ACCIDENT

Aircraft Type and Registration:	Sikorsky S-76C, G-WIWI
No & Type of Engines:	2 Turbomeca Arriel 2S2 turboshaft engines
Year of Manufacture:	2007 (Serial No. 760684)
Date & Time (UTC):	3 May 2012 at 2155 hrs
Location:	Peasmarsh, East Sussex
Type of Flight:	Public Transport
Persons on Board:	Crew - 2 Passengers - 2
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence (Helicopters)
Commander's Age:	55 years
Commander's Flying Experience:	10,250 hours (of which 4,800 were on type) Last 90 days - 11 hours Last 28 days - 4 hours
Information Source:	AAIB Field Investigation

Synopsis

The helicopter descended towards the tops of trees following a discontinued night approach to a private landing site in conditions of reduced visibility and low cloud, when no go-around procedure or routing was available or briefed. One Safety Recommendation is made.

History of the flight

Pre-flight preparation

The helicopter was chartered to fly passengers on a return flight from a private landing site at Peasmarsh, East Sussex, to Battersea Heliport. It was based at London Stansted and therefore had to position empty from its base to Peasmarsh before flying the passengers to Battersea. It was required to remain on the ground until the passengers returned and fly them back to Peasmarsh, before returning to its base. The passengers were regular clients of the operator, and both pilots had visited the site at Peasmarsh regularly[1], in S-76C helicopters, prior to the incident flight.

The commander arrived at Stansted around lunchtime, to carry out some office work prior to flying. The co-pilot (who was also a qualified commander) reported shortly before the proposed flying duty.

Footnote

[1] The co-pilot commented that he had not done so by night.

The commander had discussed the weather with his Chief Pilot and the operations team at Stansted the day before. Arrangements were made for Lydd Airport, which was only a short distance from the landing site at Peasmarsh and would otherwise have been closed in the evening, to be available as an alternate for the flight from Battersea to Peasmarsh.

The commander studied NOTAMs and meteorological forecasts and reports before the co-pilot's arrival, and then discussed these, and the planned fuel loads, with him; they agreed that the co-pilot would be pilot flying on the first two sectors, with the commander flying the third and fourth.

The first sector to Peasmarsh was uneventful. For the approach to Peasmarsh, the co-pilot briefed that the minimum safe altitude (MSA) was 1,250 ft amsl, and that he intended to descend to this altitude slightly north-west of the landing site to gain visual contact with the ground. If contact were gained, he would continue with a visual approach to the site and land.

The approach was executed as briefed, visual contact was gained, and the helicopter landed safely. The passengers boarded, and the helicopter flew to Battersea, landing at 1725 hrs, where the passengers disembarked.

The flight crew arranged for the helicopter to be refuelled to a total of 1,650 lbs on board, giving an endurance of between two and three hours depending upon power settings; the approximate hourly burn used for planning purposes was 700 lbs/hr. With refuelling complete, the flight crew relaxed and ate dinner in the heliport.

Whilst waiting, the commander monitored weather reports, including those from Lydd and Southend. The last report he obtained from Lydd was the 2050 hrs observation. The surface wind was from 290° at 3 kt, visibility was 7 km in slight drizzle with one or two octas of cloud at 900 ft aal and five to seven octas at 1,400 ft aal. There was a one degree split between temperature and dew point. Southend's 2050 hrs observation reported a northerly wind at 3 kt, 8 km visibility and overcast cloud 900 ft aal. Southend's ILS approach was serviceable.

The commander assessed from the available information that the chances of being able to make a successful approach at Peasmarsh were good, but he retained Lydd as an alternate destination.

The two pilots agreed that they would follow the same routine for the arrival at Peasmarsh as they had done earlier, but no formal briefing for the approach and landing was conducted, either on the ground or during the subsequent flight.

In due course, the passengers arrived for their return to Peasmarsh. The co-pilot carried out pre-flight actions in the flight deck whilst the commander accompanied the passengers to the helicopter and gave them a safety brief, during which he recalled reminding them that Lydd was available as an alternate should poor weather preclude an approach to Peasmarsh.

The helicopter was serviceable with no deferred defects, and its mass and balance were within the applicable limits.

The flight from Battersea towards Peasmarsh

For the third and fourth sectors of the evening, the commander was to be pilot flying, in the right seat of the helicopter; the co-pilot was pilot not flying, in the left.

The helicopter departed Battersea at 2135 hrs, and after leaving the Heathrow control zone, recorded data showed that it climbed to cruise at 2,100 ft amsl, beneath the London TMA[2], towards Biggin Hill. The flight crew recalled that this portion of the flight was conducted in IMC, although they had intermittent visual contact with the ground below the helicopter.

During the cruise the commander asked the co-pilot to obtain the latest METAR from Lydd, and to inform the air traffic control service there that the helicopter was en route to Peasmarsh. The co-pilot did not record the METAR but both pilots set the Lydd QNH on their altimeters. The co-pilot carried out the approach checklist and stated that the minimum sector altitude (MSA) for their approach was 1,250 ft. He then asked the commander for his intentions. The commander replied that he intended to descend to 500 ft with the aim of achieving visual contact with the landing site. The co-pilot did not enquire upon what datum the 500 ft value was to be based, but assumed that it would be above the highest obstacle near the site.

A waypoint had been stored in the flight management system (FMS), 3 nm west of the landing site, to aid their arrival as an approach from the west would give them the best visual perspective of both the lit helipad and three lights in the middle of the field in which the helipad was sited. The FMS route from that point was to Peasmarsh, and then, according to the commander's recollection, to Lydd. The waypoint was coded so that the helicopter would turn prior to the waypoint to establish on the outbound track from the waypoint, rather than overflying it.

Approaching the FMS position, the commander found that forward visibility was "limited" and that he was flying on instruments, The commander however, recalled that the co-pilot stated he had visual contact with the ground beneath. The commander recalled selecting 600 ft[3] on the altitude pre-select and began a descent using the flight director and autopilot to establish on the track towards Peasmarsh. He switched the landing lights on, but the glare from falling rain in front of the helicopter prompted him to switch them off again. The landing gear was selected down.

When interviewed by the AAIB, the co-pilot recalled informing the commander of his concerns that the helicopter was below the safety altitude without sufficient visual references. However, the co-pilot believed that, rather than pressing this point, his better option was to support the commander as effectively as he could, even though he believed that the commander's actions were flawed.

As the descent continued, the co-pilot provided a commentary to the commander on his visual references; he recalled being able to see the ground intermittently, but that the

Footnote

2 The lower limit of the TMA was 2,500 ft amsl in the vicinity of Biggin Hill.
3 The co-pilot recalled the value set was 800 ft.

forward visibility was "not good". The co-pilot then paid attention to his flight instruments and moving map display, giving a commentary of the distance to run to the landing site, height, and speed. The co-pilot became aware that the helicopter was now about 30 seconds flying time from the landing site, and at approximately 350 ft agl. He recalled during interview that the helicopter was still "in the bottom of the cloud" and considered calling for the commander to go around, or taking control of the helicopter to execute a go-around himself.

In due course, the commander saw the landing site but assessed that the helicopter was too high and too fast to continue the approach straight in; the co-pilot recalled concurring with this assessment but did not recall a discussion about it. The commander decided to fly over the site, noting that the driver, who was to take the passengers onwards, had parked his car near the helipad.

The commander elected to carry out an orbit to the right to make a further approach He chose a right-hand turn rather than left for a better view and because he was aware of pylons to the north-west of the field. He recalled a brief conversation with the co-pilot during which he stated his intention to complete the right-hand orbit to make a further approach, and believed that the co-pilot had understood and agreed with this course of action. The commander decoupled the flight director and took manual control of the helicopter. The helicopter overflew the landing site at approximately 300 ft agl and 35 KIAS.

