CONTENTS

SPECIAL BULLETINS

COMMERCIAL AIR TRANSPORT

GENERAL AVIATION

SPORT AVIATION / BALLOONS

ADDENDA and CORRECTIONS

CONTENTS (Continued)

(ALL TIMES IN THIS BULLETIN ARE UTC)

INCIDENT

Aircraft Type and Registration:	Boeing 757-3CQ, G-JMAB
No & Type of Engines:	2 Rolls-Royce RB211-535E4-B-37 turbofan engines
Year of Manufacture:	2001
Date & Time (UTC):	12 December 2007 at 1935 hrs
Location:	Stand 32, Manchester Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 10 Passengers - 283
Injuries:	Crew - None Passengers - None
Nature of Damage:	Front of No 1 engine nacelle dented at one o'clock position
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	48 years
Commander's Flying Experience:	10,048 hours (of which 6,119 were on type) Last 90 days - 94 hours Last 28 days - 55 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Whilst approaching its allocated parking position, the aircraft sustained damage to the port engine when it struck a stationary airbridge that was parked incorrectly. An AAIB investigation into a similar occurrence in 2003 resulted in Safety Recommendations concerning the remote activation of stand entry docking guidance by Apron Control. The airport operator accepted these recommendations and proposed safety action but this appears to have been ineffective. Therefore, one further Safety Recommendation is made to address the same issue.

History of the flight

The aircraft landed at Manchester International Airport at 1935 hrs following an uneventful flight and was instructed to park on Stand 32. Due to commitments elsewhere on the airport, a dispatcher allocated to attend the arriving aircraft was unable to reach the stand before the aircraft. Stand guidance was activated remotely by Apron Control. The commander manoeuvred the aircraft from the taxiway centreline to the centreline of the stand using the azimuth guidance system and commenced gentle braking to stop the aircraft as it approached the indicated stopping position. Deceleration was more pronounced than he expected and the aircraft stopped approximately 3 ft short of the indicated position.

The pilots shut down the engines and the passengers and crew disembarked without further incident. The left engine intake cowling had impacted the outer air bridge. The Aerodrome Fire fghting and Rescue Service (AFRS) was not called and did not attend.

Damage to aircraft

Maintenance personnel assessed the damage to the front upper intake lip of the intake cowl of the left engine as beyond allowable limits and replaced the cowling in accordance with the Aircraft Maintenance Manual. The engine strut, fairings, structure, mounts and fttings were also inspected but found to be undamaged.

Aircraft information

The operator stated that the aircraft was fully serviceable prior to the accident. Following replacement of the damaged engine cowl, the aircraft was declared serviceable and returned to normal operations.

Stand Entry Docking Guidance

Stand 32 was equipped with an Aircraft Guidance for Nose-In Stands (AGNIS) system to provide centreline guidance and a Parallax Aircraft Parking Aid (PAPA) to provide stopping guidance. The pilots used a commercially available aerodrome guide which contained a description of these systems (see Figure 2).

Recorded information

Analysis of recorded fight data, conducted by the aircraft operator, showed that the aircraft approached Stand 32 at a ground speed of 12 kt prior to commencing the fnal turn on to the stand centreline, and decelerated progressively to 3.75 kt immediately before impact with the airbridge. Photographs taken immediately afterwards show that the aircraft stopped approximately 3 ft short of the position indicated by the PAPA.

Figure 1

Damage to engine cowling

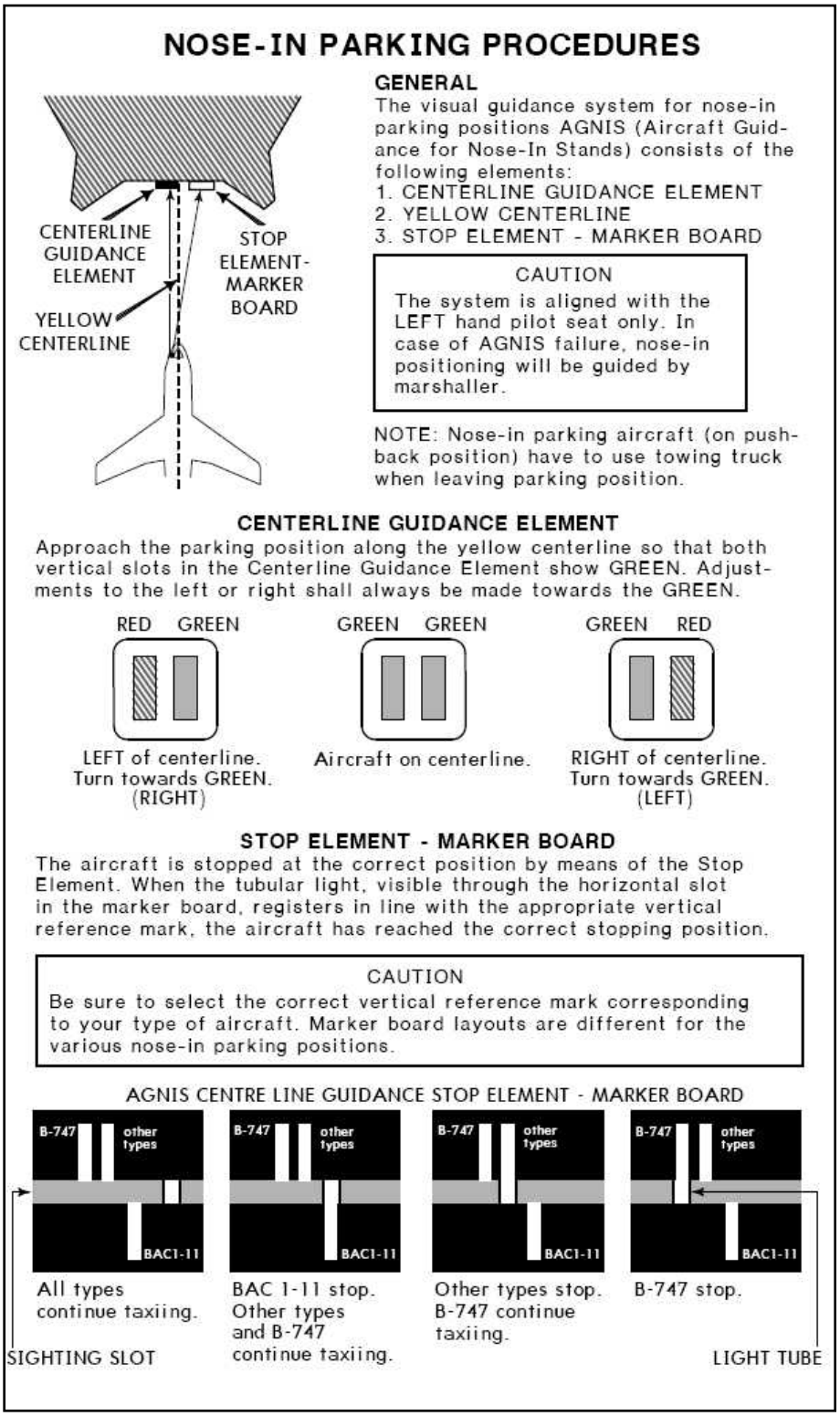

Figure 2

Airbridge management

When parked correctly the airbridge was positioned so that its main wheels remained wholly within a circle painted on the apron surface for this purpose, giving adequate clearance between the airbridge and arriving or departing aircraft. G-JMAB was the first aircraft allocated this stand and photographic evidence indicated that the airbridge was parked incorrectly during its arrival.

The outer airbridge on Stand 32 had been subject to maintenance work on the two previous days and was handed over to the airport operator at 1440 hrs on the day of the occurrence. In the absence of relevant procedures the airport operator did not check physically that the airbridge was serviceable or that it had been returned to its correct parking position. The Apron Controller was unable to check visually, prior to its use, that the stand was clear and that its guidance system and airbridge were properly positioned and serviceable.

In its own investigation, the airport operator stated that there was no written procedure for the management of stand closures but noted that the handling agent did not check the position of the outer airbridge though required to do so by local procedures. It was also concerned that the AFRS had not been called to attend.

Figure 3

Parked position of airbridge

Airside safety management

Civil Aviation Publication (CAP) 642 – *'Airside Safety Management'* provides advice and guidance on safe operating practices for airside operations. It does not contain requirements. Paragraph 2 of section 6.3 entitled *'"Ownership" of Stand/Parking Bay'* states, in part:

> *'When a stand is allocated for use to an aircraft operator and the arrival of their aircraft on stand is imminent, it is usually the responsibility of the handling staff to ensure that the stand and clearways are free from obstruction by vehicles or equipment. These staff should also ensure that the airbridge(s) is (are) fully retracted or correctly parked with the drive wheels in the parking box provided (see paragraphs 9.7 to 9.10) before the arrival of the aircraft. These actions must be completed by the handler before the VDGS is switched on. Switching on the VDGS will normally signify to the aircraft commander that these actions have been completed and it is safe for the aircraft to enter the stand.'*

Stand 32 is at the western end of the Pier C extension to Terminal 1 at Manchester Airport. The apron surrounding Pier C is bounded at its western end by a marked roadway and Taxiway D, but there are no surface markings to define its boundaries with the adjacent Stands 28 and 31. Paragraph 7 of section 6.9 of CAP 642, entitled *'Signs Markings and Guidance'* states:

> *'Where CAP 168 does not give suitable guidance, signs and markings should adhere to an alternative standard, such as those described in the IATA Apron Markings and Signs Handbook, wherever possible.'*

Although there is no published requirement for such markings, the Aerodrome Standards office of the CAA responsible for inspecting Manchester Airport stated that the airport operator is in the process of defining standards for such markings.

Previous occurrence

The AAIB published in its March 2003 Bulletin a report[1] of the investigation into a similar occurrence involving an aircraft arriving on Stand 6 at Manchester Airport. Following a technical problem, the airbridge on Stand 6 could not be parked in the correct position. From the remote location of Apron Control, the stand allocator was not aware that Stand 6 was obstructed, allocated it to an arriving aircraft and activated the Stand Entry Docking Guidance (SEDG) lighting. The marshaller arrived at the stand when the aircraft was already manoeuvring to park as directed by the illuminated SEDG. Neither the aircraft commander nor the marshaller noticed that the airbridge was incorrectly parked until it was too late to prevent the upper surface of the aircraft's left engine cowling striking the underside of the airbridge.

In relation to activation of SEDG the AAIB report referred to Appendix B, paragraph 3 of CAP 642, which stated:

> *'The system is switched on by an airline or handling staff. In the case of airbridge served stands, one set of VDE[2] control switches are mounted in a panel in the airbridge cab; a second set of switches are mounted in a conspicuously marked panel in a prominent position at the head of the stand. Either set of switches will operate the equipment and on all pier served stands timer*

Footnote

[1] AAIB reference EW/C2003/07/09.

[2] Visual Docking Equipment (VDE) is the term used in CAP 642 to refer to SEDG.

switches are used which automatically switch off the VDE after 10 minutes. On non pier served stands a single set of switches is provided, mounted on a conspicuously marked panel at the head of the stand; the VDE on these stands do not have timer switches and the VDE must be switched off when the aircraft is safely parked on the stand.

Airline or handling staff must ensure that the stand is unobstructed by vehicles or equipment and that the airbridge is retracted and correctly parked before the arrival of the aircraft and before switching on the VDGS[3]. Switching on the VDGS signifies to the aircraft commander that these actions have been completed and it is safe for the aircraft to enter the stand. Once the VDGS has been switched on, the person responsible for stand safety and VDGS operation must not leave the stand until the aircraft is parked, unless the VDGS is switched off again.'

Two Safety Recommendations were made to Manchester Airport which addressed control of the SEDG systems:

'**Safety Recommendation 2003-131**

Manchester Airport plc should ensure that Stand Entry Docking Guidance lighting is not activated by Apron Control until a positive communication has taken place with staff at the stand confirming that the stand is clear. Until the aircraft has parked and shut down its engines, those staff should remain available at the stand to inform Apron Control if the stand subsequently becomes obstructed.'

Safety Recommendation 2003-132

For the airbridges and stands serving Terminals 1 and 3, Manchester Airport Plc should, within a reasonable timescale, fund and develop Stand Entry Docking Guidance lighting controls and associated procedures that comply with the advice and guidance contained in Civil Aviation Publication (CAP) 642.'

The report stated:

'On 12 January 2004 a representative of Manchester Airport plc notified the AAIB that the airport accepted the safety recommendations. Budgetary provision had been made for a program of works and an investigation implemented into the engineering and electronic functions of the current Stand Entry Docking Guidance systems, encompassing all three Terminals, to define the scope of the proposed works.'

A third Safety Recommendation addressed to the CAA proposed an expansion of the UK aerodrome audit process to include the control and use of SEDG systems. The CAA accepted this recommendation.

Analysis

No procedure existed for inspecting the proper arrangement of the stand and its equipment prior to its return to service after maintenance. Accordingly, an opportunity was lost to check that the airbridge was parked correctly.

Illumination of stand guidance is understood by pilots to indicate that the stand is ready to accept arriving aircraft. In this case, however, the stand guidance was activated by Apron Control, from a location where the

Footnote

[3] Visual Display Guidance System (VDGS) is the term used in CAP 642 to refer to SEDG.

stand could not be checked visually. When a dispatcher or other appropriate member of ground staff is present it may be possible for that member of staff to activate the emergency stop signal should it appear that the aircraft is endangered in some way. The dispatcher reached the stand after the occurrence and could not therefore perform this function.

