

Interim Report

Identification

Type of Occurrence:	Serious incident
Date:	23 October 2017
Location:	Near way-point JUIST
Aircraft:	Helicopter
Manufacturer / Model:	Sikorsky Aircraft Corporation / S-76B
Injuries to Persons:	None
Damage:	Aircraft not damaged
Other Damage:	None
State File Number:	BFU17-1441-7X
Published:	March 2018

Factual Information

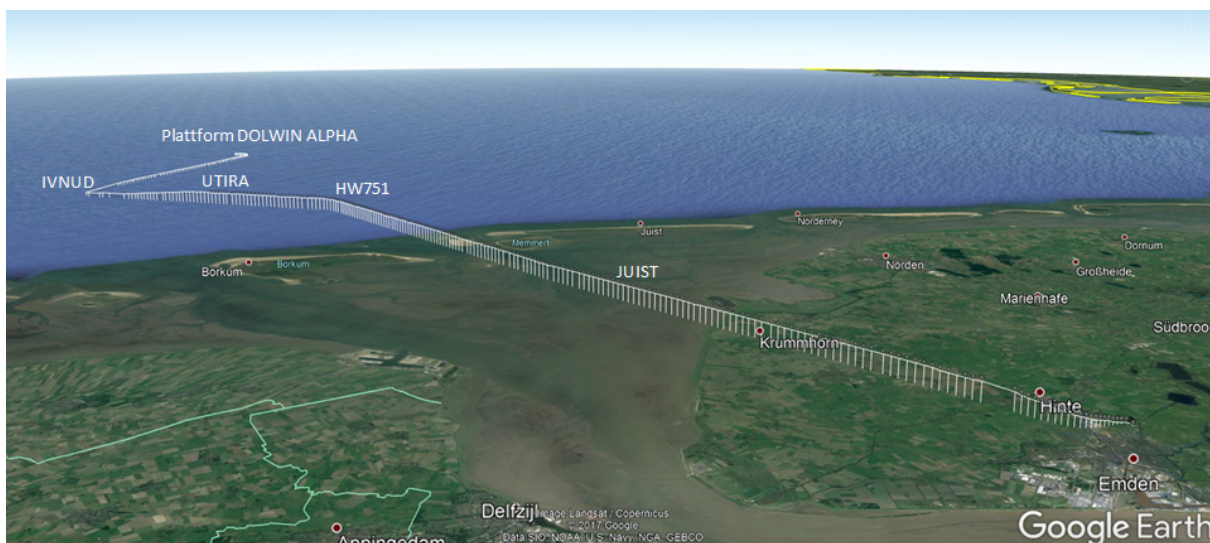
History of the Flight

On 25 October 2017 the BFU was informed by a helicopter operator that possibly a serious incident had occurred on 23 October 2017.

The operator stated that on that day commercial air passenger transport above sea from the offshore convertor station DOLWIN ALPHA to Emden Airfield (EDWE)

should have been conducted. At 0759 hrs¹ a two-pilot flight crew took off from Emden Airfield with a helicopter S-76B with the destination convertor station DOLWIN ALPHA. In addition to the flight crew approximately 379 kg cargo was on board.

According to the flight plan and the FlightRadar24 recording the flight route was as follows: EDWE, JUIST, HW751, UTIRA, IVNUD and DOLWA. After take-off the helicopter climbed to 2,500 ft AMSL. From way-point UTIRA on the flight altitude was reduced to about 700 ft AMSL. At 0832 hrs the helicopter landed at the helipad of the convertor station DOLWIN ALPHA. While the engines were still running the cargo was unloaded and the passengers embarked for the return flight.



Course of the outbound flight

Source: FlightRadar24 / Google Earth / BFU

At 0842 hrs the helicopter took off now with four persons on board for the return flight along the same route to Emden. After take-off the helicopter climbed to 2,000 ft AMSL which remained the same up until right abeam of Borkum Island. At 0854 hrs the flight crew established radio contact with the Flugleiter (A person required by German regulation at uncontrolled aerodromes to provide aerodrome information service to pilots) at Emden Airfield and requested information regarding the prevailing weather conditions. They received the answer: *"Im Augenblick regnet es hier, Untergrenze few eintausend, overcast tausend-fünfhundert und Wind südwest 10 bis 15 in Böen 20 kt, QNH 1010 und Sicht hier Festmarke 2.5 bis 3 km (Right now it is raining, cloud base few one thousand, overcast thousand five hundred and wind south-west 10 to 15 gusts 20 kt, QNH 1,010 and visibility here*

¹ All times local, unless otherwise stated.

visual reference point 2.5 to 3 km)." At 0857 hrs the crew informed Bremen Radar of passing way-point JUIST.