The commander observed the lights of Rye and other habitation towards Lydd, over the descending terrain to the south-east of the landing site; it was apparent that the visibility was somewhat better and the cloudbase higher in that direction.

As he commenced the right-hand orbit, the commander had a clear view of the lights in the centre of the field, but stated that problems began at that point. He was flying both by reference to the instruments and outside cues, intending to maintain height, and decelerate. He had lost sight of the helipad lights in the corner of the field and as the turn continued found himself relying upon the lights in the centre of the field as his only visual reference[4].

As the turn progressed through a westerly heading, the helicopter descended for a short time at up to 500 fpm. The EGPWS recorded issuing 'CAUTION TERRAIN' and then 'WARNING TERRAIN' alerts, as the helicopter's height reduced towards 100 ft agl. Neither pilot recalled being aware of these alerts at the time.

A slight climb towards 400 ft amsl occurred. The commander recalled beginning a further descent, and seeing the lights in the middle of the field begin to flicker. The co-pilot, who was monitoring the instruments, saw that the helicopter was descending and began to speak to highlight this to the commander when he saw the radio altimeter "winding down towards zero extremely quickly". The co-pilot found himself momentarily unable to continue speaking, expecting the helicopter to crash.

Footnote

[4] See '*Aerodrome information'* below.

Simultaneously, the commander assessed that the lights were not, in fact, flickering on and off, but appeared to be doing so because his view of them was becoming obstructed intermittently by the treetops. Recognising that the helicopter was approaching the treetops, he began an aggressive go-around, flaring the helicopter and increasing power. The commander considered that although the go-around was aggressive, the applied torque did not enter the "blow-away" range[5]. He later stated during interview that he felt uncomfortable about the situation at that time, and assessed subsequently that he had become disorientated very quickly. During the go-around, both pilots heard the EGPWS 'TAIL TOO LOW' warning.

The minimum radio altitude recorded in this portion of the flight was 2 ft[6].

The commander decided not to make a further approach to the site, but climbed the helicopter into IMC and diverted to Lydd where an uneventful visual approach and landing was carried out.

The passengers disembarked and continued their journey by car.

The flight crew discussed the weather at Stansted, which was close to the minima for an instrument approach, and the fact that the weather at Luton was much better, and then flew the aircraft back to its base at Stansted.

On arrival they went into an office, carried out post-flight paperwork and the co-pilot initiated a conversation about the events at Peasmarsh. The commander annotated the voyage report and left it on the chief pilot's desk. No entry was made in the aircraft's technical log relating to the go-around and no air safety report or MOR was raised.

Damage to aircraft

The helicopter was subjected to routine inspection over subsequent days. When the incident came to the attention of the company's management some time later, it was inspected by engineers. No damage was found.

Personnel information

Commander

Age:	55 years
Licence:	Airline Transport Pilot's Licence (Helicopters)
LPC/OPC renewed:	5 February 2012
Line check:	Valid to 30 November 2012
Medical certificate:	Class One

Footnote

5 See '*Blowaway power*' below.
6 The manufacturer reported that this may not be a reliable indication of the '*aircraft's actual altitude*', and that the accuracy of the radar altimeter was ± 2 ft.

Flying experience:	Total all types:	10,250 hours
	Total on type:	4,800 hours
	Last 90 days:	11 hours
	Last 28 days:	4 hours
	Last 24 hours	2 hours
Previous rest period:	49 hours	

Co-pilot

Age:	42 years	
Licence:	Airline Transport Pilot's Licence (Helicopters)	
LPC/OPC renewed:	LPC: 7 May 2012; OPC: 10 November 2011	
Line check:	Valid to 30 June 2012	
Medical certificate:	Class One	
Flying experience:	Total all types:	5,000 hours
	Total on type:	185 hours
	Last 90 days:	19 hours
	Last 28 days:	5 hours
	Last 24 hours	2 hours
Previous rest period:	22 hrs 30 mins	

Aircraft information

General

Manufacturer:	Sikorsky Aircraft
Type:	Sikorsky S-76C[7]
Aircraft Serial No:	760684
Year of manufacture:	2007
Certificate of Registration:	Valid, United Kingdom
Certificate of Airworthiness:	EASA Certificate of Airworthiness
Engines:	2 Turbomeca Arriel 2S2 turboshaft engines
Total airframe hours:	995
Maximum Takeoff weight:	5,307 kg

Aircraft description

The Sikorsky S-76C++ is a twin-turbine engine helicopter. The minimum flight crew is one pilot, for VFR or IFR operations, though the operator habitually operated the helicopter with two pilots. The helicopter was certified for flight by day and night and under VFR and IFR.

Engines, Digital Engine Control Units (DECUs), and rotor rpm

The helicopter was fitted with two Turbomeca Arriel 2S2 turboshaft engines equipped with DECUs. DECUs control the engines to ensure that various parameters did not exceed their maximum values in normal flight.

Footnote

[7] This model of the S-76 is known in the industry as the C++.

Rotor rpm (Nr) is normally governed to 107% of the nominal value, though the rotor disc is at its most efficient at 100%. Thus, if the rotor rpm falls below the normal value, the rotor disc gains, rather than loses, efficiency and produces more lift until Nr falls below 100%, when efficiency reduces.

Blowaway power

The DECUs incorporate a 'blowaway' function to provide for occasions when pilots might wish to apply more than takeoff power, for example to avoid an unforeseen or extraordinary situation.

The blowaway logic is triggered either by:

- A slow to moderate decay in Nr, to 100%, or
- A decay rate of 5% per second or greater at 104% Nr or less

With blowaway logic active, the engines provide up to the single-engine limit of 100.5% N_1 or 115% torque (whichever is sensed first). A reduction in power demanded by the pilots prompts the DECUs to revert from blowaway logic to their normal state.

Meteorological information

General situation

The Met Office provided an aftercast of weather conditions at and near Peasmarsh around the time of the incident. The summary of their findings stated:

> *'The weather during the period in question was influenced by an area of weak low pressure. Satellite imagery and surface observations show that cloud bases were generally low, around 700-1800ft, but also as low as 200ft at times during drizzle. Over high ground, it is highly likely that hill fog was present. Visibilities in the area were around 7000m towards the east and 2500m to the north. Although the rainfall radar is showing very little precipitation, it is a known limitation with this instrument that drizzle is not well represented. The numerous surface observations of light drizzle in the area confirm its presence, which at times could have easily brought the visibility down to 2000m. You would also expect to see the much lower cloud bases in association with areas of drizzle.*
>
> *The surface winds remained light throughout the period (2-5kt), between westerly and north-easterly, varying considerably due to the slack flow over the differing terrain. In these conditions it is also possible that any hills or ridges in the terrain would suffer from an 'upslope effect' – conditions on the windward side of the hill would be much poorer than elsewhere. As such any mainly north or north west facing slopes may well have experienced particularly poor visibility and low cloud bases.'*

Forecasts

Relevant terminal areas forecasts (TAFs) were as follows:

London Gatwick (elevation 203 ft amsl)

EGKK 0315/0418 03006KT 2500 BR BKN003 BECMG 0315/0317 6000 NSW BKN008 PROB 40 0317/0407 2000 DZ BKN003=

EGKK 0318/0424 03006KT 2500 DZ BR BKN003 BECMG 0318/0320 7000 NSW OVC010 TEMPO 0320/0407 1800 DZ BKN003 PROB40 0410/0417 4000 -DZ BKN005 BECMG 0417/0420 3000 BR OVC003=

Lydd (elevation 13 ft amsl)

EGMD 0315/0319 36008KT 7000 BKN008 TEMPO 0315/0319 4000 –DZ BR BKN004=[8]

Meteorological reports

Relevant Meteorological Actual Reports (METARs) were:

London Gatwick:

2120Z 03/05/12 EGKK 032120Z 32005KT 1800 -DZ BKN003 OVC007 08/07 Q1009 REDZ=

2150Z 03/05/12 EGKK 032150Z 34004KT 2500 -DZ SCT003 BKN005 08/07 Q1009=

2220Z 03/05/12 EGKK 032220Z 32004KT 2500 HZ FEW004 BKN006 08/07 Q1008=

Lydd:

2120Z 03/05/12 EGMD 032120Z 26003KT 7000 -DZ BKN012 09/08 Q1009=

2150Z 03/05/12 EGMD 032150Z 26002KT 7000 FEW009 BKN012 09/08 Q1009=

2220Z 03/05/12 EGMD 032220Z 25002KT 5000 BKN009 09/08 Q1008=

Herstmonceaux

Observations were also made at a meteorological observing station at Herstmonceaux, some 13 nm west-south-west of Peasmarsh. These were observations used within the meterological community and not routinely accessed by pilots. They are included here because they provide further insight into the meteorological conditions which the helicopter encountered near Peasmarsh:

Footnote

[8] This TAF expired at 1900 hrs, slightly less than three hours prior to the incident; no further TAF was issued.