Safety action

In relation to the occurrence to G-JMAB, the airport operator acknowledged that previous safety action had not been effective and in its subsequent report proposed the following corrective actions:

1. Airfeld Operations to produce a Local Operating Procedure for the Management of Stand Closures and Restrictions

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2. Airfeld Operations to produce a Local Operating Procedure for Emergency Response to Apron Incidents

3. Dispatcher to undergo Airbridge revalidation

4. Handling agent to brief staff on the procedure for checking stands prior to the arrival of an aircraft

On 2 March 2008, in response to item 1 above, the airport operator issued Local Operating Procedure AOP 018/2008, entitled – *'Stand Closures & Restrictions'*. Under the heading *'Reinstatement of Stands for Operational Use'* it stated:

> *'Airfield Operations are responsible for the reinstatement of closed or restricted stands. The reinstatement of a stand is subject to a formal inspection by competent Airfield Operations personnel and positive confirmation that all stand facilities, including SEDGS and airbridges have been tested and reinstated by the relevant Maintenance Team.*
>
> *When Airfield Operations are satisfied the stand is serviceable, the MAPS1 form[4] confirming the original closure should be completed by the Airfield Duty Manager or Airfield Duty Officer (Confirmation of Reinstatement) and faxed to Apron Control on ext. 2143.*
>
> *Under no circumstances should Apron Control accept any closed stand for operational use until they are in receipt of the completed MAPS1 form applicable to that stand.'*

The airport operator also issued Local Operating Procedure AOP 007/2007 in response to item 2, which was intended to address the concern that the AFRS had not been called to attend the incident. The operator noted that the dispatcher had undergone "driver training" for the purpose of airbridge revalidation on 13 December 2007. In relation to item 4 the handling agent stated that dispatchers are trained "via Manchester Airport's own training department" and that "performance of this duty is monitored by means of turnaround checks against a checklist". There were, however, no surface markings to define the apron's boundaries with the adjacent Stands 28 and 31. Without knowing which part of the apron constitutes a particular stand, a dispatcher cannot determine that the stand is clear. Accordingly, the airport operator stated that it intends to define suitable standards for such markings, but noted that the lack of such markings was not a factor in this incident.

Footnote

[4] The name given to the airport operator's form used for 'Stand Closure & Rectification Notification'.

Although the proposed safety action addressed the specific cause of the incident involving G-JMAB it did not address the shortcomings of the practice of activating the SEDG remotely which was the subject of Safety Recommendations 2003-131 and 132, both of which were accepted by the airport operator. Accordingly the following Safety Recommendation is made.

Safety Recommendation 2008–025

It is recommended that Manchester Airport Plc review its response to:

Safety Recommendation 2003–131: '*Manchester Airport plc should ensure that Stand Entry Docking Guidance lighting is not activated by Apron Control until a positive communication has taken place with staff at the stand confirming that the stand is clear. Until the aircraft has parked and shut down its engines, those staff should remain available at the stand to inform Apron Control if the stand subsequently becomes obstructed.'*

and:

Safety Recommendation 2003–132: '*For the airbridges and stands serving Terminals 1 and 3, Manchester Airport Plc should, within a reasonable timescale, fund and develop Stand Entry Docking Guidance lighting controls and associated procedures that comply with the advice and guidance contained in Civil Aviation Publication (CAP) 642.'*

to ensure that, having accepted these recommendations, it takes the proper action to address them.

ACCIDENT

Aircraft Type and Registration:	Turbolet Let L 410 UVP-E, OK-RDA
No & Type of Engines:	2 Walter 601-E turboprop engines
Year of Manufacture:	1986
Date & Time (UTC):	28 April 2008 at 1003 hrs
Location:	En route from Belfast City to Ronaldsway, Isle of Man
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 2 Passengers - 16
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to right nose baggage door
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	44 years
Commander's Flying Experience:	7,452 hours (of which 4,440 were on type) Last 90 days - 130 hours Last 28 days - 53 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During the departure from Belfast City Airport the right nose baggage door opened in flight. The aircraft continued its flight to the Isle of Man where it made an uneventful landing. One piece of baggage was subsequently found to be missing. The incident occurred because the right nose baggage door had probably been incorrectly closed prior to departure.

History of the flight

The commander was a company line training captain who was carrying out line training of the co-pilot on the scheduled flight from Belfast City Airport to the Isle of Man (Ronaldsway). The aircraft departed from Runway 22 at Belfast City at 0914 hrs and was handed over to Aldergrove approach at 0917 hrs, who gave clearance to proceed to the Isle of Man. Shortly after this, whilst the aircraft was in the area of the south-west corner of Strangford Loch, the right nose baggage door opened. The crew reduced speed to 120 kt and, as there was no vibration and the door appeared to be stabilised in the open position, decided to continue to their destination. They did not declare an emergency and at 0923 hrs informed Aldergrove approach that they would like to continue the flight at a speed of 120 kt. When the controller asked if the aircraft had a problem, he received the reply: "YES I DO CONFIRM WE HAVE A RIGHT NOSE LUGGAGE HOLD DOOR OPEN THIS IS AN UNPRESSURISED AIRCRAFT BUT AT THIS SPEED IS STABLE NOT VIBRATING SO WE'LL CONTINUE TO DESTINATION". The co-pilot monitored the open door

during the remainder of the flight. On the approach to Ronaldsway the crew requested, and were given, a wide vectoring for a long final with all turns to the left for a left-hand circuit. They also requested a runway inspection after landing to ensure that nothing had fallen from the aircraft. This was subsequently carried out by the airport fire service who found no debris on the runway.

The airport Duty Manager at Ronaldsway was notified at 0950 hrs that the aircraft was landing with an open baggage door. From his position in the control tower, he could see that the door was open and a holdall was hanging out of the aircraft. One piece of baggage was subsequently found to be missing, which the commander believed might have been mislaid by the ground handling agency at Belfast City Airport. Figure 1 shows the position of the right nose baggage door after arrival at Ronaldsway.

Engineering inspection

The operator's maintenance engineer inspected the baggage door and reported that there were no defects with either the door or its locking device that would have prevented the door from locking. From photographs taken by the Airport Manager at Ronaldsway, it can be seen that whilst the locking device appeared to be locked from the outside, the hook on the mechanism had not engaged with the catch (Figure 2).

Securing of baggage door

A report from the Hungarian aircraft accident investigation authorities stated that it is standard practice in this airline for the baggage to be loaded through the left baggage door and that it is the co-pilot's responsibility to check that the nose compartment doors are closed and locked prior to departure. The fact that the door

Figure 1

Nose baggage door after arrival at Ronaldsway

did not open during the outbound journey suggests that it was probably opened at Belfast City Airport. Whilst the door locking mechanism appeared from the outside to have been locked, it is apparent, from the lack of damage, that the hook did not engage in the catch when the locking mechanism was closed. A modification is available to fit a physical indicator to the front door locking mechanism, but the modification had not been incorporated on this aircraft.

Figure 2
Door locking mechanism

ACCIDENT

Aircraft Type and Registration:	Eurocopter AS332L2 Super Puma, G-REDM
No & Type of Engines:	2 Turbomeca Makila 1A2 turboshaft engines
Year of Manufacture:	2004
Date & Time (UTC):	22 February 2008 at 1330 hrs
Location:	North Sea, approximately 165 nm north-east of Aberdeen
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 2 Passengers - 15
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to main rotor blades, bonding leads broken, evidence of high energy tracking on two pitch link ball joints and one main rotor servo upper ball joint
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	39 years
Commander's Flying Experience:	3,800 hours (of which 2,300 were on type) Last 90 days - 100 hours Last 28 days - 50 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent enquiries by the AAIB

Synopsis

The aircraft was flying through a line of showers whilst en route from an offshore rig in the North Sea to Aberdeen, when it was struck by lightning. There was no loss of systems nor any other adverse effects on aircraft behaviour and it continued to Aberdeen where it landed safely.

History of the flight

The aircraft was cruising at 2,000 ft, en route to Aberdeen, 15 minutes after take-off from the 'Bruce' offshore platform, when it encountered a line of rain showers. These were orientated approximately north-north-west/south-south-east and extended to the limits of the helicopter's weather radar display. The crew selected a crossing point which appeared to be the shortest transit of the shower band where the weather radar showed no red returns. About 30 seconds after entering the line of showers, both pilots saw a bright flash at the rotor tip in the one o'clock position, accompanied by a 'bang' or 'pop' sound.

Although the lightning strike had not caused any noticeable effects on the aircraft's behaviour, the crew initially decided to head towards the nearest available platform which did not involve returning through the line of showers, in accordance with the checklist requirement

to land as soon as possible. A diversion to Sumburgh or Kirkwall was considered but the observed weather in those directions was judged to be unsuitable. It was then established that the nearest suitable platform had unfavourable weather conditions and all other suitable platforms reported winds in excess of 50 kt. The crew therefore elected to continue on to Aberdeen, where an uneventful landing was made.

Aircraft damage

Subsequent examination of the aircraft revealed damage to the main rotor blades which included arcing damage to the leading edge anti-erosion strips, broken bonding leads and damaged trim tabs. High energy tracking was also visible on two main rotor pitch link ball joints and one main rotor servo upper ball joint. The main rotor head and other components were removed and returned to the manufacturer for detailed investigation. Strip examination of these components did not reveal any evidence of pitting or other damage. Of the four rotor blades, one was damaged beyond repair limits, whilst the remaining three were repairable.

Recorded lightning data

The UK company EA Technology archives recorded data of air to ground discharges detected by their specialist lightning detection equipment. They noted significant electrical discharges in the North Sea occurring at 1325, 1328 and 1335 hrs on the day in question. On examining the recorded data, however, it was clear that none of these strikes were within 60 km of the helicopter's position. The detection equipment records only air-ground strikes, which are normally regarded as the most damaging type of lightning strike. Although more extensive analysis of the data may have revealed lower energy strikes closer to the aircraft location at the relevant time, it was judged that further investigation of these would not be of value. The physics of lightning is far from perfectly understood but it would appear that the event involving this aircraft was probably an inter-cloud or an intra-cloud strike. Such an event is frequently triggered by the presence of an aircraft. The reported lightning data available to flight crews in forecasts is based on recent measurements of lightning activity occurring in the area. Thus, if there is no recent history of lightning strikes in the relevant area, the likelihood of a strike in that area cannot be predicted.

Additional information

A very large number of lightning strikes have been encountered by AS332-series helicopters operating over the northern North Sea, since the type's entry into service. These appear to have occurred predominantly during the winter months. The most severe of these occurred to G-TIGK in 1995, when a tail rotor blade received damage from a lightning strike which caused a tail rotor imbalance which led to the detachment of the tail-rotor gearbox. Slight main rotor blade damage also occurred on that occasion. Although the helicopter ditched safely and all the occupants survived, it subsequently sank and was damaged beyond economic repair. Following that event, a modified tail rotor blade was introduced which was adopted by operators as the standard fit on UK-registered North Sea-operated AS332 helicopters.

Although lightning strikes to helicopters continue to occur, no further UK-registered AS332-series helicopters have been lost due to such events. Numerous changes and modifications, many associated with lightning protection, have been made to the original AS332s which remain in service in the North Sea and newer, better-protected versions of the AS332-series have also entered service. Although varying degrees of lightning damage have been

experienced and in the case of the later 'glass cockpit' versions, some loss of instrument displays has resulted, the concerns raised following the G-TIGK accident about the robustness of the AS332-series helicopters in the North Sea lightning environment have not been borne out. The modifications to earlier aircraft and improvements incorporated at build on later examples appear to have contributed to this improved airframe survivability. Lightning strikes have led to considerable expense in repairs, component replacement and, occasionally, shipment of damaged aircraft by surface means from rigs and other remote locations. However, since the G-TIGK incident, they have not rendered any of the affected aircraft unable either to complete the flight safely, or successfully divert.

A previous major lightning strike to another operator's AS332-series helicopter (G-CHCG) occurred in March 2006 and was reported on in AAIB Bulletin 1/2007. The damage experienced by that aircraft was more severe than that seen on G-REDM, suggesting that the latter had suffered a lower intensity strike.

The checklist for G-REDM required the crew to land as soon as possible following a lightning strike to the helicopter. Although the flight was continued to the planned destination, this decision was made after consideration of the prevailing atmospheric conditions.

ACCIDENT

Aircraft Type and Registration:	Avid Speedwing, G-BTMS
No & Type of Engines:	1 Rotax 582 piston engine
Year of Manufacture:	1999
Date & Time (UTC):	6 May 2008 at 1400 hrs
Location:	Burtenshaw Farm, East Sussex
Type of Flight:	Private
Persons on Board:	Crew – 1 Passengers - None
Injuries:	Crew – None Passengers – N/A
Nature of Damage:	Minor damage to aircraft and car
Commander's Licence:	Commercial Pilot's Licence - ATPL (Frozen)
Commander's Age:	28 years
Commander's Flying Experience:	201 hours (of which 106 were on type) Last 90 days - 10 hours Last 28 days - None
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Shortly after taking off from a farm strip, the engine power started to reduce slowly. The pilot turned the aircraft back towards the airfield and landed downwind on the runway from which he had just taken off. He was unable to stop the aircraft on the runway and it collided with a parked car.

History of the flight

As the owner had replaced the engine spark plugs the day before the accident, his son, who was the pilot on the accident flight, performed a long engine ground run prior to departing from the 300 metre long grass strip. At approximately 150 ft agl, the pilot became aware of a change in the engine noise and noticed that the rpm was slowly decreasing. At around 400 ft agl, he turned back towards the strip and positioned the aircraft for a downwind landing on the runway from which he had just taken off.

The pilot stated that there was a strong tailwind and he was aware that the groundspeed was very high as he crossed the threshold. He applied the wheel brakes after touchdown, but when the aircraft hit a bump half-way down the runway, it was still travelling fast enough for it to become airborne for a further 30 metres. He was subsequently unable to stop the aircraft on the runway and it collided with a parked car.

Following the accident the engine was examined by an engineer, but no obvious cause for the loss of power could be found.

ACCIDENT

Aircraft Type and Registration:	Cozy Mk IV, 4X-OYG
No & Type of Engines:	1 Lycoming IO 360 A1B6 piston engine
Year of Manufacture:	2007
Date & Time (UTC):	12 July 2008 at 1226 hrs
Location:	Wick Airport, Highland
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Minor damage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	62 years
Commander's Flying Experience:	3,500 hours (of which 93 were on type) Last 90 days - 50 hours Last 28 days - 30 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and telephone conversation with Israeli AAIB

Synopsis

The pilot omitted to the lower the nose landing gear prior to landing at his destination.

History of the flight

The pilot was en-route from Israel to the United States to attend the Oshkosh rally.

The aircraft is of a canard configuration with a fixed main landing gear and retractable nosewheel. Based on information given by the pilot to the Israeli AAIB, and forwarded subsequently to the UK AAIB by telephone, the pilot reported that at a late stage on the Le Touquet/wick sector of his fight, he encountered bad weather, and, after becoming visual with Wick Airport, omitted to lower the gear.