Before reaching way-point JUIST the helicopter began to descend. The descent ended in low altitude with reduced speed near the coast line. Then the helicopter climbed again to about 500 ft AMSL and continued the flight to Emden. At 0901 hrs the crew again requested information regarding the prevailing weather at Emden Airfield. The answer was: *"Im Augenblick ist es ein bisschen runtergegangen, few siebenhundert, broken eintausend, overcast tausend-achthundert, der Regen lässt jetzt ganz sachte nach (Right now it has decreased a little bit few seven hundred, broken one thousand, overcast one thousand eight hundred, the rain is gradually slowing down)." At 0905 hrs the crew signed off with Bremen Radar. At 0911 hrs the helicopter landed at Emden Airfield.*



Course of the return flight including descent

Source: FlightRadar24 / Google Earth / BFU

On 9 November 2017 BFU staff members interviewed the crew regarding their tasks at the day of the occurrence, the course of the flight, and the subsequent events at the company until the occurrence was reported to the BFU.

According to congruent pilots' statements during the two legs (outbound and return) the co-pilot in the left-hand seat acted as Pilot Flying (PF) and the Pilot in Command (PIC) in the right-hand seat as Pilot Non Flying (PNF). After take-off from the convertor station DOLWIN ALPHA the helicopter had been operated using the Flight Director (FD) coupled in the Upper Modes ALT and NAV. Between the way-points

UTIRA and HW751 the FD had decoupled without reason. The two autopilots had changed from Attitude Retention (ATT) Mode to Stability Augmentation System (SAS) Mode. This resulted in the PF having to actively control the helicopter manually. Subsequently, the PNF tried to find and eliminate the cause for the FD failure. Both in vain. After they had enquired about the prevailing weather conditions at Emden Airfield they decided to reduce the flight altitude before reaching the coast line. During descent the helicopter had suddenly encountered heavy rain and significantly reduced visibility. At about 500 ft AMSL the co-pilot had handed over controls to the PIC. He had instructed the co-pilot to extend the landing gear because he wanted to be prepared for a possible off-field landing due to the unexpected bad weather.

According to the Cockpit Voice Recorder (CVR) recording the PIC allowed the helicopter to continue the descent because no visual contact with the coast line had been established. At that time even in low altitude there was no visual contact with the coast line. At about 0900 hrs the co-pilot said "100 ft GND". A few seconds later the computer voice from the radar altimeter announcing "One Hundred Feet" and an acoustic signal were recorded. There was no verbal comment about the altitude warning. The helicopter continued to descend. Both pilots looked outside searching for the coast line or a brighter place in the grey clouds ahead of them. The co-pilot recognised the low altitude and read the radar altimeter "20 ft GND". He advised the PF accordingly. At the same time the airspeed had decreased to approximately 40 kt. The PF stopped the descent and increased the airspeed. A short time later in low altitude the pilots had the coast line in sight. The flight was continued towards Emden under Visual Flight Rules (VFR) with reduced cruise speed and in low altitude. Due to the limited visibility and low clouds it was decided to fly an approach to runway 07. When the engines were shut off the pilots noticed that the cyclic stick trim switch was not pushed in, i.e. the function was disengaged.

The PIC stated that the heavy shower and the therefore reduced visibility had occurred totally unexpectedly. He had not considered to changing flight rules and conducting the instrument approach RNAV (GPS) Y RWY25 to Emden due to the unclear situation with the FD.



Descent before reaching the coast line

Source: FlightRadar24 / Google Earth / BFU

The BFU asked the two passengers, who were seated opposite the flight direction, to describe their observations.

One passenger stated the helicopter had been in clouds after about 15 minutes flight time and then began to descend. Compared to previous flights the approach to Emden had been rather low.

The second passenger described the weather as not uncommon for an offshore flight. It had been windy and rainy but without strong turbulences. He stated that the first half of the flight had been uneventful. Then the helicopter had entered clouds and after some time it had made noises like during descent. After they had left the clouds the helicopter had flown much lower than usual. The passenger estimated the altitude was about 100 m AMSL. Then the helicopter had descended in stages until the main rotor generated spray. The passenger estimated the lowest altitude was 5 to 10 m. At the same time the helicopter had had a nose-up attitude. Then the coast line had been reached and they had flown over land slightly above the wind turbines to Emden.