2050Z Wind - 20002KT. Visibility - 3500M. Cloud – few 100FT, broken 1600FT

2150Z Wind - 10001KT. Visibility - 3300M. Cloud – scattered 500FT, broken 1100FT

2250Z Wind - 35002KT. Visibility - 2400M. Cloud – scattered 300FT, broken 1000FT

Communications and aids to navigation

No air/ground communications were made at Peasmarsh. Communications with other agencies were apparently without difficulty and unremarkable.

No aids to navigation were sited at or near to Peasmarsh.

The helicopter was equipped with a flight management system (FMS), which derived position information from the global positioning system (GPS). The FMS contained a database of waypoints, some defined by the flight crew, and was capable of storing routes.

Aerodrome information

A satellite image of the site near Peasmarsh is shown below.

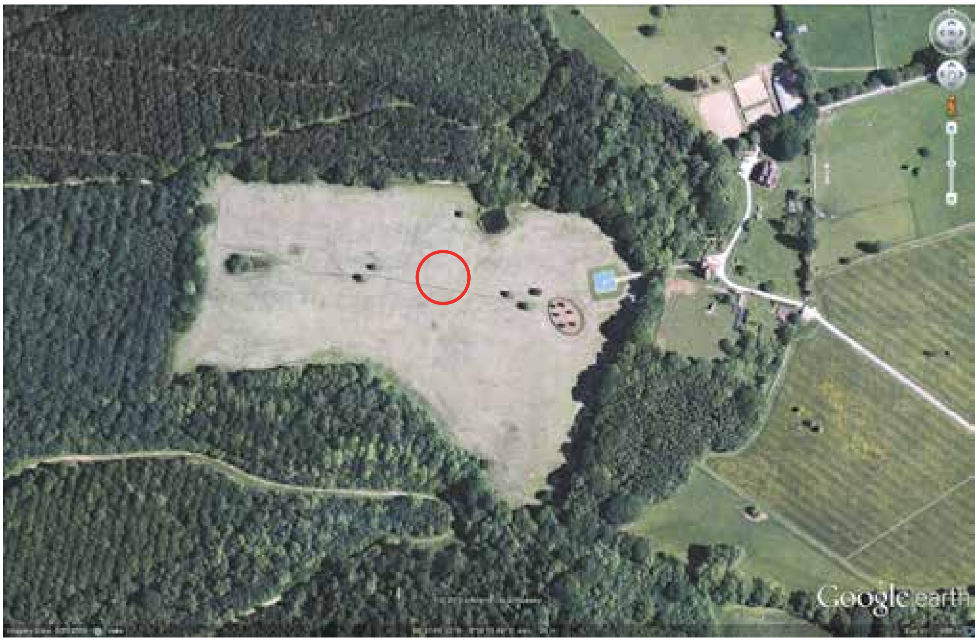

Figure 1

The field containing the landing site near Peasmarsh;
the red circle indicates the position of the triangle of lights

The helipad was sited in the north-eastern corner of a large field. A series of lights marked the perimeter of the helipad for night operations. A further group of three lights, approximately in the centre of the field, had been installed to aid helicopters making approaches, especially from directions other than the west. All these lights were illuminated for the arrival of G-WIWI.

The landing site was relatively isolated, with little cultural lighting in the vicinity. To the east and south, some miles from the site, more cultural lighting was present, but to the north and west, the surroundings were sparsely-populated and largely unlit.

The elevation of the site was approximately 115 ft amsl.

Recorded information

Following the serious incident the combined flight data and cockpit voice recorder fitted to the helicopter was downloaded by the operator. This was several weeks after the incident by which time the voice recordings for the incident had been overwritten by subsequent operations. However, flight data for the incident was available and a copy was provided by the operator to the AAIB. Data for the incident was also recovered from the EGPWS. The helicopter had a DVRS (Digital Video Recording System) fitted to record the EFIS and other instrument displays in the cockpit - information that is not recorded by the flight data recorder - but DVRS recordings for the incident had been overwritten by subsequent operations.

Parameters of valuable assistance to the investigation, such as position over and above the ground (latitude, longitude and height) were recorded by the EGPWS[9].

Salient parameters from the flight data and EGPWS recordings are presented in Figure 2. Figure 3 shows the ground track detected and recorded by the radar head at Pease Pottage, 40 miles to the west and north, and the GPS track recorded by the EGPWS. (The helicopter's altitude was near the radar's lower limit at that range and acquiring a fix in azimuth and recording a track was imprecise.) Also indicated on the ground track are the positions at which EGPWS caution and warning alerts were made.

Figure 2 starts with the helicopter decelerating though 52 KIAS at 324 ft amsl[10] (about 204 ft aal) on the approach to the helipad from the west. It passed over the helipad 12 seconds later (time 21:55:22 hrs) at 32 KIAS, at about the same altitude.

Footnote

[9] The Honeywell MK XXII Helicopter Enhanced Ground Proximity Warning System (EGPWS) records a number of parameters each time caution or warning is given. The record rate is 1 Hz for a period of 30 seconds, beginning 20 seconds before the caution or warning.

[10] The pressure altitude recorded by the FDR has been converted from 1013.25 hPa to the QNH of 1009 hPa to give amsl.