ACCIDENT

Aircraft Type and Registration:	DH82A Tiger Moth, G-ANJA
No & Type of Engines:	1 De Havilland Gipsy Major I piston engine
Year of Manufacture:	1939
Date & Time (UTC):	23 May 2008 at 1825 hrs
Location:	5 miles west of Lashenden, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Undercarriage collapsed, damage to three main wings, nose / engine cowlings and a number of broken longerons in fuselage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	50 years
Commander's Flying Experience:	153 hours (of which 22 were on type) Last 90 days - 11 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During an aerobatic manoeuvre the engine stopped. While conducted a forced landing the pilot changed his selection of feld twice and was subsequently unable to make his third choice of feld. The pilot deliberately stalled the aircraft onto the ground in a feld approximately 100 m short of his selected feld. The landing gear collapsed and the aircraft was substantially damaged.

History of the flight

The pilot, whose currency for self-fy hire from the fying club had lapsed, successfully completed a dual check with an instructor at Headcorn Aerodrome. The weather conditions were described as good, with a light easterly wind. After the check fight, the instructor left the aircraft and the pilot went for a short local solo fight. The aircraft climbed to 3,300 ft and was approximately 1 mile to the west of Staplehurst when the pilot decided to fy an aileron roll. After a clearing turn the pilot entered a shallow dive, which increased the airspeed to 110 kt. He then pitched the aircraft up to between 15º and 20º and commenced a roll to the right. As the aircraft passed through the inverted position, the engine stopped suddenly. The aircraft lost speed and fell out of the manoeuvre with the propeller stopped.

The pilot recovered the aircraft to level fight. he considered that he had insuffcient height to attempt

to restart the engine and selected a field for a forced landing; he transmitted a 'Fan stop' call on the Headcorn air traffic frequency. As the aircraft neared the field the pilot could see that it contained tall crops and was therefore unsuitable, so he turned the aircraft towards a nearby playing field. He then noticed children in the field so flew towards a nearby golf course. It then became clear to the pilot that he had insufficient height to reach the golf course so he transmitted a 'MAYDAY' call on the Headcorn frequency. At a height of around 50 ft, whilst about 100 yards before the golf course, the pilot decided to stall the aircraft into the preceding field. The landing gear collapsed and the aircraft sustained substantial damage. The pilot, who was wearing a 4-point harness, was uninjured and having made the aircraft safe, he vacated it normally.

Additional information

The DH82A Tiger Moth has a single fuel tank situated above the fuselage between the upper wings. Fuel is gravity fed to a conventional carburettor. If the aircraft is subjected to negative 'g' the fuel flow from the fuel tank to the carburettor stops, and the fuel in the float chamber of the carburettor transfers to the top of the chamber, leaving the main jet sucking air instead of fuel. The net effect is that the engine stops.

Rolling the Tiger Moth is a manoeuvre which requires advanced aerobatic skills. The aircraft only has ailerons on the lower wing, and when the aircraft is inverted there can be some shielding of the ailerons by the upper wing and the rate of roll is therefore slow. Furthermore, to successfully complete this manoeuvre requires precise rudder control inputs by the pilot.

Because of the difficulty of conducting rolling manoeuvres in the Tiger Moth, together with the propensity of the engine to stop when subjected to negative 'g', the flying club only authorises its most experienced pilots to perform rolling manoeuvres in this aircraft. Moreover, these rolling manoeuvres are performed overhead the airfield in case the pilot is unable to restart the engine.

The pilot involved in this accident was cleared by the club for aerobatics in its more modern aerobatic aircraft but he was not authorised to conduct aerobatics in the Tiger Moth. He stated that he had previously conducted rolling manoeuvres with a check pilot in the Tiger Moth and at the time of the accident he was not aware of any club restriction on flying aerobatics in the Tiger Moth.

ACCIDENT

Aircraft Type and Registration:	Pioneer 200 Alpi, G-CEVJ
No & Type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2007
Date & Time (UTC):	14 June 2008 at 1000 hrs
Location:	Franklyns Field, near Wells, Somerset
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to landing gear, firewall, engine bearer and propeller
Commander's Licence:	Private Pilot's Licence
Commander's Age:	63 years
Commander's Flying Experience:	136 hours (of which 16 were on type) Last 90 days - 7 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During the final stages of the approach to land, the pilot found that movement of the control stick became impeded by a kneeboard strapped to his thigh. In an attempt to free the controls he pulled back hard on the control stick. The stick then freed suddenly, resulting in a full-aft control input being applied and the aircraft stalling into the ground.

History of the flight

The pilot and passenger departed Franklyns Field, a small grass airstrip, at 1100 hrs local time and conducted a short flight consisting of two circuits to test engine cooling performance. During final approach to land back at the airfield, aft movement of the control stick became impeded. In an attempt to free the controls the pilot pulled back hard on the stick, which then freed suddenly and resulted in a full-aft control input being applied to the aircraft. The aircraft pitched nose high and stalled into the ground from a height of approximately 10 ft, causing extensive damage to the aircraft but no injuries to the pilot or passenger. The pilot realised that the kneeboard strapped to his left thigh had slipped round and caused the restriction in control stick movement.

Comment

Obstruction of controls by kneeboards is not a new problem and was highlighted in a CAA General

Aviation Safety Information Leaflet (GASIL), published in September 2003. Whilst kneeboards are a useful pilot aid during the cruise phase of flight, the GASIL recommends that they be placed in a safe, secure stowage position during critical phases of flight such as takeoff and landing.

ACCIDENT

Aircraft Type and Registration:	Pilatus P2-05, G-BLKZ
No & Type of Engines:	1 Argus AS 410-A2 piston engine
Year of Manufacture:	1948
Date & Time (UTC):	31 May 2008 at 1659 hrs
Location:	Heath Farm, Barkston Heath, Grantham, Lincolnshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Minor) Passengers - 1 (Minor)
Nature of Damage:	Damage to the propeller, landing gear, and underside
Commander's Licence:	Private Pilot's Licence
Commander's Age:	48 years
Commander's Flying Experience:	888 hours (of which 3 were on type) Last 90 days - 16 hours Last 28 days - 6 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and preliminary post accident inspection report from a maintenance organisation

Synopsis

Whilst cruising at 2,000 ft the engine failed. During the subsequent forced landing, the landing gear collapsed. The pilot and passenger sustained minor injuries but were able to exit the aircraft without assistance. The aircraft sustained substantial damage.

History of the flight

The pilot reported that the aircraft had departed from RAF Waddington for a planned flight to Spanhoe Airfield and had climbed to 2,000 ft. Cruise power had been set and the engine temperatures and pressures were indicating normal values. Approximately five minutes later, a slight vibration was noted which quickly developed into heavy vibration. Oil was observed to be running from the right side of the engine cowling and onto the windscreen. The pilot reduced power and lowered the landing gear but, at approximately 800 ft agl, the engine stopped. The flaps were lowered and a slight left turn was made to avoid uneven ground and power lines. The aircraft landed heavily in a slightly nose-down attitude and the landing gear collapsed. The pilot and passenger sustained minor injuries but were able to exit the aircraft without assistance. The landing gear was severely damaged, the propeller and underside of the aircraft less so.

Aircraft details

The Pilatus P2 is a tandem two-seat, tailwheel-configured, low-winged all metal aircraft, designed

in the 1940's as an advanced military trainer. The main landing gear is retractable. The type remained in military service until the early 1980's. The Argus engine was originally developed in 1937 and is of a supercharged, inverted V12 configuration, producing around 465 horsepower at full power. This particular aircraft was constructed in 1948.

The engine was rebuilt 2001 and had flown approximately 367 hours prior to the accident. Upgraded pistons, manufactured from a revised specification alloy (introduced to avoid corrosion-induced cracking problems that had been encountered on low utilisation engines), were fitted 49 flying hours and 85 flights before the accident.

The aircraft had been used to fly aerobatics and carried out a series of manoeuvres as part of a flight test for a magazine article a short time before the engine failure.

Engine examination

Initial visual inspection of the engine by the pilot revealed a golf ball sized hole in the crankcase in the vicinity of No 3 cylinder. The missing crankcase parts were found in the bottom of the engine cowling.

Subsequent preliminary investigation, by a maintenance organisation with experience of this type of engine, found that both connecting rods were broken on the third bank of cylinders from the front. The first appeared to have failed at the gudgeon pin and this failure in turn destroyed the second. Both pistons were free to move in their respective cylinders. There was no sign of 'blueing' on the crankshaft, although some 'blueing' had been caused by the flaying rods hitting the cylinder skirts and crankcase wall, indicating the bearing lubrication system had been functioning normally.

Comments

The maintenance organisation commented that this engine had failed in a similar fashion to many other Argus engines they had seen; they reported that they are not a 'strong' engine and have a history of connecting rod and piston failures. They went on to say that, like many other engines of this era, the Argus engine requires delicate handling and smooth power changes.

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-161 Cherokee Warrior II, G-BSVM
No & Type of Engines:	1 Lycoming O-320-D3G piston engine
Year of Manufacture:	1981
Date & Time (UTC):	24 June 2008 at 1621 hrs
Location:	Biggin Hill Airport, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 3
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to wing tip and fairing
Commander's Licence:	Private Pilot's Licence
Commander's Age:	71 years
Commander's Flying Experience:	356 hours (of which 197 were on type) Last 90 days - 13 hours Last 28 days - 7 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

After an uneventful fight from Le Touquet, France, the aircraft taxied to the apron and was being manoeuvred under visual signals from a marshaller. During this manoeuvre the left wing tip made contact with the right wing of a parked Piper PA-28.

ACCIDENT

Aircraft Type and Registration:	Robin HR200/120, G-GBXF
No & Type of Engines:	1 Lycoming 0-235-J2A piston engine
Year of Manufacture:	1975
Date & Time (UTC):	28 January 2008 at 1537 hrs
Location:	Alderney, Channel Islands
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Lower section of right main landing gear detached, slight buckling to flap trailing edge and paint scoring on wing underside
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	50 years
Commander's Flying Experience:	3,037 hours (of which 920 were on type) Last 90 days - 69 hours Last 28 days - 14 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and metallurgical examination by AAIB

Synopsis

Following a slightly heavier than normal landing, the right main landing gear wheel/axle unit, together with the lower part of the oleo piston tube, separated from the outer tube of the leg. A failure of the oleo piston tube due to fatigue cracking was found to have been present for some time.

History of the flight

The flight was planned as 'refresher' training for the pilot under instruction, who held a PPL. After carrying out a normal visual approach in calm conditions to Runway 26 at Alderney, the instructor stated that the subsequent landing was slightly heavier than normal, but otherwise satisfactory. However, during the landing roll, the instructor noticed the aircraft begin to veer to the right and he took control. He then became aware of the right wing dropping and he counteracted this with the application of full opposite aileron, but without effect. He also noticed sparks originating from beneath the wing. He was able to steer the aircraft onto the grass beside the runway; the aircraft gently yawed to the right, coming to rest on a heading of 022º. Both occupants exited the aircraft without difficulty.

During the subsequent inspection, it was found that the right main landing gear oleo piston tube had fractured

just above the chromium plated lower section. The torque-link bolt had also sheared which, together with a failure of the brake hose, had allowed the lower part of the oleo piston tube and wheel unit to detach from the aircraft.

Main landing gear

The Robin hR200 has a fxed tricycle landing gear. Each main landing gear unit incorporates an air/oil-fled oleo piston tube, integral with the wheel axle, which operates within the outer cylinder to attenuate loads from the landing gear to the airframe on touchdown (Figure 1). The cylinder is connected to the axle via a torque linkage. The landing gear is maintained 'on condition' and there had been no history of loss in oleo pressure, or fuid leaks from the seals on the subject leg. It was not possible to establish the service history of the failed unit.

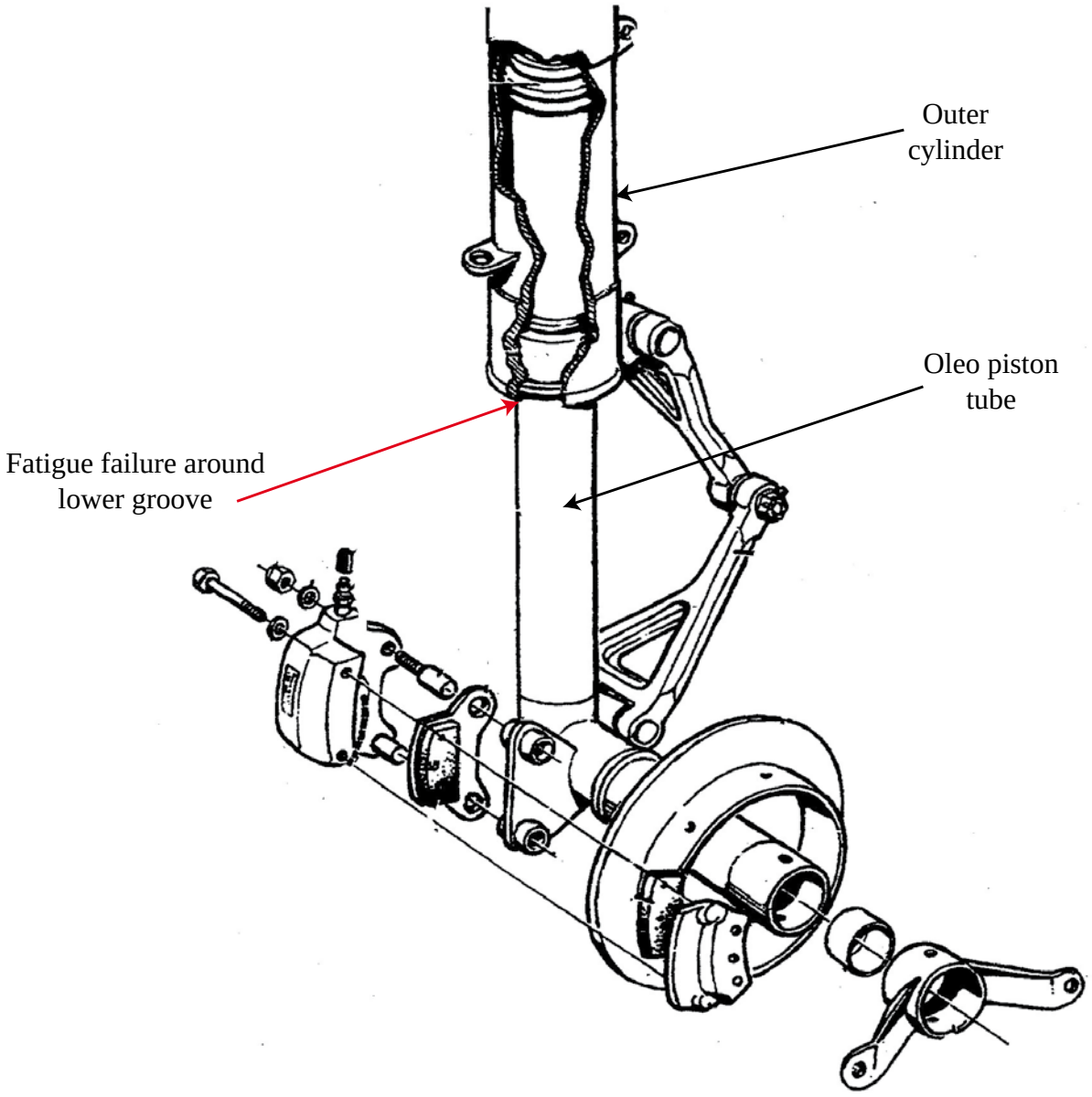

Figure 1

Diagram of the Robin HR200 Main Landing Gear unit

Metallurgical examination

Metallurgical examination of the fractured oleo piston tube showed that it had failed along the lower of two grooves, where a circlip and seal are normally located, Figure 2. The piston tube had been separated for some time, as evidenced by debris recovered from within the unit and damage to the fracture surfaces. This damage meant it was difficult to determine the cause of the failure, other than that it had been associated with a fatigue cracking mechanism. No previous occurrences of this type of failure have reportedly occurred.

