircraft has a low-wing configuration of 10 m span.

ACCIDENT

Aircraft Type and Registration:	Aerotechnik EV-97 Eurostar, G-CBWG
No & Type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2002
Date & Time (UTC):	19 August 2012 at 1810 hrs
Location:	Private strip, Lane Farm, Hay-on-Wye, Radnorshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to left main landing gear, nosewheel, propeller, lower engine cover and underside of fuselage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	60 years
Commander's Flying Experience:	285 hours (of which 20 were on type) Last 90 days - 18 hours Last 28 days - 5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Whilst attempting to take off from a grass farm strip in good weather and light winds, the pilot reported that having travelled approximately 150 m down the runway, the aircraft hit a bump and became airborne at an airspeed of between 45 and 50 mph. The aircraft flew level, about six feet off the ground for a short distance, before the right wing dropped, and it landed heavily back onto the runway. The resulting impact bent the left main gear and collapsed the nose gear, causing the propeller to strike the ground. The pilot and passenger were able to exit the aircraft uninjured.

ACCIDENT

Aircraft Type and Registration:	1) Mainair Blade 912, G-MZBA 2) Schleicher ASW19B, G-DELA
No & Type of Engines:	1) 1 Rotax 912 UL piston engine 2) No engine
Year of Manufacture:	1) 1996 (Serial no: 1068-0296-7-W870) 2) 1981 (Serial no: 19346)
Date & Time (UTC):	6 May 2012 at 1251 hrs
Location:	Aboyne airfield, Aberdeenshire
Type of Flight:	1) Private 2) Private
Persons on Board:	1) Crew - 1 Passengers - None 2) Crew - 1 Passengers - None
Injuries:	1) Crew - 1 (Serious) Passengers - N/A 2) Crew - None Passengers - N/A
Nature of Damage:	1) Damage to airframe, pylon, wing and engine 2) Damage to right wing, tailplane and fin
Commander's Licence:	1) National Private Pilot's Licence 2) National Private Pilot's Licence
Commander's Age:	1) 62 years 2) 68 years
Commander's Flying Experience:	1) ~ 2,400 hours (of which 17 were on type) Last 90 days - 30 hours Last 28 days - 6 hours 2) 4,351 hours (of which 200 were on type) Last 90 days - 17 hours Last 28 days - 5 hours
Information Source:	Aircraft Accident Report Forms submitted by the pilots, account by duty instructor and further enquiries by the AAIB

Synopsis

An ASW19B glider was on approach to Runway 27S while a Mainair Blade flex-wing microlight was on approach to the intersecting Runway 05. Both pilots made downwind calls but due to a radio problem in the microlight neither pilot heard the other's calls. When the duty instructor (also A/G operator) became aware of the conflict he radioed the microlight to abort, but this call was not received by the microlight pilot. The glider pilot heard the call but was already committed to landing and did not know from which direction the microlight was approaching – he touched down and looked ahead but did not see any other aircraft. The microlight

appeared suddenly on his left, at about the 10 o'clock position, and he instinctively applied full left rudder to avoid it but the glider's right wing struck the microlight, seriously injuring its pilot.

History of the flights

Account from the pilot of ASW19B glider (G-DELA)

Aboyne airfield is an unlicensed airfield operated by Deeside Gliding Club and used primarily by gliders. It has two parallel paved runways, 09N/27N and 09S/27S (Figure 1), and two intersecting grass runways, 12/30 and 05/23, although Runway 05 is not designated. The pilot of the glider G-DELA was returning to the airfield after a two-hour flight and joined overhead at 1,500 ft aal to determine the wind direction and circuit traffic. He assessed the wind as being a light northerly with occasional variations to the north-east. He elected to use Runway 27S which he stated was "normal for the given conditions" while accepting that there might be a small tailwind. He then saw another glider and heard it make a 'downwind left-hand 27' radio call. He watched it land and clear the runway and then he heard the microlight G-MZBA make a downwind call for 27, later changing it to 05.

After a short period the glider pilot saw G-MZBA climbing away from Runway 05 to the north-east. The circuit appeared clear so he proceeded downwind and made a "downwind left-hand for 27" call. At this point he lost sight of G-MZBA and did not hear any further radio calls from it. While on the base leg he estimated the wind to be from the north to north-east at 5 kt and on final approach he heard the ground-based duty instructor (also the A/G operator at the time) making a radio call to G-MZBA saying that there was a glider on final, which he followed with a call to abort. As the glider pilot crossed the runway threshold he heard the duty instructor say to him "… there is an aircraft coming towards you". After touching down the glider pilot looked ahead but could not see any aircraft. Suddenly, G-MZBA appeared on his