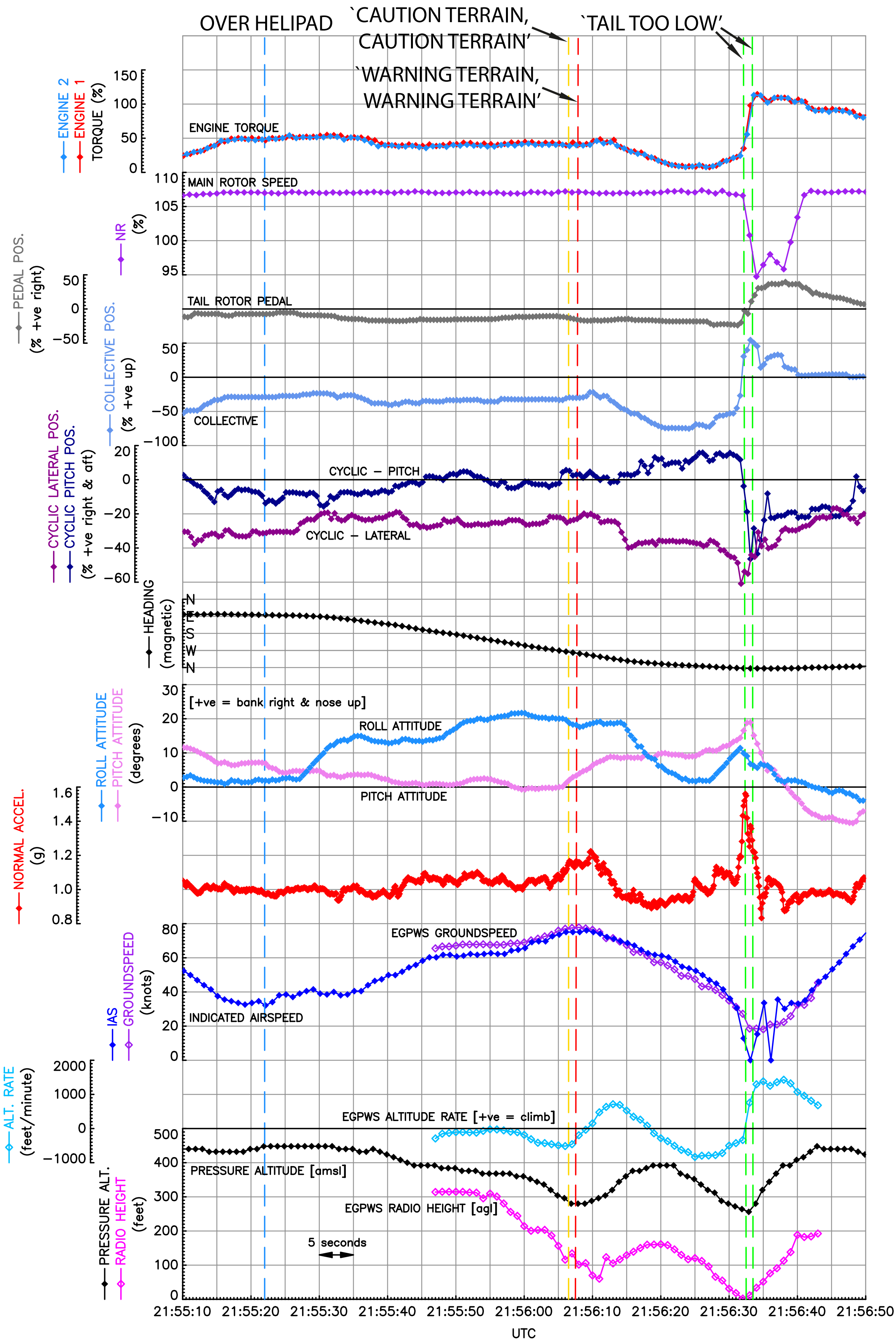

Figure 2

G-WIWI salient flight data from flight recorder and EGPWS

UTC	Event
21:55:27	Helicopter commences right turn from easterly heading. During the turn the helicopter descends and decelerates.
21:56:06	EGPWS recorded issuing a 'CAUTION TERRAIN, CAUTION TERRAIN' audio alert[11]. Helicopter is on a westerly heading, 116 ft radio height and 75 kt indicated airspeed.
21:56:07	EGPWS recorded issuing a 'WARNING TERRAIN, WARNING TERRAIN' audio alert[12]. Helicopter continues right turn, decelerates and climbs.
21:56:20	Helicopter climbs to 161 ft radio height before descending again. Airspeed continues to reduce.
21:56:32	EGPWS recorded issuing a 'TAIL TOO LOW' warning[13]. Helicopter is on a northerly heading, radio height 2 ft and 18.5 kt groundspeed (indicated airspeed below reliable range). Collective input immediately made, engine torque rises and helicopter climbs.
21:56:33	EGPWS recorded issuing another 'TAIL TOO LOW' warning. Total engine torque of 241.5%[14] recorded before reducing as aircraft climbs and accelerates away, departing to the north.

Use of flight data

AAIB Special Bulletin S4/2012, published on 9 October 2012, reported on the routine analysis of the flight data for maintenance action by operators showed that the conversion of engine torque and engine free turbine speed data into engineering units was incorrect. In particular, the conversion factor for engine torque was such that the calculated values were about 6% lower than they should have been. Consequently, the operator of G-WIWI was initially unaware that the helicopter had exceeded the manufacturer's stated torque limit during the go-around manoeuvre, and so delayed carrying out necessary maintenance actions.

As a result, the helicopter manufacturer sent a letter[15], dated 5 October 2012 (and re-issued 9 October 2012), to all S-76 operators, S-76 centres and field service representatives advising them of the issues identified in the Special Bulletin and the correct conversions to be used.

Footnote

[11] The 'CAUTION TERRAIN, CAUTION TERRAIN' alert is a Honeywell MK XXII EGPWS 'Look-Ahead' alert that compares the aircraft flight path to terrain and obstacle databases, and issues the caution alert if it detects a terrain or obstacle threat approximately 30 seconds ahead of the aircraft. However, below 100 kt, the "Look-Ahead" threat envelope is reduced until completely inhibited at 70 kt or less. The pilot can activate the 'Audio Inhibit' cockpit switch that turns off all MK XXII audio warnings for 5 minutes; however, the software version of the EGPWS fitted to G-WIWI does not record the position of this. The 'Terrain Inhibit' cockpit switch, used by the pilot to inhibit Terrain and Obstacle alerts and warnings, is recorded and had not been engaged during the incident.

[12] For this 'Look-Ahead' alert, if the aircraft flight path approaches to within approximately 20 seconds of a threat area, the voice message "WARNING TERRAIN, WARNING TERRAIN" is given.

[13] The "TAIL TOO LOW" warning is Honeywell MK XXII EGPWS Mode 6 tail strike warning function based upon radio height, pitch attitude, pitch rate and barometric altitude rate.

[14] Manufacturer's stated torque limit is 240%.

[15] Sikorsky Aircraft Corporation letter – S-76C+ and S-76C++ FDR Data, Interpretation of – CCS-76-AOL-12-0005.

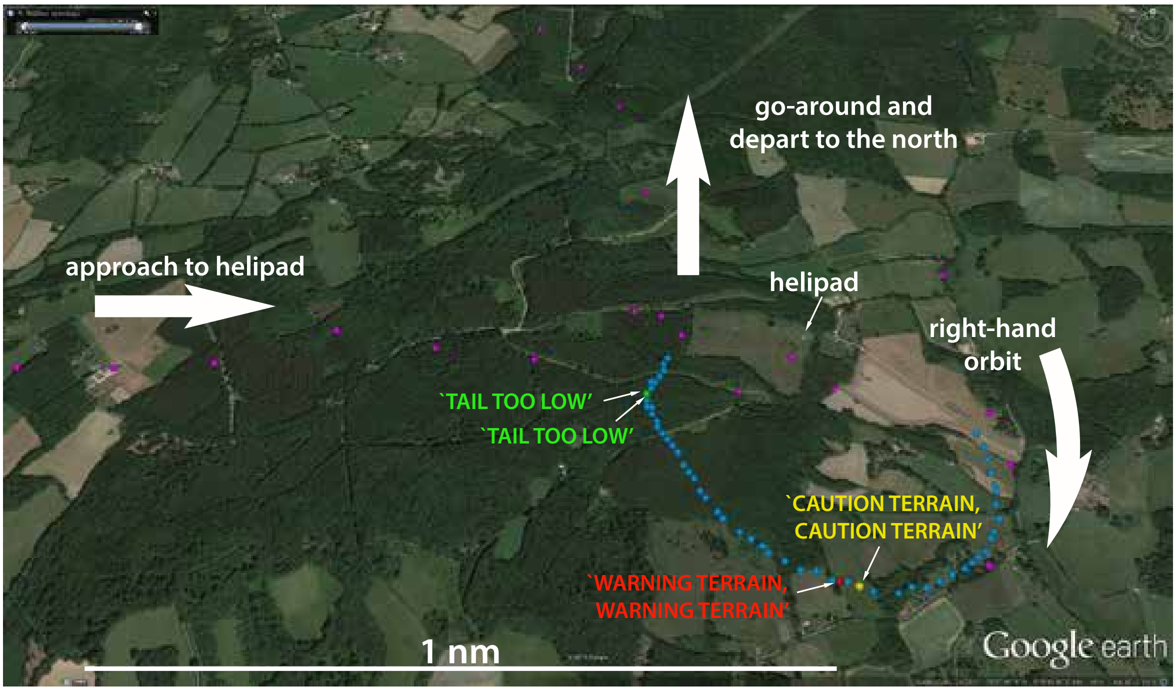

Figure 3

Radar ground track (dark pink) and EGPWS GPS ground track (light blue)

The Special Bulletin also highlighted that information about the conversions was spread over a number of documents. This lack of clear and accurate guidance for the flight data recorder, which is fundamental to an air safety investigation, resulted in the following Safety Recommendation:

> **Safety Recommendation 2012-033**
>
> It is recommended that the Sikorsky Aircraft Corporation issues, in a single document, correct flight data recorder engineering unit conversion information for S-76C++ helicopters equipped with a Teledyne Control Flight Data Acquisition Unit part number 2231230-10-A-1. This document should follow the guidance given in Federal Aviation Administration Advisory Circular 20-141B and UK Civil Aviation Publication 731.