Conclusions

It is likely that the piston tube, having been failed at this location for some time, had continued to operate normally within the shock strut, with the torque links just being able to retain the lower section within the outer cylinder when in flight. As such, when on the ground, the landing gear would have had a normal appearance. However, on the subject flight it is possible that the piston tube may have exited the outer cylinder on takeoff or, more likely, that the heavier than normal touchdown loads allowed the tube to deflect rearwards and separate from the leg, before sliding back in to the outer casing and operate apparently normally. The failure of the torque link bolt and brake hose appeared to have occurred after the separation of the piston tube from the outer cylinder.

The origin of the fatigue cracking and/or the initiating event could not be established due to damage to the fracture surfaces brought about by the gear remaining in service after the piston tube had completely failed.

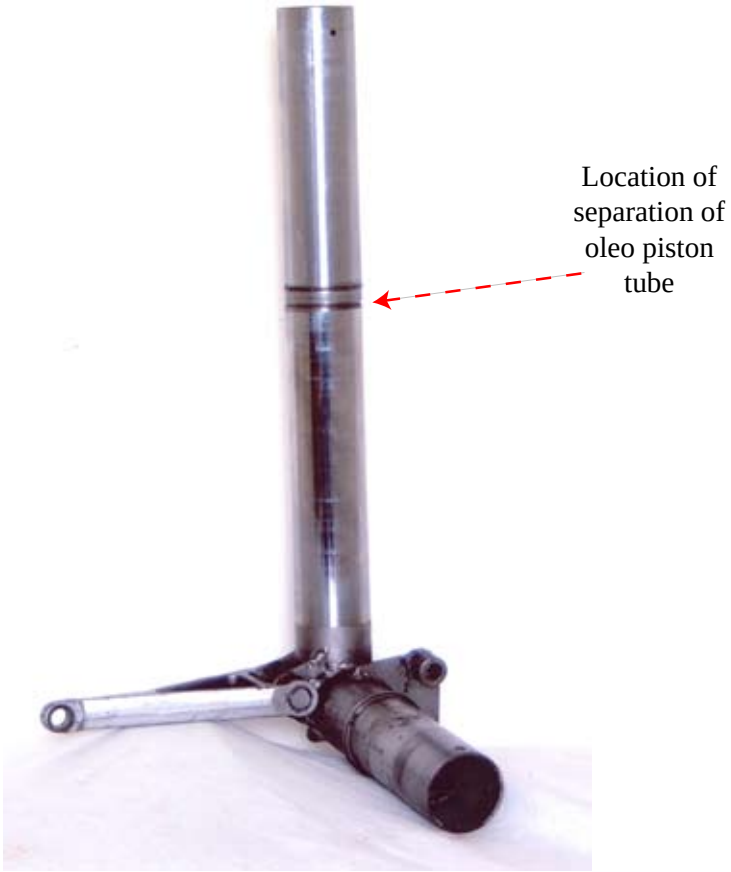

Figure 2

Right Main Landing Gear oleo piston tube

ACCIDENT

Aircraft Type and Registration:	Scottish Aviation Bulldog 120 Model 121, G-CBBC
No & Type of Engines:	1 Lycoming IO-360-A1B6 piston engine
Year of Manufacture:	1973
Date & Time (UTC):	4 July 2008 at 1022 hrs
Location:	3 nm north of Basingstoke, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Canopy broken and fire extinguisher lost
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	61 years
Commander's Flying Experience:	4,828 hours (of which 239 were on type) Last 90 days - 20 hours Last 28 days - 8 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft's portable fire extinguisher detached during aerobatic flight and broke through the Perspex canopy. There were no injuries reported and the aircraft landed safely.

Description of the accident

The pilot reported that he carried out pre-flight checks in accordance with the Flight Reference Cards, which included a check of the security of the hand-held fire extinguisher in the rear luggage area. Other equipment and loose articles were removed from the aircraft prior to takeoff from Blackbushe Airport for an aerobatics flight.

The pre-aerobatics checks were carried out, during which the pilot reached behind his seat to confirm that the fire extinguisher was secured in place. The pilot then flew a series of aerobatic manoeuvres, commencing at 3,000 ft. He carried out a loop, a stall turn and two slow rolls without incident. During a third slow roll, when the aircraft was inverted with about minus 1.5 g applied, the fire extinguisher came free and broke through the top of the canopy. The aircraft returned to Blackbushe for an uneventful landing, and the incident was reported to the authorities. There were no reports of injuries on the ground or damage to property.

The extinguisher had been secured in a bracket which was itself secured to the top of the control tunnel which ran centrally through the rear baggage area, so that it was accessible to the pilot or passenger. The

extinguisher was secured in the bracket by a commonly used type of quick-release sprung latch. The latch appeared serviceable when inspected after the flight.

The pilot had removed a large box of servicing sundries prior to the flight, and considered it possible that the latch had become dislodged in the process, such that it opened under application of sufficient negative g.

Comment

This accident highlights the importance of checking that cockpit equipment is properly secured prior to flight, which is a critical check if aerobatic manoeuvres are planned. Further guidance on this and other aspects of aerobatics in general aviation aircraft is given in the CAA's General Aviation Safety Sense leaflet Number 19, *'Aerobatics'*.

ACCIDENT

Aircraft Type and Registration:	Steen Skybolt, G-ENGO
No & Type of Engines:	1 Lycoming O-360-A4J piston engine
Year of Manufacture:	2007
Date & Time (UTC):	31 May 2008 at 1930 hrs
Location:	Brimpton Airfeld, near Aldermaston, Berkshire
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Landing gear collapsed, propeller damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	60 years
Commander's Flying Experience:	238 hours (of which 1was on type) Last 90 days - 1 hour Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The owner of the aircraft was undergoing type conversion training under the supervision of another pilot. A number of circuits were completed successfully, but on the final landing the landing gear collapsed. A steel tube was found to have failed.

History of the flight

The pilot was flying circuits at Brimpton Airfeld, where Runway 07, a grass runway, was in use. On the final landing, a smooth touchdown was made but the landing gear collapsed.

The aircraft was inspected after the accident and the shock cord truss tube, a hollow steel tube located under the forward fuselage, was found to have failed. The aircraft had flown approximately six hours since it had been built. In that time there had been one hard landing, following which the aircraft was inspected and no damage was found. The reason for the failure of the tube has not been determined although it was considered possible that some damage from the earlier landing could have gone undetected.

ACCIDENT

Aircraft Type and Registration:	Vans RV-6A, G-RVPW
No & Type of Engines:	1 LycominG O-320-B3B piston engine
Year of Manufacture:	2004
Date & Time (UTC):	7 June 2008 at 1400 hrs
Location:	Netherthorpe Airfeld, South Yorkshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to the propeller, engine and forward fusleage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	60 years
Commander's Flying Experience:	260 hours (of which 106 were on type) Last 90 days - 8 hours Last 28 days - 7 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

After landing, as the aircraft was decelerating through 25 kt, its nosewheel dug into an area of soft ground. The nose landing gear collapsed and the aircraft tipped onto its nose, damaging the propeller and the forward fuselage, and also causing the engine to be shock loaded. The pilot and passenger were uninjured and left the aircraft unaided.

ACCIDENT

Aircraft Type and Registration:	Yak-3, G-CDBJ
No & Type of Engines:	1 Allison V1710-YAK 2F piston engine
Year of Manufacture:	2003
Date & Time (UTC):	5 July 2008 at 1600 hrs
Location:	Pent Farm Airstrip, Folkestone, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Left main landing gear leg detached, and two of the propeller blades were damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	66 years
Commander's Flying Experience:	1,640 hours (of which 14 were on type) Last 90 days - 16 hours Last 28 days - 10 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Whilst landing, the aircraft overran the runway at low speed. The left main landing gear struck a substantial fence post, detaching the leg from the aircraft. Both occupants were uninjured and able to vacate the aircraft unaided.

History of the flight

After a flight from London City Airport where it had been displayed at their 'Fun Day', the tailwheel aircraft was attempting to land on Runway 03 at Pent Farm, its base. The runway is 925 m long with a grass surface that was dry and frm at the time of the accident. The runway slopes up approximately 230 ft along its length and is, therefore, the preferred runway for this type of aircraft in all but very strong southerly wind conditions. The wind was reported by the pilot as southerly at 10 kt.

The aircraft had touched down on all three wheels and light braking was being applied. A cart track crosses the runway approximately half way along its length and, as the aircraft crossed the track, it was launched back into the air. The pilot considered a go-around, but discounted the option due to the power lines and steeply rising high ground ahead.

As the aircraft settled back onto the runway, braking was resumed. When the pilot realised that he was not going to stop by the end of the runway, he decided to

continue ahead and through a fence, rather than attempt a ground loop manoeuvre. The left main landing gear leg struck a six inch diameter fence post, detaching the leg from the aircraft, which caused the propeller to strike the ground.

The aircraft came to a stop and both occupants, who were uninjured, vacated the aircraft as normal, through the opened canopy.

Comment

The Met Office provided an aftercast of the likely local conditions at the time of the accident.

A south westerly gradient covered the incident site, with a cold front some 100 nm to the east, and a low pressure centre positioned over St George's Channel, to the west. The air mass was returning polar maritime, with visibility of the order of 15 km to 30 km, with small amounts of 'fair weather' cumulus at approximately 3,000 ft to 45,00 ft above mean sea level. There was no significant weather.

The south westerly gradient was analysed and from that analysis, and consideration of nearby Lydd and Manston airport weather reports, the following wind estimate was given; surface wind, 220º/12-15 kt, gusting 20 kt/25 kt and the 500 ft wind, 230º/20 kt.

ACCIDENT

Aircraft Type and Registration:	Eurocopter EC135 T2, G-IWRC
No & Type of Engines:	Two Turbomeca Arrius 2B2 turboshaft engines
Year of Manufacture:	2002
Date & Time (UTC):	16 September 2007 at 1316 hrs
Location:	East of North weald Airfeld, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Extensive damage to fuselage, tailboom and rotors
Commander's Licence:	Private Pilot's Licence
Commander's Age:	55 years
Commander's Flying Experience:	2,500 hours (of which 450 were on type) Last 90 days - 48 hours Last 28 days - 15 hours
Information Source:	AAIB Field Investigation

Synopsis

The pilot and his passenger were returning to the UK from Europe. Whilst passing through the Stansted control zone, the helicopter's autotrim in the Automatic Flight System disengaged and the helicopter pitched nose-down. The pilot, believing he had a double engine failure, entered autorotation. During the landing fare, the tail of the helicopter struck the ground frst, severing the fenestron drive. The helicopter subsequently rolled on to its side and was extensively damaged. The occupants escaped without injuries.

History of the flight

The pilot and his wife were returning from Kotrijk, Belgium, to a private landing site near Oxford the day after a friend had died in a helicopter accident. The weather conditions were fne with a moderate north-westerly wind. At 1309 hrs the helicopter was at 1,000 ft in the Billericay area, when the pilot contacted Essex Radar for a clearance to cross the Stansted control zone. After obtaining the clearance, the pilot requested, and was cleared, to climb to 1,500 ft in order to remain clear of the airfeld at North weald. The pilot used the autopilot in the ALT ACQUIRE mode to climb to 1,500 ft. As he neared North Weald, he consulted his fight guide to obtain the radio frequency for the airfeld and passed them his fight information via his second radio. With the autopilot engaged in NAV GPS and ALT modes, and whilst fying hands off, the pilot

returned the guide to its stowage in the right door. At this time he heard, and felt, a dull thud from above and behind him, similar to a bird strike. He also felt the helicopter change attitude. He stated that as he looked forward he noticed that the helicopter was pitching nose-down. His wife, who was occupying the front left seat and had been reading a magazine, expressed her alarm and later mentioned that the helicopter felt 'wobbly'. The pilot placed his hands on the controls and entered an autorotation.

The pilot checked his instruments and he recalls that one of the needles on the triple tachometer gauge, which shows engine and rotor speeds, pointed up, one was in the normal position, and the third needle pointed down. He also stated that he was not aware of any visual or aural warnings. His immediate assessment was that he had lost all engine power and therefore decided to try and make an autorotative landing at North Weald Airfeld, which he could see ahead of him. he made an emergency call to Essex Radar, who gave him a bearing and distance to North Weald. The pilot realised that he would not make the airfeld and therefore selected an alternative landing site and informed Essex Radar that he would be landing in a feld.