The BFU does not have any Flight Data Recorder (FDR) recordings of the flight available.

Personnel Information

Pilot in Command

The 64-year-old pilot held an Airline Transport Helicopter Pilot's License (ATPL(H)) issued by the Luftfahrt-Bundesamt (German civil aviation authority, LBA) in accordance with Part FCL. The valid licence listed the ratings for pilot in command on

SK76 including instrument flight rules. He held a class 1 medical certificate issued in accordance with Part-MED with the restriction VML (wear multifocal spectacles and carry a spare set of spectacles) valid until 10 December 2017.

According to the operator he had a total flying experience of 11,461 hours, of which 3,025 hours were flown on SK76. His company deployed him as Line Training Pilot in Command, among others.

Co-pilot

The 38-year-old pilot held a Commercial Helicopter Pilot's Licence (CPL(H)) issued by the LBA in accordance with Part FCL. The valid licence listed the ratings as PIC for SK76 and AW169, including instrument flight rules. The licence also listed language skills for English and ATPL Theory and MCC/IR. He held a class 1 medical certificate issued in accordance with Part-MED without restrictions; valid until 7 November 2017.

According to the operator he had a total flying experience of 910 hours, of which 359 hours were flown on SK76.

Aircraft Information

The S-76B is a helicopter with a maximum of 14 seats produced by Sikorsky Aircraft Corporation. It is equipped with a three-wheel retractable landing gear, a four-blade main rotor and a four-blade tail rotor for anti-torque. Maximum take-off mass is 5,307 kg. The helicopter is equipped with two PT6B-36A turbine engines. In 1982 the aircraft type S-76B was certified as transport helicopter in accordance with Federal Aviation Regulations (FAR) Part 29.

The retractable landing gear is equipped with a warning device, which is triggered visually and acoustically at an airspeed of less than 60 KIAS or an altitude of less than the selected Decision Height (DH), if the landing gear is in the retracted position.

The helicopter in question, year of manufacture 1992, manufacturer's serial number 760395, had a certificate of registration issued by the Luftfahrt-Bundesamt. According to the weight report of 11 December 2014 the empty mass was about 3,789 kg. According to the flight plan the take-off mass at the day of the occurrence was about 4,920 kg, including crew, additional equipment, cargo, and about 1,200 lbs fuel. The last Airworthiness Review Certificate (ARC) was issued on 5 October 2017. At the time of the occurrence, the helicopter had a total operating time of

approximately 9,259 hours. For flights above sea, the helicopter had been equipped with class Sea-State 4 (up to 2.5 m significant wave height) emergency floats, among other things.

The helicopter was equipped with a Honeywell SPZ -7000 Digital Automatic Flight Control System (DAFCS). This system consists of an autopilot function for attitude stabilisation (SAS or ATT modes), and a flight director function for roll and yaw control (ALT, IAS, VS, HDG, Nav or ILS modes). During automatic flight control one or several flight director modes (upper modes) are coupled with the autopilot in ATT mode. If the cyclic stick trim function is disengaged the AP changes from ATT mode to SAS mode. It is not possible to couple the FD in SAS mode.



Overview AP and FD panels and the trim push switch

Source: BFU

Prior to departure the DAFCS has to be self-tested with a two-level test (Level 1 and Level 2) with running engines. The crew stated that at the day of the occurrence the two test levels had been without fault.

The helicopter was equipped with a radar altimeter / Audio Voice Alerting Device (AVAD) which warns visually and an acoustic signal and also with the announcement "One Hundred Feet" if descent past the selected DH occurs.

The helicopter was maintained by the operator's maintenance organisation, certified in accordance with Part 145.