Manufacturer's response to Safety Recommendation 2012-033

> *The Sikorsky Aircraft Corporation accepted this recommendation and published document SER-761985 (ENGINEERING UNITS CONVERSION (EUC) DOCUMENT FOR 2231230-10/-10A-1 FLIGHT DATA ACQUISITION UNIT (FDAU) ON S76B/C/C+/C++ AIRCRAFT), dated 8 April 2013.*

Medical and pathological information

Both pilots held Class One medical certificates and stated that they were in good health and well-rested prior to the flight.

Tests and research

A series of flight profiles were flown in S-76C++ and EC225 (for comparison and context) simulators to observe the functionality of the EGPWS installations, and the manner in which alerts were presented. EGPWS visual cues appeared not to be especially attention-getting, being small and presented only as illuminated script in small lit push-buttons (see Figure 4).

Figure 4

The right hand instrument panel in G-WIWI showing the 'GPWS visual alert (amber, right of the EADI - circled red)

Organisational and management information

The helicopter was owned by one company (HO) but operated, on this occasion, under an Air Operator's Certificate (AOC) held by another (OC).

Helicopter owner (HO)

HO, based at London Stansted, operated a fleet of Agusta 109, and Sikorsky S-76 and S-92 helicopters. It owned some helicopters, and managed others on behalf of their owners. Because it was a company registered outside the United Kingdom, HO was not eligible to hold a United Kingdom Air Operator's Certificate. Instead, it had made a series of arrangements with other UK registered companies, holding AOCs, to enable its helicopters to fly commercially. HO, however, retained an in-house capability to operate its helicopters on private flights.

The incident flight was being operated under commercial arrangements such that OC was responsible for the oversight of operations.

Operating company (OC)

OC had its main base at Oxford Airport and operated a smaller fleet of Eurocopter EC135, EC155 and Sikorsky S-76 helicopters at various bases in England.

An arrangement between HO and OC permitted HO to offer its helicopters for commercial air transport provided that the management of all operations-related activities was undertaken by OC.

OC operations manual

The OC operations manual, accepted by the CAA, did not contain specific procedures for operations at private landing sites.

However, a senior company official confirmed that the recognised procedure, for landing at a private landing site from a flight conducted in IMC above the MSA, is to descend to MSA approaching the site and only continue to land if sufficient visual references can be identified. If visual contact is not gained, the crew should either continue to their alternate (normally a licensed airfield with instrument approach aids) and make an instrument approach or remain at or above MSA until visual conditions prevail and a visual descent and approach can be carried out.

OC's flight safety functions

OC published flight safety notices (FSN) to its staff from time to time. A FSN published in September 2011 stated:

> *'Although we are still coming into Autumn season and temperatures are still relatively high, conditions of poor visibility and low cloudbase can become more frequent.*
>
> *It is essential that great care is taken during the planning of flights when the weather forecast shows less than clement conditions and that adequate provision is made with regard to diversion and the fuel carried for the task.*
>
> *Under no circumstances should any pilot be put under pressure to continue to any site that he regards as less than completely safe in all respects.'*

The operator also held regular flight safety meetings. The minutes of the meeting held in December 2011 stated:

> *'Private landing sites at night:*
>
> *It was pointed out to the pilots that our most hazardous operation is probably making night approaches to private landing sites. The company will support any pilot who has concerns about the safety/suitability of any site and will provide ground support or lighting as required…'*

Regulation of the operation

The operation was regulated principally according to the Air Navigation Order (ANO), JAR-OPS 3, and OC's operations manual.

Regulations relevant to the visual approach to Peasmarsh

Relevant definitions within the Rules of the Air Regulations 2007 were as follows:

> *"IFR flight' means a flight conducted in accordance with the Instrument Flight Rules in Section 6 of these Rules;*
>
> *'Visual Flight Rules' means Visual Flight Rules prescribed by Section 5 of the Rules of the Air Regulations 2007(b);*
>
> *'Visual Meteorological Conditions' means weather permitting flight in accordance with the Visual Flight Rules;*
>
> *'With the surface in sight' means with the flight crew being able to see sufficient surface features or surface illumination to enable the flight crew to maintain the aircraft in a desired attitude without reference to any flight instrument and 'when the surface is not in sight' is to be construed accordingly.'*

Rule 20 was pertinent to the choice of the flight rules under which the flight was conducted:

> *'Choice of VFR or IFR*
>
> *20 (1) Subject to paragraph (2) an aircraft shall always be flown in accordance with the Visual Flight Rules or the Instrument Flight Rules.*
>
> *(2) In the United Kingdom an aircraft flying at night shall:*
>
> *(a) be flown in accordance with the Instrument Flight Rules outside a control zone;*
>
> *(b) be flown in accordance with the Instrument Flight Rules in a control zone unless it is flying on a special VFR flight.'*

Rules 33 (minimum height) and 34 (quadrantal rule and semi-circular rule) were the applicable instrument flight rules; rule 34 was not relevant below 3,000 ft amsl:

> *'Minimum height*
>
> *33.—(1) Subject to paragraphs (2) and (3), an aircraft shall not fly at a height of less than 1,000 feet above the highest obstacle within a distance of 5 nautical miles of the aircraft unless—*
>
> *(a) it is necessary for the aircraft to do so in order to take off or land;*
>
> *(b) the aircraft flies on a route notified for the purposes of this rule;*
>
> *(c) the aircraft has been otherwise authorised by the competent authority in relation to the area over which the aircraft is flying; or*

> *(d) the aircraft flies at an altitude not exceeding 3,000 feet above mean sea level and remains clear of cloud and with the surface in sight and in a flight visibility of at least 800 metres.*
>
> *(2) The aircraft shall comply with rule 5.*
>
> *(3) Paragraph (1) shall not apply to a helicopter that is air-taxiing or conducting manoeuvres in accordance with rule 6(i).'*

Article 107 of the ANO requires operators to specify and observe Aerodrome Operating Minima (AOM) and the Order defines 'aerodrome' to include areas (such as Peasmarsh) set apart for the landing and departure of helicopters. The UK AIP, in Section AD1.1, states that helicopter operations are to be conducted with AOM no lower than calculated using JAR-OPS 3. JAR-OPS 3.430 and its Appendix give details of minimum AOM in relation to instrument approach procedures (IAP). There are no AOM given in relation to approaches not made in accordance with an IAP.

JAR-OPS 3.365 stated the following concerning minimum flight altitudes:

> *'The pilot flying shall not descend below specified minimum altitudes except when necessary for take-off or landing, or when descending in accordance with procedures approved by the Authority.'*

Additional information

TAWS and TAWS II (GPWS and EGPWS) - background

Ground proximity warning systems (GPWS) were first developed in the 1970s in response to the significant number of controlled flight into terrain (CFIT) incidents and accidents then affecting aviation operations. As they were introduced and refined, and especially since the development of enhanced ground proximity warning systems (EGPWS), the rate of CFIT accidents in the sphere of fixed-wing commercial air transport has reduced dramatically.