The helicopter handled normally during the approach and as it passed over the edge of the feld the pilot commenced the fare. he was aware of the tail boom touching the ground before the helicopter landed on its skids and ran along the ground for a short period before rolling onto its right side. The pilot and passenger, who were uninjured, vacated the helicopter through the front left door. The pilot could hear at least one engine running at what he described as 'low power' and, therefore, he returned to the helicopter to shut down the engines.

Accident site

From police photographs it was established that the helicopter crashed in a feld approximately 1 nm to the east of Runway 02/20 at North weald. The feld had been recently cultivated leaving a loose top surface of soil and straw. From ground marks it was established that the helicopter touched down tail frst on a track of approximately 345º. The tail then dragged across the ground for approximately 3.5 m before both skids touched down at about the same time. The helicopter then ran across the feld for a further 10 m before it rolled onto its right side.

The photographs show that the tail boom had broken just forward of the horizontal stabiliser and all four main rotor blades had failed close to the blade roots. Broken fragments of the blades were scattered around the helicopter.

Helicopter description

The EC135 T2 is a light twin-engine helicopter equipped with a 'Fenestron' torque control system and conventional helicopter controls. G-IWRC was equipped with a Central Panel Display System (CPDS), Pilot's Displays (PD), Navigation Displays (ND), an Auto Flight System (AFS) and a high skid assembly which increases the ground clearance.

Central Panel Display System

The CPDS incorporates the Vehicle and Engine Monitoring Display (VEMD) and the Caution and Advisory Display (CAD).

The VEMD consists of upper and lower screens, which are used to display engine and dynamic system parameters. In addition to displaying the engine

parameters (N1[1] , TOT[2] and torque) the upper screen also displays limitation exceedence information and warning messages following a failure of the Full Authority Digital Engine Controls (FADEC) or engines. A flight report is generated in the VEMD which contains details of the flight duration, engine cycles and any mast moment exceedences.

The CAD displays cautions, advisory messages and fuel system indications. A Master Caution light, located adjacent to the Warning Unit illuminates when cautions are generated on the CAD. Cautions are listed in the order of their appearance and can be cancelled by the pilot pressing the CDS/AUDIO RES switch on the cyclic stick grip.

Auto Flight System

The Auto Flight System is hierarchical in concept and on G-IWRC comprised a three axis Stability Augmentation System (SAS) and an autopilot. The SAS consisted of a Pitch and Roll SAS (P&R SAS) and Yaw SAS. The helicopter was also equipped with a pitch damper. These systems are used for stabilising the attitude of the helicopter about the longitudinal, lateral and yaw axes by applying limited authority inputs to the main controls. The SAS system is designed for 'hands-on' operation, which means that the pilot must provide control inputs through the cyclic control and yaw pedals in order to control the attitude of the helicopter. The SAS is automatically activated during the start procedures and can be disengaged by pressing either of the SAS DCPL switches located on top of each cyclic stick grip. Re-engagement of the SAS is through a four-way switch on the cyclic grip, labelled P&R/P – P/Y RST.

The three-axis autopilot is designed for hands-off operation. It is controlled by the Auto Pilot Mode Selector (APMS) mounted on the instrument panel, and comprises all the necessary controls to engage the autopilot and select one of its 12 modes. When the AP button on the APMS is selected the autotrim (A TRIM) automatically engages. The higher modes such as the altitude and navigation modes can then be selected via push buttons on the APMS. In normal operation the helicopter is flown with the basic autopilot, in attitude mode, permanently selected ON.

If the SAS DCPL switch is operated in flight, then the autopilot, pitch damper and the SAS will disengage. As the electro-hydraulic and electro-mechanical actuators in the flying control system will no longer receive any computed commands, they will return to their null positions, which can result in uncommanded small control inputs. The helicopter manufacturer stated that the uncommanded movement of the actuators may cause the helicopter to pitch up or down, and roll to the left or right. The following warnings are generated following the operation of the SAS DCPL switch:

Warning Unit - AP A TRIM lamp illuminates and gong repeats every three seconds. Warnings self-cancel after 10 seconds.

CAD - AUTOPILOT, P/R SAS, Y SAS, P DAMPER.

Master Caution - Illuminates until all the cautions on the CAD have been cancelled by the pilot.

PD - Red Y, R, P flash for 10 seconds then are replaced by an amber OFF.

Footnote

[1] Engine gas generator speed.
[2] Turbine Outlet Temperature.

Warning Unit

The Warning Unit is mounted near the top of the instrument panel and generates the visual and audio warnings for a number of systems. A memory within the unit stores, in chronological order, the last 31 warnings generated when the helicopter is in the fight condition. Whilst there is no timebase to determine when each warning was generated, there is a fag within each message code which toggles at the end of each fight. Consequently it is possible to determine the warnings which were generated during the last fight.

Emergency situations requiring immediate action will be indicated by a gong and the illumination of the relevant red warning light on the warning panel. The gong can be reset by pushing the CDS/AUDI RES button on the cyclic stick grip. The warnings that could be generated on G-IWRC include AP A TRIM, which is generated if the autopilot or autotrim is intentionally deselected, or if there is a failure in the AFS that does not allow the helicopter to maintain its attitude. The AP A TRIM warning and its associated gong self-cancel after 10 seconds.

Examination of the helicopter

The helicopter was examined after it had been moved by a maintenance organisation. The left side of the helicopter was mostly undamaged and the damage to the right side was consistent with it rolling onto this side. With the exception of a failed weld on the forward right shoe, the skid assembly was undamaged. Whilst the pilot's and one of the cabin transparencies had broken, the cockpit area remained intact.

The fenestron and rear section of the tail cone had broken away from the helicopter, and the aft drive shaft for the fenestron fan had failed just behind the forward fexible coupling. The fenestron fan had made contact with the inside of the duct and two of the blades had broken away at the blade roots. The remainder of the blades were bent slightly forwards. The damage to the inside of the duct was greatest between the 3 and 6 o'clock positions, when looking from the right side of the helicopter. The tail bumper and right side of the fenestron duct were also damaged. All the damage to the fenestron was consistent with a heavy tail strike and it is assessed that the fenestron drive shaft probably failed when the tail frst struck the ground.

Apart from the right engine exhaust, which was slightly dented, the engines were undamaged and the turbines rotated freely. The air intake guards on both engines were covered in matted vegetation, which was considerably denser around the right engine intake. An internal inspection was carried out using a borescope and no damage was evident that would cause either engine to stop in fight. It was noted that the turbine blades on the right engine were covered by a black coating that was later identifed by the engine manufacturer as burnt vegetation. The engine and main gearbox magnetic chip detectors were examined and found to be clean.

The main rotor head had been extensively damaged and the main rotor blades had been destroyed. All the damage was consistent with the rotor blades striking the ground whilst engine power was still being delivered to the main rotor transmission. As far as could be established there was no pre- impact damage to the hydraulic system or control actuators. All the drive shafts and clutch assemblies between the engine, main transmission and fenestron operated correctly.

The warning unit was tested and found to be satisfactory. The main rotor transmitter and the cabling between the engine and main rotor transmitter, as well as the

triple tachometer gauge were examined and found to be undamaged. The triple tachometer gauge was tested using its in-built test facility and found to be satisfactory. Signals representing the main rotor and engine speeds were injected into the triple tachometer gauge cabling at the main rotor transmission and engine bulkhead plugs, and the readings on the gauge were satisfactory.

Due to the damage to the helicopter it was not possible to conduct a full dynamic test of the AFS. Nevertheless the condition of the AFS was checked as far as possible by using the AFS Development Test Set. In addition, with the assistance of the helicopter manufacture, the investigation identified the conditions that would generate the AP A TRIM warning light and, as far as possible, established the serviceability of the components in this part of the system.

Recorded information

Secondary radar returns from G-IRWC were recorded by Stansted and Debden radars and indicated that prior to the accident the helicopter was maintaining a ground speed of approximately 120 kt at an altitude of approximately 1,000 ft and a track of 295º. Approximately four minutes prior to the accident the helicopter climbed to 1,600 ft at 969 ft/min and approximately three minutes later started to descend at 2,300 ft/min before the radar return was lost at approximately 500 ft. The radar returns did not show any other aircraft in the vicinity of G-IWRC in the period prior to the final descent.

Testing and examination

FADECs

Both FADECs were returned to the engine manufacturer where they were tested and the internal memory downloaded. The tests established that both FADECs were serviceable and that during the flight the Training and Manual modes were switched off as is normal.

The data from the download revealed that at 4,039 and 4,040 seconds (approximately 1 hour 7 minutes) after the power to the left and right FADECs was turned on, both engines went into One Engine Inoperative (OEI) mode for a period of 0.36 seconds. During this event the left and right engines N1 were, respectively, 93.71% and 91.26%, N2 were 105.23% and 98.13%, and the torques were 63.6 dNm and 65.74 dNm. The OEI event was recorded because the torque from each engine went above the normal limit of 59.52 dNm. The difference in the recorded values for each engine is believed to be due to the sampling frequency of the FADECs.

Engines

Both engines were tested by the engine manufacturer with the FADECs that were fitted to the helicopter during the accident flight. Both engines ran normally and their performance was considered to be within normal in-service limits.

Fuel

Following the accident there was a total of 284 kg of fuel on board the helicopter with 42 kg in each of the supply tanks. Fuel samples from all the helicopter's fuel tanks were analysed by QinetiQ and found to be of a satisfactory standard.

Warning unit

The warning unit was returned to the equipment manufacturer and the data contained in its internal memory was downloaded. There were 31 warnings recorded in the memory; all occurred during the last

fight. The oldest warning was generated by the autopilot when the main rotor rpm went above 112%. This warning would have illuminated the AP A TRIM red warning light and caused the ROTOR RPM red warning light to fash. A permanent audio tone, which could not be cancelled and which would remain on while the rotor speed was high, would also have been generated. Successive warnings indicated that the main rotor rpm fuctuated between about 106% and 112%. During this period the AP A TRIM remained illuminated and the ROTOR RPM caption would have fashed whenever the rpm exceeded 106%. In this speed range the permanent tone would have changed to a gong which, unless cancelled, would sound every three seconds. The AP A TRIM warning light then extinguished and the ROTOR RPM fashing warning and gong would have been generated each time the rotor rpm exceeded 106%.

During the last nine warnings the AP A TRIM red warning light illuminated then extinguished before the LOw FUEL warning illuminated. The ROTOR RPM red warning light then illuminated as the rotor rpm went below 95%, which would have also generated a pulsed tone. The fnal warning was the AP A TRIM, which occurred when the rotor rpm was below 95%.

The signal for the AP A TRIM warning is generated by the autopilot and supplied to the Warning Unit through switch 50CA. A test was carried out by removing switch 50CA from its mounting rail and tapping it with a screw driver. The test revealed that vibration, or a heavy shock, will cause the contacts in the switch to briefy move and generate the AP A TRIM warning. However, because the signal is not generated by the autopilot, the light goes out as soon as the contacts move back to their original position.

VEMD

Interrogation of the VEMD revealed that the accident fight lasted for 1 hour 6 minutes during which the mast moment limitation was exceeded. It was assessed that the mast moment limitation occurred when the helicopter rolled over and the rotor blades struck the ground.

Attitude and Heading Reference System (AHRS)

As a result of this accident the manufacturer undertook a ground test to establish if a disturbance to the airframe, suffcient to cause the thud reported by the pilot, could have caused the autotrim to disengage. The hydraulic system on the helicopter was pressurised, air speed set to 80 kt and the HDG and ALT modes engaged in the autopilot. The AHRS units were tapped, with the result that the autotrim disengaged and the GYRO warning was briefy displayed on the CAD. This test indicated that a sudden disturbance could cause the autotrim to disengage.

EC135 simulator assessment

An assessment of possible malfunctions that could have caused the initial upset was conducted, with the pilot who had been in command during the accident fight, in an EC135 full motion simulator. Reducing the power from one of the engines to ground idle at 120 kt produced engine indications and a yawing motion that where similar to the symptoms that the pilot recalled experiencing at the start of the incident. A similar yawing and 'wobbly' motion was also reproduced by disconnecting the SAS. This was achieved by pressing the SAS DCPL switch on the second pilot's cyclic stick grip. Disconnecting the SAS in this manner caused the AP A TRIM red warning light to illuminate and an aural warning 'gong' to sound. A red fashing 'P' 'Y' and 'R' was also displayed on the PFD. All the warnings self-cancelled after ten seconds when the 'P', 'Y'

and 'R' on the PD changed to amber OFF. In addition the Master Caution illuminated and the following warnings were displayed on the CAD: AUTOPILOT, DECOUPLE, P/R SAS, YAw SAS and P DAMPER.

Engine off landings

In order to perform a normal engine off landing in a helicopter, the pilot must first fare the helicopter at a specific height above the ground. The exact height, which must be carefully judged, depends on the helicopter's weight and the wind conditions on the day. If the pilot fares too high he looses the benefit of the fare effect and he will land heavily. If he fares too low, then the pilot risks either striking the tail, or landing hard and fast. This manoeuvre is not normally practised by pilots of twin engined helicopters. When it is practised, it is with the SAS engaged; the manoeuvre would be more difficult to fly with the SAS disengaged.

Previous event

In November 2007 an experienced helicopter pilot with over 14,000 hours on helicopters and over 2,000 hours on type, submitted a Mandatory Occurrence Report[3] following the uncommanded disengagement of the autopilot on another EC135. The pilot was flying 'hands-off' at about 125 kt, with the autopilot engaged, when he heard, and felt, a dull thud from above and behind him. At the same time the AP A TRIM warning light illuminated, the gong sounded and the CAD displayed 'GYRO' for approx five seconds. On checking the APMS he noted that the autopilot was OFF. The pilot said that he initially thought that the thump was the result of hitting a large bird, but also stated that it felt as if a hydraulic ram had moved very quickly. The SAS remained engaged and the pilot stated that following the initial disturbance the helicopter gently pitched up and started to climb. The autopilot was re-engaged in flight and has since operated satisfactorily. The company maintenance engineers were unable to establish why the autopilot suddenly disengaged.

Fast disconnect of Auto Flight System and regulations

As helicopters have developed, the control response and control sensitivity has increased. With the stabilisation systems disconnected, modern helicopters are generally considered more difficult to fly than their predecessors. Meanwhile, advances in electronics and autopilots have made flight control systems more effective. Consequently, in comparison with older helicopter designs, the difference in handling between the stabilised and unstabilised flight modes is greater with modern machines.