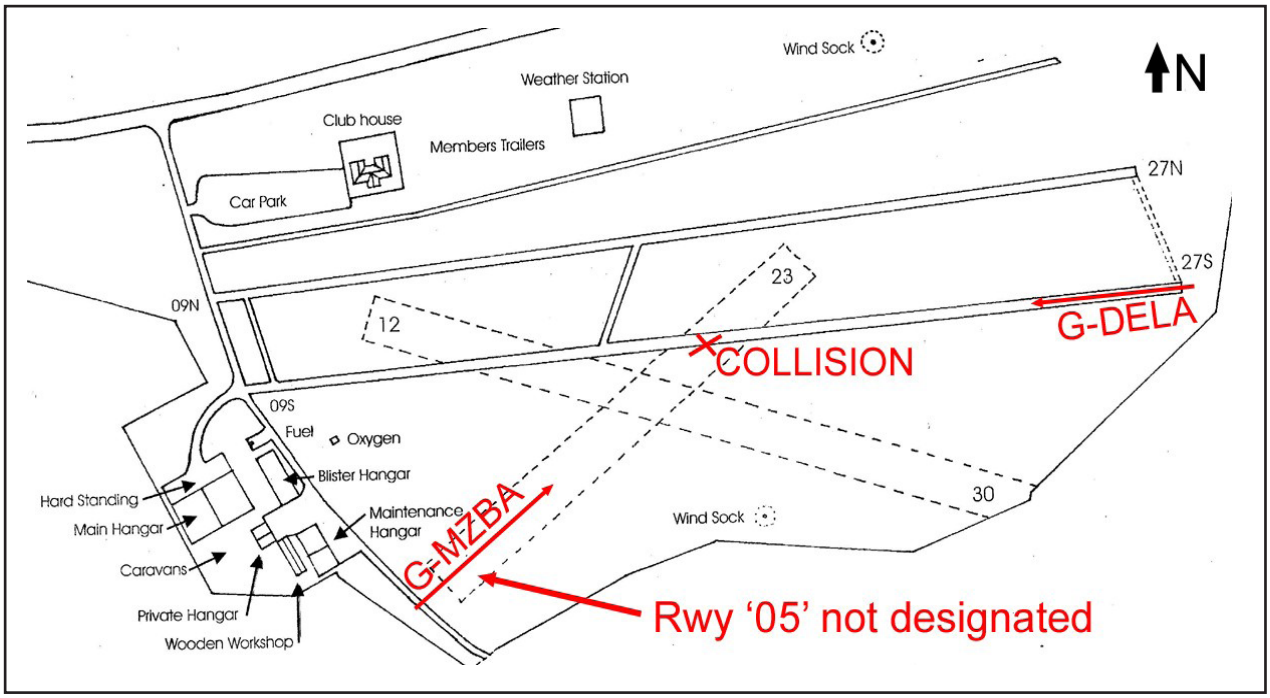

Figure 1

Airfield diagram courtesy Deeside Gliding Club

left at about the 10 o'clock position, and he instinctively applied full left rudder to avoid the microlight, but then there was a loud bang as the glider's right wing struck G-MZBA. When the dust cleared he found that his aircraft had come to rest on the northern side of the runway facing towards the north (Figure 2). He was not injured and was able to exit the glider unaided.

Account from the pilot of Mainair Blade microlight (G-MZBA)

The pilot of G-MZBA had planned a local flight from his home airfield of Aboyne to Insch and back. He was an experienced glider, hang-glider, and powered fixed-wing pilot but only had 17 hours on flex-wing microlights and was therefore careful to avoid strong crosswinds. His radio checks on the ground at Aboyne were satisfactory but on arriving at Insch he was asked why he had not responded to radio calls from the airfield. He carried out another radio check on the ground and his radio appeared to be operating satisfactorily.

While approaching Aboyne on his return flight he listened to the appropriate Aboyne Air/Ground radio frequency but did not hear any traffic. He knew that there was flying activity so he assumed that he must have an intermittent problem with his radio.

When he arrived overhead Aboyne at 1,000 ft aal he assessed the wind as being moderate from the north, varying from north-west to north-east, with gusts. He decided that his first approach would be to Runway 30 and radioed his intentions when downwind. On final approach he saw that the windsock was indicating a wind from the north-east so he aborted his approach at 600 ft aal and made a radio call that he was going around. He then decided to use Runway 05 and entered a left-hand circuit at 800 ft aal and made a downwind call – he could not see any other aircraft in the circuit.

Figure 2

Damage to right wing of G-DELA
(photograph courtesy Martin Gallagher)

While on final approach to 05 he saw from the windsock that the wind was almost straight down the runway. The landing was normal and as he was slowing down he suddenly saw the glider, G-DELA, immediately in front of him turning to the left, and realised that he was going to hit its right wing. The next thing he could remember was lying on the ground with an ambulance crew in attendance. The pilot was wearing a helmet but this had been damaged as he sustained an injury to his head and left eye. He also suffered three broken ribs and broken bones in his left hand.

The pilot of G-MZBA stated that he had been aware that he probably had a radio reception problem and was aware that Runway 27 or 09 was likely to be the operating runway for gliders. However, he did not see any gliders in the circuit so he believed it was safe to make an approach to Runway 05. He said he remained high on the approach to 05 to avoid any potential turbulence from the maintenance hangar close to the end of the runway. While on final approach his attention was focused on the runway ahead and checking the wind direction, so he did not look closely for traffic on the final approach to Runway 27. By the time he saw G-DELA it was too late to avoid a collision.