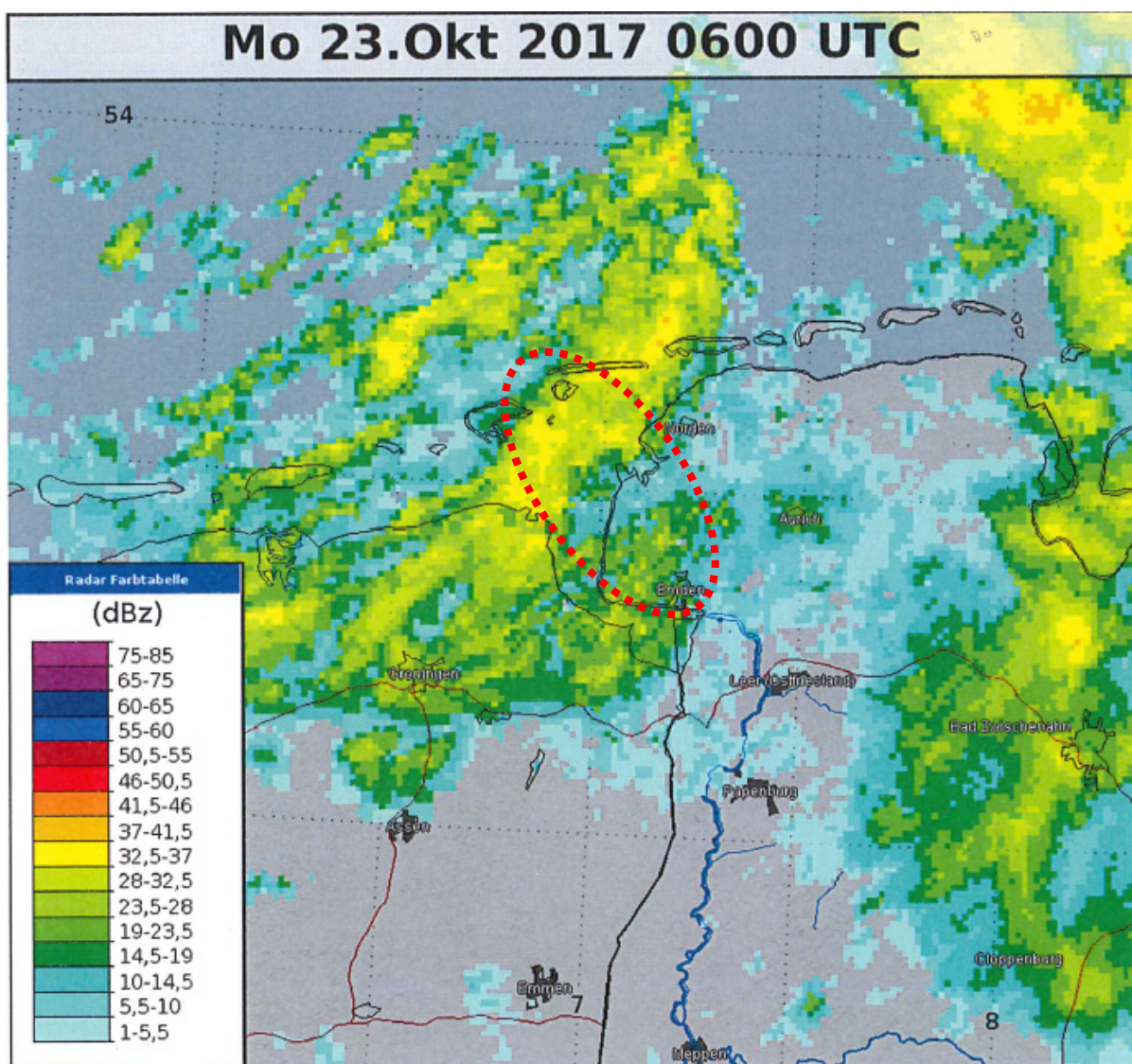
Meteorological Information

The BFU asked the Deutscher Wetterdienst (German meteorological service provider, DWD) for an official aviation weather report.

On the morning of 23 October 2017 a low pressure system was lying over the Deutsche Bucht (German Bay). During the morning it moved toward the Elbe estuary becoming weaker in the process. With the south-western to western current, relatively mild and very humid air was moved to the north-west of Germany.

The flight route from EDWE to DOLWA was part of the General Aviation Forecast (GAFOR) area 01 (East Friesland). The DWD had classified this area between 0300 and 0900 UTC as M5, ISOL RADZ. According to the DWD this means: ground visibility between 5 and 8 km and/or cloud base between 500 and 1,000 ft above the reference height of 200 ft. Forecast were sporadic drizzle, spray and rain.

The weather station Emden reported at 0700 hrs wind from 220° with 10 kt, gusts 16 kt. Ground visibility was 17 km. The cloud cover was given with scattered (SCT) at 1,500 ft, broken (BKN) at 2,800 ft, and overcast (OVC) at 3,800 ft. The temperature was about 12°C and the dewpoint about 10°C. Barometric air pressure (QNH) was 1,010 hPa.