The EC135 was originally certified under JAR 27, which was superseded by EASA CS-27. Paragraph 672 of CS-27 addresses stability augmentation systems, and paragraph 1329, autopilots.

'Paragraph 672 states 'the design of the stability augmentation system or any other automatic or power-operated system must allow initial counteraction of failures without requiring exceptional skill or pilot strength by overriding the failure by movement of the flight controls in the normal sense and deactivating the failed system In the guidance material relating to paragraph 672 it states Consideration should be given to the consequences of inadvertent de-selection of the automatic stabilization system, especially if the de-activation control is mounted on a primary control grip.

Footnote

[3] MOR 200711114 dated 9 November 2007.

Paragraph 1329(a)(2) states that 'Each automatic pilot system must be designed so that the automatic pilot can:……..be readily and positively disengaged by each pilot to prevent it interfering with control of the aircraft.'

A SAS DCPL switch is mounted on top of each cyclic grip and, whilst it is protected from inadvertent operation by an annular guard, the switch sits about 1 mm proud of the guard (see Figure 1). Tests were undertaken, on the ground, to establish if either of the front seat occupants could have inadvertently operated this switch. In the first test the corner of the magazine which the passenger had been reading was knocked against the switch. The test proved that it is possible for the corner of a heavy magazine to operate the switch. The second test simulated the pilot turning to place a book in the right door stowage. This test proved that it is possible for an elbow to operate the switch. On both tests the pressure to operate the switch also caused the cyclic stick to move forwards.

Figure 1

Position of SAS DCPL Switch

Human factors

In an attempt to reconcile the pilot's report with the recorded data, a prominent human factors expert was consulted. In the view of the consultant, the pilot's report of a dull thud at the onset of the emergency was likely to be reliable, as this was the first stimulus to attract his attention and it preceded his appreciation of the subsequent changes in attitude, and other alarming stimuli. The pilot suspected he had a power failure, and his previous single engine experience may have predisposed him to enter an autorotation without delay.

The pilot would have been naturally concerned about rotor rpm, and did interrogate the triple tachometer gauge (see Figure 2). However, controlling the helicopter attitude and selecting a suitable landing site would have demanded most of his visual attention during the short time available and so it is likely that he only gave the gauge a brief glance.

The two N2 pointers are below the NR pointer in this photograph of the gauge at rest. Note the tail of the NR pointer.

Figure 2

The triple tachometer gauge

The triple tachometer gauge is a complex instrument and a brief examination might lead to errors in interpretation, such as confusing rotor rpm and engine N2, or mistaking the tail of the rotor rpm needle for an engine N2 pointer. The pilot appears to have gained a vivid impression of an unusual set of indications, but not a detailed and accurate interpretation sufficient to inform him that the engines were performing normally.

The sudden onset of what appeared to be a major emergency was likely to increase the pilot's arousal levels and affect his cognitive performance. In such situations narrowing of attention is probably the most commonly reported effect with the auditory channel the most commonly affected sense. This would account for the pilot's failure to notice any audio warnings.

It is possible that the pilot may also have been somewhat predisposed to land quickly following the death, the previous day of a friend in a helicopter accident. The presence of his wife as a passenger can only have accentuated any such predisposition.

Flight testing

A flight test was undertaken with the manufacturer to establish what happens when the SAS DCPL switch and autopilot are disconnected whilst the helicopter is flying at 130 kt with the AP height hold and NAV modes engaged. The test revealed no marked departure from the established flight path or noises, such as a dull thud. Moreover, at this cruise speed the cyclic stick is far enough forward to make it unlikely that the pilots elbow would have inadvertently operated the SAS DCPL switch.

Analysis

The technical investigation established that both engines functioned normally throughout the flight and the accident sequence most probably started when the autotrim disengaged whilst the pilot was flying hands-off with the autopilot engaged. It is suspected that the dull thud which appeared to emanate from the engine area, and the possible misreading of the N2 pointers on the triple tachometer gauge, led the pilot to believe that he had lost engine power. Based on this information the pilot entered an autorotation and successfully positioned the helicopter for what he believed was a power-off landing. However, he misjudged the flare and the tail struck the ground first resulting in the failure of the tail pylon and fenestron drive shaft. As the helicopter skidded across the field, the left skid dug into the soft soil, which caused the helicopter to roll onto its right side.

Possible reasons for the autotrim function to disengage in flight include the inadvertent operation of the SAS DCPL switch, power failure to the SAS computer or the autopilot detecting a sensor failure, transient fault or disagreement.

Whilst it was possible for the pilot's elbow to operate the SAS DCPL switch inadvertently on the ground, in flight the position of the cyclic control, when the helicopter is flown at 130 kt, means that it is unlikely that he could have done so whilst returning the flight guide to its stowage. The passenger was a frequent flyer on the helicopter and the pilot believes that it is also unlikely that she would have inadvertently knocked the SAS DCPL switch with her magazine.

The symptoms described by the pilot and the warnings recorded in the warning unit are very similar to those associated with the occurrence reported by an experienced commercial pilot in November 2007. On both occasions the pilot's described a dull thud from the engine area and on the first occasion the pilot reported

that the autopilot disconnected and a GYRO warning displayed on the CAD. As part of this investigation the manufacturer undertook a ground test of the AHRS units which indicated that a disturbance could result in the auto trim disengaging and the GYRO warning illuminating briefly. The manufacturer has unsuccessfully attempted to reproduce the thud during test flights and has stated that they are unaware of any other cases where this has occurred.

The dull thud could have been caused by an external influence such as a bird strike, turbulence, wake vortex or the helicopter manoeuvring; but none of these factors applied to either of the reported occurrences. It is therefore most likely that the thud was a consequence of a slight change in the pitch of the rotor blades as a result of a disturbance in either the hydraulic system or the flying controls. Unfortunately, the extensive damage to the helicopter meant that it was not possible to test the hydraulic system, or to test the AFS dynamically.

The manufacturer has stated that they are unaware of any previous occurrences of the SAS disengaging in flight and, given the design of the hydraulic system, do not believe that it would have caused the thud. Whilst the actuators will move to their neutral positions following the disengagement of the SAS, in the given flight conditions this movement is likely to be small and have a negligible effect on the helicopter. It would, perhaps, only become significant if the SAS disconnected in turbulent conditions.

The autopilot is designed to monitor and disengage the autotrim function if it detects a discrepancy, failure or transient fault in the AFS. It would therefore seem that on this occasion it was probably the autopilot which disengaged the autotrim function. However, this should not have caused the helicopter to start to pitch nose down. Nevertheless, the investigation could not establish if the disengagement of the auto trim occurred before or after the dull thud, and it is possible that movement of the rotor control system, sufficient to cause the dull thud, might have moved the cyclic stick slightly forward such that the helicopter adopted the nose-down attitude reported by the pilot.

From the information in the warning unit it was established that in the early part of the accident sequence the AP A TRIM warning light illuminated and a gong sounded every three seconds for 10 seconds. The Master Caution light would also have illuminated and messages informing the pilot of the loss of the AFS systems would have be displayed on the CAD and PD. However, the pilot believed that he had an engine problem and therefore entered an autorotation, which would have required him to pitch the helicopter nose up initially to reduce speed. This would have caused the rotor rpm to increase, and the engine power to decrease. The engine N2 would have remained at 100%. From the warning unit it is know that the rotor rpm exceeded 112%, which would have caused the ROTOR RPM warning light to flash and a constant tone to be generated in the pilot's headset. It is possible that in glancing down at the triple tachometer gauge the pilot mistook the tail of the rotor NR pointer as being one of the engine N2 pointers, thereby reinforcing his belief that he had an engine problem (see Figure 3). However the engine and torque indications on the upper VEMD screen would have shown that both engines were still operating normally.

The AP A TRIM warning light and gong would self-cancel ten seconds after they had been activated and the flashing red messages on the PD would change to amber OFF messages. The descent took approximately 42 seconds, during which the pilot's workload would have been very high. In addition to flying the helicopter,

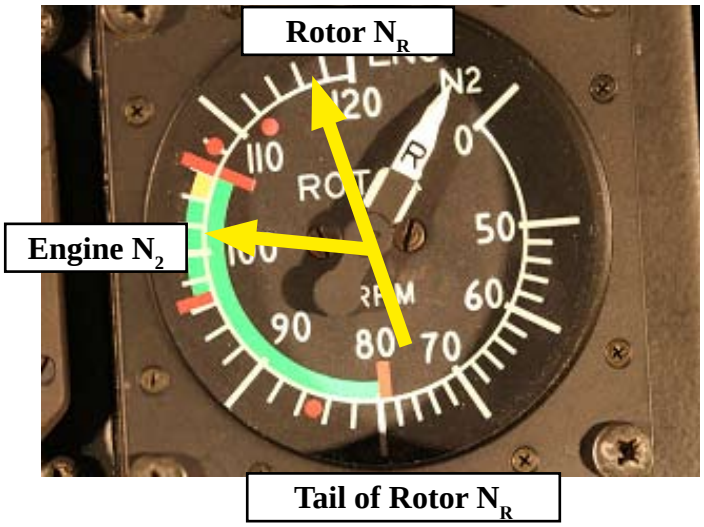

Figure 3

The Triple tachometer gauge with the positions of the pointers, as determined by the investigation, superimposed in yellow. The N2 pointers are not visible as, in this photo, they are hidden by the NR pointer

he made two radio calls and positioned the helicopter for a feld landing. During this period the rotor rpm fuctuated between 95% and 112%. Each time the rpm exceeded 106% the ROTOR RPM warning light would have illuminated and a gong would have sounded every three seconds.

After the tail contacted the ground, it is likely that the helicopter would have pitched forward and landed heavily on the front of the skids, possibly causing the contacts in switch CA50 to briefy move and generate a further AP A TRIM warning. Since the autopilot did not generate this warning it would cancel as soon as the contacts opened again. At this stage the rotor rpm was still in the 95% to 106% band and the engines and FADECs were operating normally. With the fenestron drive shaft broken, any torque reaction would have caused the helicopter to yaw to the left. There were no ground marks to indicate this happened, so the collective lever was probably in a lowered position after the tail struck the ground. Ground marks indicated that the helicopter landed in a level (roll) attitude and as it slid across the feld the left skid dug into the soft ground causing the helicopter to yaw to the left and roll onto its right side. As the main rotor blades struck the ground the torque from both engines briefy increased to 63.6 and 65.74 dNm in an attempt to maintain the rotor NR. As the main rotor blades disintegrated, the rotor NR would have started to increase and the FADECs would have reduced the engine power to prevent the turbines from over-speeding.

Whilst the pilot appears to have missed the warnings, his priority would have been to position the helicopter for the feld landing. The disengagement of the autotrim would have generated 3 to 4 gongs during the frst 10 seconds when his work load would have been very high. Subsequent gongs would only have been generated whilst the rotor rpm was above 106%, and it is not known how long the rotor rpm exceeded this threshold.

Safety Recommendation

Whilst it is unlikely that the inadvertent operation of the SAS DCPL switch caused this accident, it is felt that the guard provides insuffcient protection and might not comply with the guidance given in EASA CS-27. The use of a guard that more effectively protects the switch might help to prevent inadvertent operation. Equally a change in philosophy, such that the initial operation of the AFS fast disconnect switch leaves a basic level of SAS still engaged, might help to prevent inadvertent operation.

Safety Recommendation 2008-038

It is recommended that Eurocopter review the design of the Stability Augmentation System (SAS) DCPL switch on the EC135 helicopter to reduce the likelihood of inadvertent de-activation of the SAS.

Conclusion

From the available evidence it would appear that the accident sequence started with the disengagement of the autotrim function when the pilot was flying 'hands-off' at a fast cruise speed. The pilot misread his triple tachometer gauge and, aware of the thud from the engine area, believed that he had suffered a total engine failure and therefore entered an autorotation. He successfully positioned the helicopter for a power-off landing in a suitable field, but misjudged the landing flare and the tail pylon broke off when it struck the ground first. As the helicopter travelled over the field, a skid dug into the soft earth causing the helicopter to roll onto its right side.

The investigation could not identify the reason why the autotrim disengaged or the cause of the dull thud which the pilot heard at the start of the accident sequence.

ACCIDENT

Aircraft Type and Registration:	Robinson R44 Raven II, G-LAVH
No & Type of Engines:	1 Lycoming IO-540-AE1A5 piston engine
Year of Manufacture:	2008
Date & Time (UTC):	15 May 2008 at 1350 hrs
Location:	Private landing site at Bury, Lancashire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	helicopter destroyed by fire
Commander's Licence:	Private Pilot's Licence
Commander's Age:	50 years
Commander's Flying Experience:	100 hours (of which 16 were on type) Last 90 days - 32 hours Last 28 days - 10 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The pilot had been carrying out solo hovering exercises in a newly acquired helicopter. After landing to change the frequency on the helicopter's radio, he lifted the helicopter back into the hover but realised that the cyclic control was now 'very heavy'. The helicopter began to oscillate from left to right so he descended back onto the ground from a height of 6 to 8 ft, possibly touching down on the front of its skids in a nose down attitude. During this manoeuvre it is possible that the rotors made contact with the ground and the resultant vibration caused the windscreen to detach. The helicopter was subsequently destroyed by fire but the pilot escaped with minor bruising.

History of the flight

The pilot was carrying out solo hovering and hover taxiing exercises in a newly acquired helicopter at a private landing site. The weather conditions were described as good, with a light wind of about 5 kt, good visibility and broken cloud at 4,000 ft. After ten to fifteen minutes of hovering exercises, the pilot landed the helicopter to select a different radio frequency before departing on a flight to Liverpool. When he took off again he realised that the cyclic control was 'very heavy', but could not recall if the collective was similarly affected. He managed to maintain directional control but the helicopter began to oscillate from left to right and move rearwards as he attempted to control the helicopter through the cyclic. From a height of 6 to 8 ft the pilot lowered the collective, the helicopter

descended, in a nose-down attitude touching down on the front of its skids and possibly allowing the rotors to make contact with the ground. The subsequent vibration caused and the windscreen to detach. The pilot cannot recollect the events that followed until he became aware that he was of standing in the feld looking back at the helicopter, which by now had caught fre.