However, although such systems have also been introduced in some helicopters, CFIT accidents, and serious incidents indicating that CFIT was avoided by narrow margins, have continued to take place.

This is explained to some extent by the very differing operational environments:

- fixed-wing aircraft typically only come close to terrain when approaching and departing from airports and under the protection of instrument flight procedures which assure safe heights are maintained;
- rotary-wing aircraft operate at lower heights, and often to and from locations without formal instrument flight procedures, such as private landing sites and oil and gas installations.

Enhanced Ground Proximity Warning System (EGPWS)

The aircraft was fitted with a Honeywell Mk XXII EGPWS, including a database of airports and terrain. The system was designed to provide warnings of unsafe flight conditions including approach to terrain and unusual helicopter attitude or configuration close to the ground.

The helicopter was fitted with an audio inhibit switch, which was described in the EGPWS manufacturer's pilot guide:

> *'… an **"Audio Inhibit"** switch can be installed. This momentary activated switch allows the pilot to turn off all MK XXII audio warnings for 5 minutes. Resetting the switch will also restore the audio immediately. The Audio Inhibit switch is intended for EMS and SAR operations where the aircraft may be operating very close to terrain. Under normal operations this switch **should never be needed**. The visual warnings are not inhibited. If you find that you need to use this switch during your normal operations please contact [the manufacturer]'*

The manufacturer had no record of a request from the operator to use the switch during normal operations.

Although EGPWS in fixed-wing and rotary-wing aircraft incorporates a database of runways, and thus inhibits alerts when an approach is made within predetermined parameters to a runway, the systems in helicopters are not coded with private landing sites at which they operate.

EGPWS activation - OC procedures

The OC operations manual contained the following instructions in relation to EGPWS warnings:

> *When operating in IMC or at night or in conditions of impaired visibility, in aircraft equipped with EGPWS, pilots are to be familiar with the corrective actions to be taken in the case of an audio warning:*

Mode	***Indications***	***Actions***
Mode 1 Excessive Rate of Descent	*"Sink Rate, Sink Rate"*	*Reduce Rate of Descent*
	"Pull Up, Pull Up"	*Reduce Rate of Descent*
Mode 2 Excessive Terrain Closure	*"Pull Up, Pull Up"*	*Adjust flight path away from Terrain until alert ceases*
	"Terrain, Terrain"	
Mode 3 Inadvertent Descent/Loss of Altitude after Take Off	*"Don't Sink"*	*Positive Rate of Climb*

Mode 4 Unsafe Terrain Clearance	*"Too Low Terrain" (above 100 KIAS)*	*Adjust Flight Path to recover Safe Terrain Clearance*
	"Too Low Gear" (below 100 KIAS	
Mode 5 Below Glideslope	*"Glideslope"*	*Execute Missed Approach per SOP*
Mode 6 Selectable Callouts	*"Bank Angle"*	*Keep Nose Up*
	"Bank Angle, Bank Angle"	*Decrease Bank Angle*
	"Tail Too Low, Tail Too Low"	*Lower Nose or Increase Height*

The manual did not refer to the visual warnings presented by the EGPWS, or the 'look ahead' alerts such as 'CAUTION TERRAIN' and 'WARNING TERRAIN'.

Helicopter Terrain Awareness Warning System (HTAWS)

The CAA commissioned research which, at the time of publication, had resulted in the publication of an interim report[16] on *'Class A Terrain Awareness Warning System[17] (TAWS) for Offshore Helicopter Operations'*. The executive summary of the report stated:

'Controlled flight into terrain is a major cause of accidents in helicopter operations which Terrain Awareness Warning Systems (TAWS) could help to address. However, existing helicopter TAWS are not considered to be optimised for the offshore operations undertaken by the majority of the UK's medium/large helicopter fleet, and would have offered little or no protection in the case of the accident scenarios that have been experienced in that environment. The objective of the research was therefore to seek to identify improvements to helicopter TAWS to improve warning times for offshore operations without incurring an undue number of nuisance alerts. At the time of conducting the study, the Honeywell MKXXII Enhanced Ground Proximity Warning System (EGPWS) represented the only Class A helicopter TAWS in operational use. Due to the nature of the offshore obstacle environment, only the 'Classic' or non-database EGPWS modes are universally effective and this is therefore where the work was focussed.

Eurocopter EC225 flight data from Bristow Helicopters' Flight Data Monitoring programme was used to establish the limits of normal operations. This enabled the Classic Mode warning envelopes and their associated input parameters to be refined and also allowed new warning envelopes to be developed. The revised and new warning envelopes were tested using the available data from four accidents and demonstrated a worthwhile improvement in performance in

Footnote

16 Proposal reference FDP-CAA-Report 121019.
17 The expressions TAWS and GPWS are interchangeable in the context of this report.

terms of warning time, while maintaining an acceptably low nuisance alert rate of less than 1 in 100. A lower nuisance alert rate might be achieved in practice, but a larger sample of the database of normal operations would be required to demonstrate this.

The EC225 analysis exercise was repeated for the Bristow Helicopters' Sikorsky S-76A+ fleet in order to evaluate the proposed new warning envelopes on an older, less sophisticated helicopter type and a different style of operation. Although the flight path variability inherent in normal operations was greater for the S-76A+ as expected, only minor adjustments to the proposed new warning envelopes were required to maintain a nuisance alert rate of less than 1 in 100. The consequent effect on the warning times generated for the four example accidents was minimal. The two helicopter types and associated styles of operation are considered to represent a broad spectrum of offshore operations, indicating that a single set of warning envelopes would have general applicability, avoiding the need to tailor warning envelopes for individual helicopter types and/or types of operation.'

Previous accidents and incidents

Accident to an Agusta A109A II helicopter on 23 October 2010

The AAIB report on the fatal accident to Agusta A109A II helicopter, registration N2NR, in the Mourne Mountains, Northern Ireland on 23 October 2010 included the following relating to the EGPWS fitted to the helicopter:

'Enhanced Ground Proximity Warning System (EGPWS)

The helicopter was equipped with an EGPWS but it had not been in use at least since the replacement unit was fitted in 2009. An EGPWS has significant safety benefits when operating under Instrument Meteorological Conditions (IMC), particularly overland. However, the EGPWS is not a requirement for helicopter operation and the alerts it provides in VMC can become considered as 'nuisance' alerts, as the system will frequently initiate "terrain" alerts due to the proximity of ground which is already visible to the pilot. For this reason the EGPWS may be selected off and examination of the data by the manufacturer showed that the system in N2NR had not been powered up since the particular unit had been installed in late 2009. Had the system been in use on the accident flight, the presence of the high ground ahead of the helicopter should have initiated a "terrain" alert...'

Accident to a Eurocopter EC225 LP Super Puma on 18 February 2009

The AAIB report on the accident to Eurocopter EC225 LP Super Puma helicopter, G-REDU, near the Eastern Trough Area Project (ETAP) in the North Sea on 18 February 2009, was published on 17 September 2011. It examined why the EGPWS fitted to the helicopter did not alert the flight crew to the situation which ultimately led to the helicopter's impact with the sea. The report stated:

> *'TAWS*
>
> *The data recorded…, together with the lack of any height warnings or alerts in the CVFDR recordings, indicated that the TAWS was inoperative at the time of the accident. The CVFDR recordings and crew interviews indicated that the crew were not aware of this. This raised three questions of concern:*
>
> - *why was the system not operational?*
> - *why was this not noticed by the crew?*
> - *how would the system have performed had it been fully operational?'*

The investigation identified that the absence of TAWS functionality was associated with the (mal)functioning of the ACAS.