Account from the duty instructor (A/G operator)

The duty instructor was handling the radio as the A/G operator at the time of the accident. He reported that they were using Runway 27N for launching gliders by aerotow and were using Runway 27S for landing by both gliders and the tug. He said the wind was light and variable at about 5 kt. He saw G-MZBA returning to the circuit and recalled hearing it call 'downwind left-hand' for Runway 27, but then a call from G-MZBA changing it to 05. He then saw it appearing to start an approach to Runway 05, but then aborting and turning to the right before turning left and heading west. He heard no further calls from G-MZBA.

The duty instructor then heard the pilot of G-DELA call 'downwind left-hand' for Runway 27. The duty instructor had no concerns at this stage because G-DELA was established on the downwind leg and he could see G-MZBA joining downwind about half a mile behind for what he assumed would be a landing on Runway 27. When G-DELA was on finals he saw the microlight passing to the south and then make a left turn to line up on Runway 05 without hearing any radio calls from it. He now realised that there was a potential conflict and he radioed to G-MZBA to "Abort, abort, abort". Not receiving a response he radioed to G-DELA that there was conflicting traffic approaching from the left, but at this time G-DELA was committed to landing on Runway 27S, due to its low height. When the collision occurred the duty instructor immediately radioed the clubhouse to request an ambulance.

In the duty instructor's opinion the wind conditions were such that a landing on Runway 05 was unnecessary. He said that he could only recall one previous occasion when an aircraft had landed on Runway 05 and that was when a glider had suffered a cable break at low height.

Deeside Gliding Club operations

Aboyne airfield is operated by Deeside Gliding Club and is used primarily by the club's glider pilots and by visiting glider pilots. Some powered aircraft are permitted to land for maintenance purposes. In 2012 permission was granted to the pilots of three microlight aircraft and one motor-glider to operate from the airfield, including the pilot of G-MZBA who was also a member of the gliding club.

The club's '*General Flying Rules*' state that the north runway is for launching and the south runway is for landing in normal operations. It further states that:

'The two grass runways 12/30 and 05/23 are for landing only. The use of 23 must be treated with extreme caution to avoid conflict with aircraft landing on 27. In general 23 is available when strong southerly/south westerly are blowing or a glider has a poor crosswind performance.'

There is no specific reference to landing on Runway 05 and this runway is not designated as a runway on the club's airfield chart (Figure 1). However, the pilot of G-MZBA had worked on the construction of Runway 05/23; he commented that the reason the '05' was not marked on the ground or on the chart was because there had been insufficient funds for paving slabs for the '05' numbers and he considered that Runway '05' was available for use. The Chief Flying Instructor commented that in glider operations any grass area on the airfield is considered available for landing and thus, although Runway 05 was not designated, landing on that section of grass was not prohibited by the club's rules.

Analysis and pilot comments

The accounts from the pilots and the duty instructor differed in terms of G-MZBA's initial manoeuvrings in the circuit; however, there was agreement on what had occurred once G-DELA was established on the approach to Runway 27S and G-MZBA on the approach to 05.

The pilot of G-DELA stated that he was unaware that G-MZBA had rejoined the circuit behind him as he had not heard any radio calls from it. By the time he received the warning from the duty instructor he was already about to touch down. He looked ahead but did not see any aircraft and was not expecting an aircraft to be landing on Runway 05 and by the time he saw G-MZBA it was too late to avoid a collision. The pilot of G-MZBA stated that he believed it was safe to make an approach to Runway 05, he did not look closely for traffic on the final approach to Runway 27 and by the time he saw G-DELA it was too late to avoid a collision.

If the radio on G-MZBA had been operating correctly the pilot would have heard the duty instructor's calls to abort and the accident could have been avoided. Had the radio been working, both pilots would also have been aware of the other's location in the circuit before the conflict was set up. Since the pilot of G-MZBA was using a runway that was rarely used and was not designated by the club, it would have been necessary to be extra vigilant for traffic approaching 09/27S. However, he was inexperienced on the aircraft type and was concerned about the wind conditions so his attention was focussed primarily on the task of flying so he did not see G-DELA until it was too late.

Safety action

The Chief Flying Instructor stated that after conducting a review the club decided to stop promulgating Runway 05/23 as an available runway and would remove any reference to it in the operating procedures for the airfield.

Miscellaneous

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

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

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

1/2010 Boeing 777-236ER, G-YMMM at London Heathrow Airport on 17 January 2008.

Published February 2010.

2/2010 Beech 200C Super King Air, VQ-TIU at 1 nm south-east of North Caicos Airport, Turks and Caicos Islands, British West Indies on 6 February 2007.

Published May 2010.

3/2010 Cessna Citation 500, VP-BGE 2 nm NNE of Biggin Hill Airport on 30 March 2008.

Published May 2010.

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

Published September 2010.

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

Published September 2010.

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

Published November 2010.

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

Published November 2010.

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

Published December 2010.

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

Published September 2011.

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

Published November 2011.

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

http://www.aaib.gov.uk