Following the accident, fames were seen emanating from the area of the main rotor mast and around the auxiliary fuel tank. The pilot, who escaped with 'minor' bruising but could not remember how he exited the aircraft, vacated the area. Onlookers reported the accident to the three emergency services, who all attended the scene. The fre was extinguished but the helicopter, apart from the tail boom and tail rotor, was destroyed.

The pilot considered that the accident was the result of three possible causes; a mechanical failure; inadvertent selection of the hydraulics switch, located on the cyclic control, to OFF or the cyclic friction remaining on having been applied after he had landed to change the radio frequency. The previous week, during preparation for and completion of his type rating skill test, the pilot had received training in fying with the main rotor fight controls' hydraulically boosted servo assistance selected 'OFF'. However, he was unable to compare the cyclic forces he had experienced then, in forward fight for a run-on landing, with those encountered during the accident.

ACCIDENT

Aircraft Type and Registration:	EV-97 Teameurostar UK Eurostar, G-CDVP
No & Type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2006
Date & Time (UTC):	4 June 2008 at 1900 hrs
Location:	Stonefeld Park, near Chilbolton Flying Club
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Serious) Passengers - N/A
Nature of Damage:	Aircraft destroyed, minor damage to overhead power cables
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	53 years
Commander's Flying Experience:	105 hours (of which 94 were on type) Last 90 days - 21 hours Last 28 days - 10 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During takeoff, the aircraft drifted left and the left wing hit power lines running parallel with the runway. The aircraft rolled left over the power lines and crashed into an adjacent feld.

History of the flight

The pilot intended to fy back from Chilbolton to his base at wycombe having fown in earlier in the day. He had not operated from Chilbolton before but received a telephone briefng from the airfeld owner and experienced no diffculties on arrival. when ready for departure, the pilot assessed the wind as being 180º/6-8 kt. He started and taxied to the Runway 24 threshold. On reaching the Runway 24 threshold area, the pilot could see no runway end or edge markings and lined up on a strip of short grass, to the left of an area of longer grass. In a frank report, the pilot commented that he may have lined up on the grass to the left of the area routinely used as a runway and thus been closer to the power lines than normal.

G-CDVP became airborne at 45 to 50 kt, approximately 150 m from the start of the runway and climbed away normally. As it climbed above trees running parallel to the runway, the right wing lifted and as the pilot corrected he heard a "twanging" sound. The left wing had struck a set of power lines which run parallel with Runway 24 at a height of approximately 50 ft. The impact rolled

G-CDVP in an anti-clockwise direction over the top of the power lines before it dropped, still with power applied, into the crop field adjacent to the power lines.

The ground impact caused considerable disruption to the fuselage and wing structure. The pilot, who was wearing a full harness, received serious injuries to the left side of his head possibly from contacting the canopy. He was knocked unconscious and suffered loss of memory.

Runway

Runway 24 has a declared length of 411 m and width of 18 m and is grass-covered. It is situated in a large field of crop or grass; at the time of the accident the runway grass was due to be cut and may have been longer than the surrounding grass. This resulted in the runway edges being ill-defined. Local pilots say the area between the left edge of the "runway" and the hedge is extremely rough with large rocks scattered in it.

Power lines are located along the airfield boundary hedge approximately 26 m to the left of the Runway 24 edge and run parallel with the runway. The lines consist of triple 33 KvA power lines horizontally spaced on top of approximately 50 ft high wooden poles. As is common on power lines near airfields, orange "ball" markers are suspended from each of the power lines.

Flight guides

Chilbolton airfield operates on a prior permission required (PPR) basis. The pilot of G-CDVP had gained PPR and was aware of the power lines running parallel with Runway 24. The power lines are shown on airfield maps available in the major flight guides and on the Chilbolton flying club website.

CAA Safety Sense leaflet 12 entitled '*Strip Sense*', contains the following information:

> *'It is important to realise that the CAA criteria for the licensing of an aerodrome e.g. clear approaches without power or other cables, no trees or obstructions close to the runway and so on, are unlikely to have been applied to the strip.'*

Analysis

Chilbolton is an unlicensed and unmarked grass strip. In the absence of other guidance, the pilot has to decide where to operate within the strip. In this accident, the pilot believed the shorter grass was the correct area from which to depart from and this placed the aircraft closer to the power lines than usual. By positioning the aircraft closer to the known obstacles the pilot had less time to react to the weather-cock effects of the crosswind and the tendency for the aircraft to swing due to the effects of the propeller wash.

Subsequent action

At the time of this event the runway was unmarked. Following this accident, a set of flat white runway corner markers has been installed.

ACCIDENT

Aircraft Type and Registration:	Ikarus C42 FB UK, G-CLIF
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2005
Date & Time (UTC):	6 June 2008 at 1500 hrs
Location:	Near Newton Pevril Airfeld, Dorset
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to right landing gear and fuselage, broken propeller
Commander's Licence:	Private Pilot's Licence
Commander's Age:	54 years
Commander's Flying Experience:	1,408 hours (of which 300 were on type) Last 90 days - 38 hours Last 28 days - 35 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During a go-around from an attempted downwind landing, the aircraft struck a tree whilst turning to avoid cables crossing the far end of the runway, and force-landed in the field beyond.

History of the flight

The pilot reports that he joined on base leg to land on the easterly runway, in the belief that the wind was across the runway. However, whilst executing the landing it became evident to him that there was actually a tailwind. After touching down briefly about one third of the way along the runway, he realised that there was insufficient distance in which to stop. He initiated a go-around but then found that, with the combination of the tailwind and full flap, he could not clear a row of cables at the far end of the runway. He managed to avoid the cables by turning to the right but, in doing so, his propeller struck the top of a row of trees bounding the southern edge of the field, at a height of between 20 ft and 30 ft. Despite suffering damage to the propeller, the aircraft continued to climb, albeit marginally, and he was able to carry out an elective landing in the field beyond the tree line.

In assessing the cause of the accident the pilot commented that, although the presence of the cables

made approaches to Newton Pevril inherently difficult, he had landed there many times previously and had never before encountered any problems. He very honestly attributed his accident to a too relaxed attitude on his part, and a dropping of his guard, as a result of which he "misread the wind potential and wrongly landed downwind".

ACCIDENT

Aircraft Type and Registration:	MW6-S Fatboy Flyer, G-MZNE
No & Type of Engines:	1 Rotax 582-48 piston engine
Year of Manufacture:	1999
Date & Time (UTC):	5 May 2007 at 1700 hrs
Location:	0.5 nm north-west of Abbots Bromley, Staffordshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Not specified by pilot
Commander's Licence:	Private Pilot's Licence
Commander's Age:	57 years
Commander's Flying Experience:	Not known
Information Source:	Limited information submitted by the pilot

Synopsis

The aircraft inverted following a precautionary landing in a soft field.

History of the flight

The MW6-S Fatboy Flyer is a three-axis microlight aircraft with a maximum takeoff weight of 390 kg. The aircraft had departed from the farm strip at Yeatsall Farm, Abbots Bromley, for a local flight. Shortly after takeoff the pilot noticed that he lacked elevator control so he decided to make a precautionary landing in a field. During the landing, on soft ground, the aircraft inverted. The pilot sustained a minor injury to his ankle.

Pilot's assessment of the cause

The pilot later determined that the elevator trim was set to a landing setting and he had missed this during his pre-takeoff checks.

ACCIDENT

Aircraft Type and Registration:	Pegasus Quik GT 450, G-CEUZ
No & Type of Engines:	1 Rotax 912UL piston engine
Year of Manufacture:	2007
Date & Time (UTC):	6 May 2008 at 1430 hrs
Location:	Charterhall Airfeld, Berwickshire
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - None
Nature of Damage:	Damage to wing and trike unit
Commander's Licence:	Student pilot
Commander's Age:	57 years
Commander's Flying Experience:	35 hours (of which 18 were on type) Last 90 days - 6 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During a landing at Charterhall, the right wing of the aircraft lifted. The student pilot compensated, to level the wings, but then noticed the airspeed had reduced. He attempted a go-around, during which the right wing struck the ground.

History of the flight

The student pilot had conducted a solo qualifying cross-country fight from Eshott to Charterhall. The weather was good, reported as CAVOK with light easterly winds. The fight to Charterhall was without incident. The pilot joined the circuit and assessed the winds from the windsock, which he judged as between 6 and 10 kt, varying between 90° and 110°. During the approach to Runway 07, the pilot experienced some turbulence at 400 ft agl. Just prior to the fare, the right wing lifted, the pilot corrected to level the wings but then realised that the airspeed had dropped. The pilot applied power and pushed the fying bar to go around. however, the right wing struck the ground, the aircraft then pitched nose-down causing the trike to hit the ground, before coming to rest.

ACCIDENT

Aircraft Type and Registration:	RAF 2000 GTX-SE gyroplane, G-CCUH
No & Type of Engines:	1 Subaru EJ22 piston engine
Year of Manufacture:	2004
Date & Time (UTC):	22 July 2008 at 1310 hrs
Location:	Wellcross Farm Airstrip, West Sussex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Substantial
Commander's Licence:	Private Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	129 hours (all of which were on type) Last 90 days - 16 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

After landing, the aircraft ran off the side of the runway into a standing crop and turned over onto its side. The pilot, who was not injured, turned off the ignition and climbed clear of the aircraft.

History of the flight

The pilot was returning to Wellcross Farm Strip, where the aircraft was based, after a flight from Popham. Flying conditions were good with clear visibility and light winds. Following a normal approach from the south to Runway 04, the aircraft landed but after touchdown continued rolling and veered over to the left. It then struck a concrete post at the edge of the runway, crossed into ploughed ground at the side and entered a standing crop of oats. As it went through the crop it swerved to the right and tipped over onto its right side. The propeller struck the crop and the ground and decelerated rapidly, this caused the engine to stall. The pilot was not injured and was able to turn off the ignition and release himself from his harness before climbing out of the aircraft.

The pilot believed that the accident was probably caused by him adding power just before landing, and then not reducing it completely to idle after landing. He said that he experienced some confusion when the aircraft did not slow down immediately, as was normal, and therefore may have made some inappropriate inputs, such as releasing the back pressure on the stick and thereby allowing the nosewheel to run on the ground. The nosewheel is linked to the rudder and, unless it was

straight, this would have caused a deviation from the runway direction, which in this case he was unable to correct. He added that the Mandatory Permit Directive (MPD2006-013) requirement to fly the aircraft without the doors leads to a higher general exposure to noise and a greater perceived reduction in noise when power is reduced. He felt that this may have contributed to a lack of appreciation of the engine power setting during the landing roll.

ACCIDENT

Aircraft Type and Registration:	Rotorsport UK MT-03, G-CEUI
No & Type of Engines:	1 Rotax 912 ULS piston engine
Year of Manufacture:	2007
Date & Time (UTC):	9 May 2008 at 1750 hrs
Location:	Kirkbride Airfeld, Cumbria
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to airframe, rotors and tail
Commander's Licence:	Student
Commander's Age:	42 years
Commander's Flying Experience:	30 hours (all of which were on type) Last 90 days - 27 hours Last 28 days - 20 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

On the student's first solo flight, the aircraft's nose rose sufficiently high during takeoff for the aircraft to lose airspeed and lift and it subsequently impacted the ground from a height of about 10 ft.

History of the flight

The student had completed three successful training flights with his instructor on the day of the accident after which the instructor considered the student ready for his first solo flight. The instructor vacated the aircraft and the student pre-rotated the rotors, pulled the control stick back, released the brake and gradually increased power for takeoff. He had been advised by his instructor that the forces on the control stick would seem different with only one person on board and he reported that when he pulled back on the stick it felt heavier than normal.

Shortly after it began its takeoff roll, the nose of the aircraft rose began to rise and, despite pushing the control stick forward, the student reported that he was unable to prevent the rise continuing. This resulted in the aircraft losing airspeed and then lift, dropping to the ground from a height of about 10 ft. The pilot was uninjured although the aircraft sustained damage in the impact.

The instructor considered that the cause of the accident was a loss of lift caused by the aircraft "falling behind the drag curve" due to insufficient application of nose-down input on the flying controls.

ACCIDENT

Aircraft Type and Registration:	Savannah VG Jabiru (1) microlight, G-CEGK
No & Type of Engines:	1 Jabiru Aircraft Pty 2200 piston engine
Year of Manufacture:	2006
Date & Time (UTC):	3 May 2008 at 1430 hrs
Location:	Church Inn Field, approximately 10 miles NW of Chichester, West Sussex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to landing gear, wingtips and propeller
Commander's Licence:	Private Pilot's Licence
Commander's Age:	44 years
Commander's Flying Experience:	482 hours (of which 70 were on type) Last 90 days - 26 hours Last 28 days - 12 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The aircraft encountered a severe downdraught at a height of 30 ft on approach to land at a private strip located near a ridge. The pilot was unable to arrest the sink rate and the aircraft struck the ground heavily. The pilot and passenger, who were wearing full harnesses, were uninjured.

History of the flight

The aircraft had already completed a flight from Popham airfield to Church Inn Field, a private strip without marked runways. After a successful landing in a south-westerly direction, the pilot and passenger visited the passenger's home for some refreshments.

When they returned to the aircraft, the wind was observed to be light, but now favourable for a takeoff in the opposite direction, to the north-east. After takeoff, at a height of approximately 400 ft, the pilot decided to make an approach to the strip to land in a north-easterly direction. When approximately 100 metres from the threshold and at a height of about 30 ft, the aircraft encountered a severe downdraught. Despite the application of full power, it continued to sink and struck the ground heavily. The nose leg collapsed, causing the aircraft to slew to the left and the propeller and both wingtips contacted the ground.

The occupants, who were wearing full harnesses, were uninjured and vacated the aircraft via the doors.

Wind and topography

The Met Office provided an aftercast for the weather for the time and location of the accident. The surface wind direction and speed were estimated to be 120° to 130° at 10 to 15 kt.

There are ridges to the east and west of the strip, which lies close to the foot of the western ridge (Figure 1). The wind direction at the time would have placed the strip downwind of the ridge and downdraughts and turbulence would be expected at low level (Figure 2). The ridge to the east may also have influenced the local airflow. The combined effect of the two ridges is difficult to assess, although a scenario in which marked changes in vertical and horizontal wind strength for the approach could readily be envisaged.