The report stated:

> *'The EC225 TAWS installation provides the crew with an ON /TEST /OFF switch on the control panel. This is contrary to typical fixed wing aircraft installations that permanently power TAWS. The ability for the helicopter crew to switch the system OFF introduces the possibility of inadvertent system loss…'*

The report continued:

> *'The HTAWS MOPS (Helicopter Terrain Awareness and Warning System Minimum Operational Performance Standards) states:*
>
> > *'An inhibited, failed, or inoperative HTAWS shall be indicated to the flight crew in a manner consistent with the flight deck design philosophy.'*
>
> *The lack of a visual cue, in the crew's normal field of view, that TAWS has been switched OFF is in line with the 'dark cockpit' philosophy applied to the EC225. The concept is that the crew does not need an indication in these circumstances as they should already be aware of the lack of TAWS because it requires positive crew action to switch the system OFF. There are limitations to this approach, associated with multiple crews not communicating a switch selection, the wrong switch being actioned and exposure to hidden failure modes mimicking the OFF status of the system. Given the implications of the loss of this system, which also fulfills the AVAD function, this concept would appear to be inappropriate in this case. This could equally apply to other TAWS installations that use the same 'dark cockpit' philosophy.'*

The following Safety Recommendation was made:

> **Safety Recommendation 2011-058**
>
> It is recommended that the European Aviation Safety Agency requires that crews of helicopters, fitted with a Terrain Awareness and Warning System, be provided with an immediate indication when the system becomes inoperative, fails, is inhibited or selected OFF.

The EASA responded to this Safety Recommendation on 26 March 2013 as follows:

> *'In the course of certification and approval of aircraft and/or installed systems, the proposed normal operation of each system is assessed against the applicable airworthiness requirements or certification specifications (CS 29.1309). Additionally, failures and emergencies directly and indirectly related to the use of the system are evaluated. This includes the acceptability of a means to disable a mandatory system, if proposed.*
>
> *As a general principle, it is acceptable to have a means of deselecting such a system, but only if the pilot is at all times aware of the degraded status of the aircraft and there is mitigation to ensure that the aircraft continues to meet an acceptable airworthiness standard. There are many examples of the satisfactory application of this principle.'*

The EASA stated that the Safety Recommendation was considered *'Closed – Partial agreement'*.

The report explained that, if the system were switched off, mandatory height callouts would be disabled, and made the following Safety Recommendation:

> **Safety Recommendation 2011-059**
>
> It is recommended that the European Aviation Safety Agency reviews the acceptability of crew-operated ON/OFF controls which can disable mandatory helicopter audio voice warnings.

The EASA responded to this safety recommendation on 30 September 2013 as follows:

> *'EASA is awaiting results from studies which may allow redefining the Helicopter Terrain Awareness and Warning System (HTAWS) standards, especially for offshore operation, as the report FDP-CAA-Report 121019 "Report for UK Civil Aviation Authority on Class A Terrain Awareness Warning System (TAWS) for Offshore Helicopter Operations", which is currently interim and hence subject to change.'*

Civil Aviation Publication (CAP) 1122

CAA CAP 1122 - '*Application for Instrument Approach Procedures to Aerodromes without an Instrument Runway and/or Approach Control',* is a document proposing the wider use of IAPs at UK aerodromes which it defines to include helicopter landing sites. The objective is to:

> *'recommend a way forward which would allow wider deployment of IAPs at UK aerodromes whilst providing continuing assurance regarding acceptable levels of safety…'*

The CAA recognises the potential offered by satellite-based navigation systems to help enable the use of IAPs to small, less well-equipped aerodromes. Using a risk-based approach, the guidance aims to improve safety at such aerodromes where the publication of IAPs is currently not possible. Only approved procedures will be designed, published and used operationally. The CAA plans a staged process of implementation and applications for IAPs to helicopter landing sites such as the one in this incident would not be considered initially.

Analysis

Background to the flight

The helicopter was serviceable for flight. The pilots were appropriately qualified and reportedly rested and fit for the duty. The flights leading up to the incident flight were routine and both pilots were familiar with the landing site at Peasmarsh. The investigation did not identify any unusual pressure placed upon the flight crew by their employer, passengers or others, to complete the proposed series of flights should conditions prove unfavourable.

Meteorology

Both pilots, and their colleagues at their base, were aware that the weather conditions affecting south-east England were not ideal for visual flight at low altitudes. The commander took the lead in gathering weather reports and forecasts from relevant aerodromes, and shared these with the co-pilot.

Forecasts showed that, during the evening, winds would be light throughout south-east England. The visibility was forecast to be between 1,800 m and 7 km at Gatwick. The Lydd forecast predicated visibility of between 4,000 m and 7 km at the end of the forecast period; no further forecast was issued with validity at the time of the helicopter's planned arrival. The cloudbase at the two aerodromes was predicted to be at between 300 and 800 ft aal.

The last reports available to the flight crew for Lydd and Southend indicated better conditions; visibilities of 7 and 8 km and cloudbases of 1,200 ft and 900 ft aal were reported. At Herstmonceaux, the visibility was measured at 3,500 m at 2050 hrs and 3,300 m an hour later; the lowest cloud was 100 ft and 500 ft agl respectively.

The available information therefore indicated that the site at Peasmarsh would be affected by low cloud and poor visibility and the crew made arrangements with Lydd to use it as a diversion if required.

For the first arrival at Peasmarsh the co-pilot briefed for a descent to the minimum safe altitude (MSA) for flight under IFR, which he had calculated to be 1,250 ft amsl, and for a route towards a GPS position 3 nm west of the landing site. This was not an instrument approach procedure, but a portion of en-route flight at or above the MSA during which it was intended that, weather permitting, sufficient visual reference would be gained to carry out a visual approach to the landing site.

The incident flight

The crew shared a similar plan for the return flight to Peasmarsh except that the commander briefed for a descent to 500 ft. In the event, no reference to 500 ft was made by either pilot during the descent and the helicopter continued descending to approximately 350 ft agl.

It was not possible to determine what visual reference, if any, the flight crew had during the latter part of their approach to Peasmarsh until the commander gained sight of the landing site. There was relatively little cultural lighting other than that on the coastal plane to the south-east and flights approaching from the north-west would be provided with few visual references.

A route planned to descend over the lower-lying coastal plain to the south and east of Peasmarsh, where considerably better cultural lighting was present, might have presented a better opportunity for the crew to gain visual contact with the ground. However, such a descent would have necessitated continuing the flight at low height towards the progressively poorer-lit area of the landing site in order for an approach and landing to be made.

Having gained sight of the landing site, the pilots concurred that the helicopter was too high and fast to make a straight-in. This indicates that the visibility beneath cloud and/or the cloud itself restricted the distance from which the landing site was visible.

With the crew now in visual contact with the ground around the landing site, the denser cultural lighting to the south-east offered better visual references; the visibility there was also reportedly better, and the cloudbase higher.

During the orbit for a second approach, the helicopter turned towards higher ground, worse weather, and less cultural lighting. As the orbit continued and the commander's visual references reduced to the triangle of lights in the centre of the field, maintaining orientation and situational awareness would have become challenging.

The helicopter's descent as it turned through a westerly heading may have been a result of intentional control inputs by the commander, perhaps endeavouring to remain visual below lowering cloud, or the result of degraded spatial awareness. Neither pilot recalled hearing the 'CAUTION TERRAIN' and then 'WARNING TERRAIN' alerts registered by the EGPWS computer, or seeing the accompanying visual indication.

The orbit continued, at between 100 ft agl and 170 ft agl, with speed reducing. The co-pilot's recollection of seeing the radio altimeter *'winding down towards zero extremely quickly'* accords with the data. The helicopter was descending over rising terrain; in fact, the tops of trees.