The pilot attributed the accident to the downdraught created by the adjacent hills. This is a well known phenomenon and pilots are advised against flying at low level downwind of high ground, particularly in strong wind conditions, or in aircraft with low wing loadings that are susceptible to gusts.

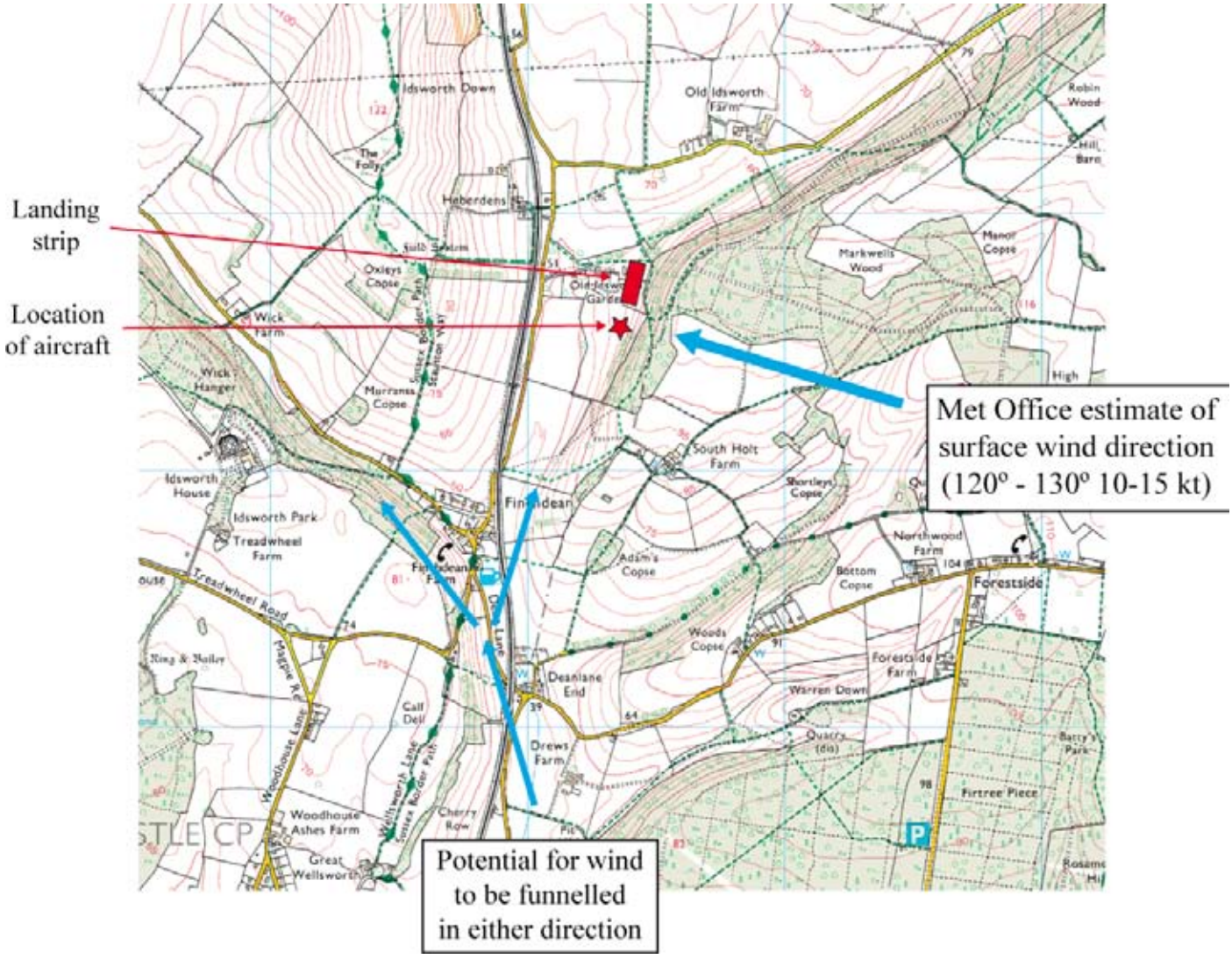

Figure 1

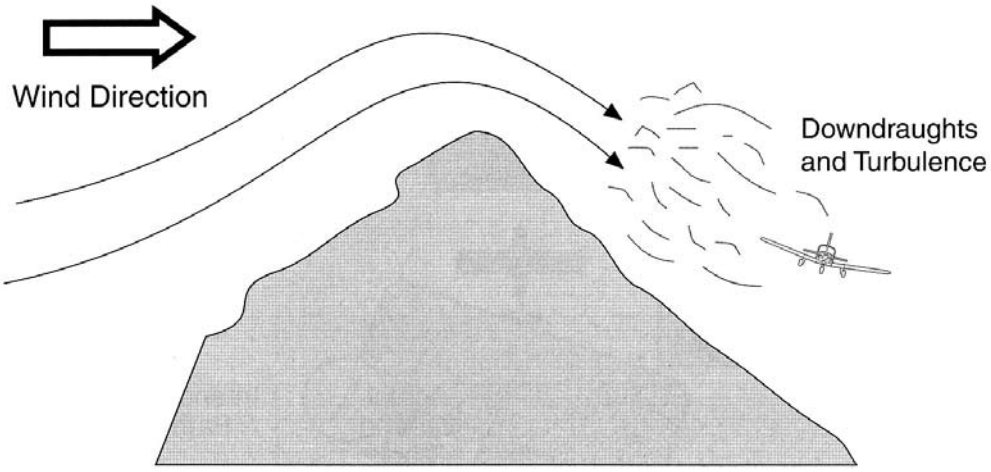

Figure 2

Dangers of flying at low level downwind of high ground
(Figure copyright AFE and Jeremy M Pratt)

ACCIDENT

Aircraft Type and Registration:	Streak Shadow, G-BZWJ
No & Type of Engines:	1 Rotax 582 piston engine
Year of Manufacture:	2002
Date & Time (UTC):	16 April 2008 at 1330 hrs
Location:	Clacton Aerfield, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Nose leg failure
Commander's Licence:	Private Pilot's Licence
Commander's Age:	54 years
Commander's Flying Experience:	850 hours (of which 390 were on type) Last 90 days - 12 hours Last 28 days - 5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

After landing on the grass runway at Clacton aerfield the nose leg collapsed. The nose leg shaft had fractured due to fatigue cracking.

History of the flight

Following an uneventful flight from Headcorn to Clacton, the pilot carried out a normal landing on the grass runway at Clacton. However, as the pilot lowered the nose onto runway the nose leg collapsed and the nosewheel detached. There was no other damage to the aircraft and the pilot was able to exit the aircraft normally.

The shaft of the nose leg had fractured at a point just above the support bearing for the castoring nosewheel. An engineer at the site examined the fracture surface and reported to the pilot that it exhibited signs of a fatigue crack prior to the final overload. Unfortunately the nose leg was scrapped before it could be further examined.

BULLETIN CORRECTION

AAIB File:	**EW/C2007/04/05**
Aircraft Type and Registration:	Airbus A319-131, G-DBCI
Date & Time (UTC):	18 April 2007 at 0944 hrs
Location:	Amsterdam Schiphol Airport, The Netherlands
Information Source:	AAIB Field Investigation

AAIB Bulletin No 8/2008, page 6 refers

The report published in AAIB Bulletin 8/2008 identified an element of training given to the co-pilot which appeared to conflict with the normal duties expected of a handling pilot in the right seat during a rejected takeoff. A Safety Recommendation (2008-027) was made in the report which recommended that the operator:

> *'review their flight crew simulator training to ensure that it reflects their current Standard Operating Procedures (SOPs).'*

Following completion of the consultation period (Regulation 12.1) for the final report and just before publication, the operator advised the AAIB that, under '*Flight Crew Incapacitation*', their Operations Manual contained an SOP which required a right seat handling pilot to carry out those duties usually assigned to the commander of an aircraft under some circumstances. As a consequence, the operator stated that there was no conflict between their SOPs and the training provided to their pilots.

Given this new information, the AAIB has accepted these observations and has withdrawn Safety Recommendation 2008-027. In order to document the training given to the crew involved and to clarify their roles in relation to the operator's SOPs, the Chief Inspector has ordered that a revised final report be published in a subsequent AAIB Bulletin.

AIRCRAFT ACCIDENT REPORT No: 6/2008

This report was published on 21 August 2008 and is available on the AAIB Website www.aaib.gov.uk

REPORT ON THE SERIOUS INCIDENT TO HAWKER SIDDELEY HS 748 SERIES 2A, G-BVOV GUERNSEY AIRPORT, CHANNEL ISLANDS 8 MARCH 2006

Registered Owner and Operator:	Emerald Airways Limited
Aircraft Type and Model:	Hawker Siddeley HS 748 Series 2A
Nationality:	United Kingdom
Registration:	G-BVOV
Place of Incident:	Guernsey Airport, Channel Islands Latitude: 49°26'N Longitude: 002°36'W
Date and Time:	8 March 2006 at 1157 hrs All times in this report are UTC

Synopsis

This serious incident was notified to the Air Accidents Investigation Branch (AAIB) by ATC at Guernsey Airport shortly after the occurrence. Inspectors from the AAIB travelled to Guernsey and commenced the investigation later that day.

The following Inspectors participated in the investigation:

Mr R D G Carter	Investigator-in-charge
Mr P Taylor	Operations
Mr R J McMillan	Engineering
Mr P Wivell	Flight Recorders

The aircraft was landing at Guernsey at the end of a two-sector cargo service from Coventry and Jersey. The Category I ILS approach on Runway 27 at Guernsey was flown in weather conditions that were poor but acceptable for making the approach and there was ample fuel on board for a diversion. The aircraft was seen to touch down between 400 and 550 metres from the 'stop' end of the runway and overran by some 145 metres onto the grass beyond the paved surface. There were no injuries.

Investigation by the AAIB revealed no aircraft or runway deficiencies to account for the overrun. During the final approach and landing there were substantial divergences from the company Operations Manual.

This operator had previously been the subject of close monitoring by the CAA over a sustained period and its Air Operator's Certificate (AOC) was later suspended.

The investigation identified the following causal factors:

(i) The flight crew did not comply with the Standard Operating Procedures for a Category I ILS.

(ii) The commander's decision to land or go around was delayed significantly beyond the intersection of the Decision Altitude and the ILS glideslope.

(iii) After landing, the crew did not immediately apply maximum braking or withdraw the flight fine pitch stops, as advised in the Operations Manual.

(iv) The operator's training staff lacked knowledge of the Standard Operating Procedures.

The investigation identified the following contributory factor:

(i) Close monitoring by the CAA had not revealed the depth of the lack of knowledge of Standard Operating Procedures within the operator's flight operations department until after this incident.

One Safety Recommendation is made to the CAA.

Findings

1. The flight crew were properly licensed and qualified to conduct the flight.

2. The flight crew were suitably rested and held valid medical certificates.

3. The aircraft was calculated to be 2,945 kg below the maximum authorized landing weight for Runway 27 and was loaded correctly.

4. The Landing Distance Required of 1,052 metres was within the Landing Distance Available of 1,453 metres.

5. The surface wind and visibility conditions were suitable for the aircraft to make an approach to land.

6. The commander, a Type Rating Examiner and Instrument Rating Examiner on the HS 748, did not brief the Standard Operating Procedure 'challenge and response' crew calls for a Category I ILS during his approach brief to the co-pilot.

7. The flight crew did not comply with the Standard Operating Procedures for a Category I ILS approach.

8. The co-pilot did not challenge the use of non-standard operating procedures.

9. The decision to land or go around was delayed significantly beyond the intersection of the Decision Altitude and the ILS glideslope.

10. The aircraft's rate of descent was arrested, or it may have ballooned, while manoeuvring to land.

11. The aircraft landed significantly beyond the touchdown zone.

12. Friction testing of the runway showed that the runway surface condition was not a factor in the aircraft over-running the runway.

13. Contrary to the Standard Operating Procedures, the flight fine pitch stops were not withdrawn after landing, thereby preventing the propeller blades from moving

to the ground fne pitch stops, and reducing the braking effect of the propellers.

14. The commander was not aware that the fight fne pitch stops had not been withdrawn.

15. The aircraft's wheel braking and propeller pitch control systems were functioning correctly at the time of the incident.

16. The aircraft required at least 400 metres of runway within which to stop with maximum braking and fight fne pitch selected on both propellers.

17. Although the touchdown on Runway 27 was made with 400 to 550 metres of runway remaining, the aircraft did not stop and overran the runway by 145 metres onto wet grass.

18. The commander did not immediately appreciate how far down the runway he had landed and delayed applying maximum braking until he saw the end of the runway.

19. The commander cycled the brakes when he realised that the aircraft was not decelerating as fast as he expected it to.

20. The No 4 tyre probably aquaplaned for a short distance on the concrete surface at the Runway 09 threshold.

21. The operator had a history of non-conformities being raised during CAA audits and had been closely monitored for at least two years. Concerns included the operator's management structure and competencies, and its ability to maintain standards of safety.

22. A CAA audit of the operator's fight crew training, across all their feets, revealed that the Type Rating Examiners lacked knowledge of the operator's Standard Operating Procedures.

Safety Recommendation

Safety Recommendation 2008-026

It is recommended that the Civil Aviation Authority implement a more robust process of graduated measures for addressing identifed safety-related shortcomings in an AOC holder's operations, within an appropriate timescale, to ensure that the AOC Holder meets and maintains the required standard.

FORMAL AIRCRAFT ACCIDENT REPORTS ISSUED BY THE AIR ACCIDENTS INVESTIGATION BRANCH

2007

4/2007 Airbus A340-642, G-VATL
en-route from Hong Kong to London Heathrow
on 8 February 2005.

Published September 2007.

5/2007 Airbus A321-231, G-MEDG
during an approach to Khartoum Airport, Sudan
on 11 March 2005.

Published December 2007.

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

Published December 2007.

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

Published December 2007.

2008

1/2008 Bombardier CL600-2B16 Challenger 604, VP-BJM
8 nm west of Midhurst VOR, West Sussex
on 11 November 2005

Published January 2008.

2/2008 Airbus A319-131, G-EUOB
during the climb after departure from London Heathrow Airport
on 22 October 2005

Published January 2008.

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

Published February 2008.

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

Published February 2008.

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

Published April 2008.

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

Published August 2008.

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