The commander's observation of the 'flickering' lights and his rapid deduction that he was in fact seeing steady lights obscured intermittently by the tops of the trees, led to an aggressive manoeuvre which began just before the radio altimeter recorded its lowest value of 2 ft.

The recovery began with the helicopter pitched 14° nose-up with approximately 12° right roll, radio height 20 ft, rate of descent 400 fpm, speed 32 KIAS, groundspeed 32 kt, 25% torque, and main rotor rpm at its nominal value, 107%.

The commander's control inputs were swift, aggressive, and co-ordinated. He applied cyclic control inputs to arrest the helicopter's rate of descent, flaring to a pitch attitude of 20° nose-up and rolling level, and raised the collective lever, applying blowaway power. The rotor speed reduced to a minimum of 95% Nr as total (combined) engine torque reached its peak value of 241.5%. The aircraft entered a climb, achieving a vertical speed of 1,300 fpm within approximately six seconds of the first recovery action.

During the recovery, the EGPWS issued two 'TAIL TOO LOW' warnings, due to the low radio height and pitch attitude of the helicopter.

EGPWS

No technical reason was identified for EGPWS warnings to be recorded without being presented to the pilots. If the audio inhibit switch had been selected prior to the approach, the audible warnings would not have been announced to the pilots, but neither pilot recalled that the inhibit switch had been selected.

Both pilots recalled hearing the 'TAIL TOO LOW' warning, issued slightly more than 20 seconds after the 'WARNING TERRAIN'. The earlier audible alerts may have also been announced, but not 'heard' by the pilots, because of inattentional deafness or the effects of overload on the pilots' capacity to process auditory cues.

The visual cues appeared not to be especially attention-getting, being small and presented only as illuminated script in small lit push-buttons.

The pilot actions specified in OC's operations manual were the same for both the 'CAUTION TERRAIN' and 'WARNING TERRAIN' alerts: *'Adjust flight path away from Terrain until alert ceases'*. The warnings might have prompted the commander to recognise that the planned orbit was proving more challenging than anticipated, and therefore to abandon the manoeuvre.

Two previous events were identified in which EGPWS-equipped helicopters were involved in situations in which the EGPWS might have provided warnings which could have prevented an accident, but did not: the fatal accident to N2NR and the accident to G-REDU. In the former case, the EGPWS had been left switched off during flight since its installation. In the latter, the investigation determined that the EGPWS was not functioning but did not establish why. In the case of G-WIWI, the system was fitted and functioning, but the flight crew did not react to the warnings presented.

The 'WARNING TERRAIN' warning triggered when the helicopter was flying at slightly less than 80 KIAS and descending at approximately 500 fpm. The helicopter's descent ceased and it entered a climb over the eight seconds following the 'WARNING TERRAIN'. It is possible either that the flight crew did assimilate and react to the EGPWS warnings, but later did not recall doing so, or that the commander became aware of the close approach to terrain and reacted to avoid it at the same time the warning was issued.

Flight safety functions

Both the FSN published in September 2011 and the minutes of the flight safety meeting two months later showed that the company had identified *'our most hazardous operation is probably making night approaches to private landing sites'*. The commander's decision-making during the approach to Peasmarsh suggests that the contents of these documents had not resulted in effective measures to enhance the safety of such operations. However, the crew's briefing for the first approach to Peasmarsh, which formed the framework for the subsequent approach, was in accordance with the recognised procedures required by OC.

Regulations concerning descent from above minimum safe altitude (MSA)

This incident arose following a descent from flight in instrument meteorological conditions (IMC) towards an attempted visual approach.

The plan for the first arrival at the landing site was to descend to the MSA calculated in accordance with Rule 33 (1) and, should the meteorological conditions encountered meet the criteria of Rule 33 (1) (d), an approach and landing would be made at the landing site using visual references. This plan was in accordance with the interpretation of the rules by the operator's senior management.

During the return flight to the landing site, the co-pilot stated that the MSA would be 1,250 ft amsl and the commander briefed that the descent would be continued to 500 ft with the aim of making visual contact with the landing site. It was not specified whether this was an altitude of 500 ft (ie amsl), an altitude that ensured 500 ft vertical separation (height) above relevant obstacles or a height above the ground.

During the final leg towards the landing site, in-flight visibility was reported by the commander as being "limited", such that he had to turn off the landing lights because of the glare from the rain and fly with reference to flight instruments. The co-pilot assessed the conditions as being "not good". The commander recalled that the co-pilot had visual contact with the ground, which the co-pilot reported as being "intermittent". The co-pilot also reported that he had been uneasy that the helicopter was below MSA without the required visual references. In circumstances such as these, aircraft are permitted to descend below MSA in order to land. As it continued towards the landing site, the helicopter descended to approximately 350 ft agl at which time it was still "in the bottom of the cloud".

Such an approach to a landing site has none of the procedural safeguards inherent in properly constructed IAPs. These safeguards minimise the risks of collision with the ground or obstacles during descent in IMC below MSA. In this incident, there were no procedures to follow and there were different recollections by the crew about what target descent altitude was actually set. There were no defined visual references for the approach which, if not achieved, would prompt a go-around, and the helicopter levelled off at approximately 350 ft agl in a position from which a landing could not be made.

Properly constructed instrument approaches have missed approach procedures and routes which minimise the risks of collision with the ground and obstacles during a go-around and climb to a safe altitude. In this case, go-around procedures and routing were not available or briefed and, during unplanned manoeuvring to re-position for landing, the pilot became disorientated and the helicopter nearly collided with trees and the ground.

A crew descending below MSA in IMC without following a properly designed IAP is exposing the helicopter's occupants to a higher level of risk of collision with obstacles or the ground than would be present while descending on a published IAP towards a runway. Public transport operations, for example, experience different levels of safety when making an approach to land in poor weather depending on whether or not a particular flight terminates at a runway with an IAP. It is doubtful that passengers are aware that the risk to their safety varies in this way. Implementation of CAP 1122 might address this difference in level of safety by allowing IAPs to be published in relation to small landing sites used by helicopters undertaking public transport operations. However, the staged implementation is unlikely to lead to safety improvements in this regard in the near future, and does not address the circumstances of descents to land other than on published approach procedures. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2014-35

It is recommended that the Civil Aviation Authority review the regulations that permit a helicopter engaged in public transport operations to descend below MSA for the purpose of landing, when flying in instrument meteorological conditions but not on a published approach procedure.

Conclusion

The descent from above the minimum safe altitude was conducted in reduced visibility and low cloud conditions into an area with limited visual references. The helicopter was therefore brought close to terrain in an environment in which situational awareness could become degraded easily.

The decision to execute an orbit around the landing site, in the circumstances pertaining, further increased the chances of situational awareness becoming degraded, whilst the helicopter was at low height above unlit and undulating terrain.

In the course of the orbit, the commander became spatially disorientated and the helicopter descended towards the tops of trees.

Although the EGPWS issued warnings that the helicopter was approaching contact with the ground, the flight crew were not aware of these warnings.

BULLETIN CORRECTION

AAIB File:	EW/C2012/05/05
Aircraft Type and Registration:	Sikorsky S-76C, G-WIWI
Date & Time (UTC):	3 May 2012 at 2155 hrs
Location:	Peasmarsh, East Sussex
Information Source:	AAIB Field Investigation

AAIB Bulletin No 12/2014, page 23 refers

In this report it was incorrectly stated that the accident to G-REDU on 18 February 2009 was fatal. It was not.

The sentence at the top of page 23 should read:

> The AAIB report on the accident to Eurocopter EC225 LP Super Puma helicopter, G-REDU, near the Eastern Trough Area Project (ETAP) in the North Sea on 18 February 2009, was published on 17 September 2011.

The online version of this report was amended prior to publication and a copy of this correction will appear in the February 2015 Bulletin