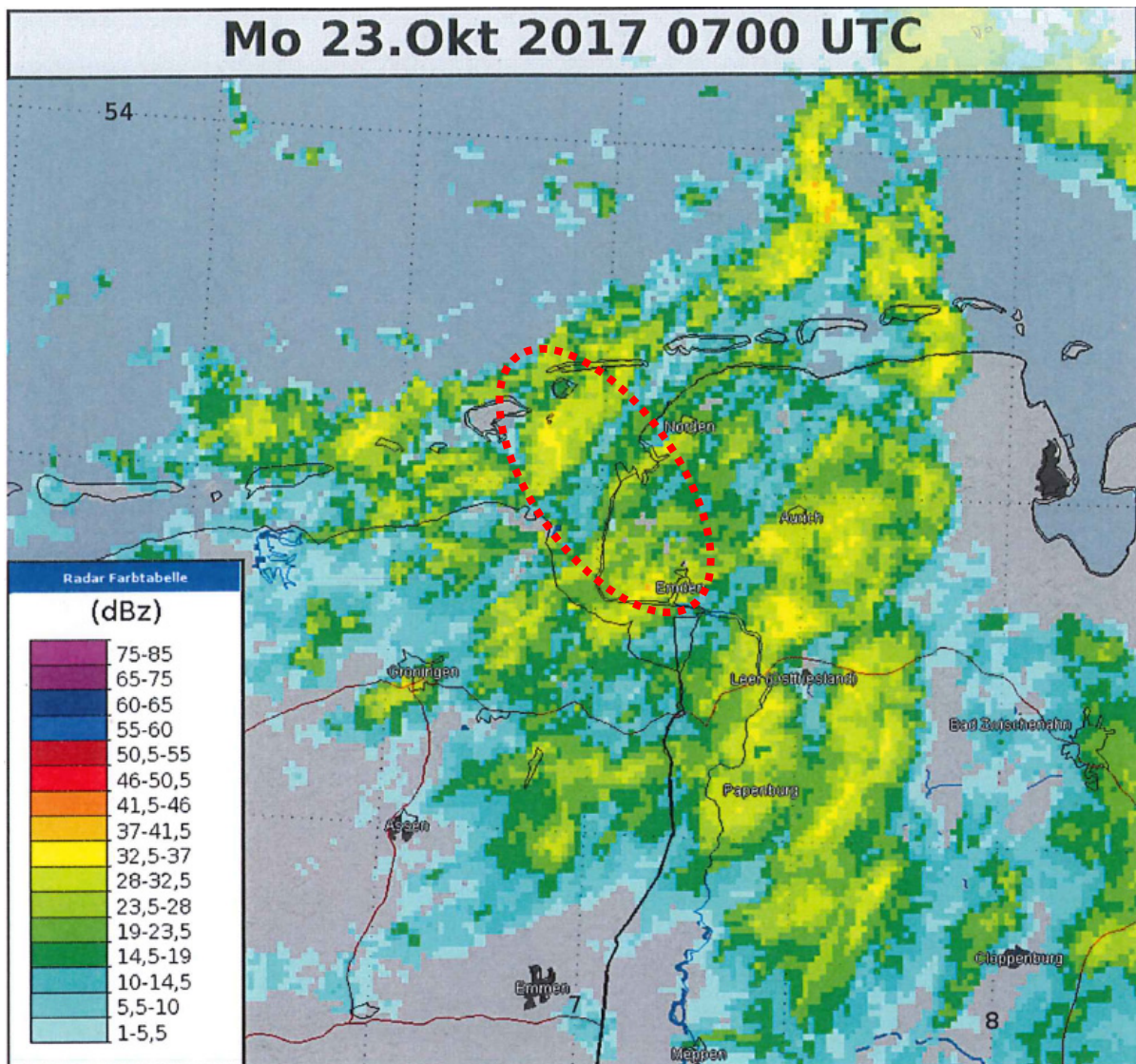


Precipitation radar image at the time of take-off in Emden

Source: DWD

One minute after the helicopter had departed, at 0800 hrs, the Flugleiter in Emden told another helicopter taking off: *"Wolken few eintausend, scattered eintausend-vierhundert und overcast eintausend-achthundert (clouds few one thousand, scattered one thousand four hundred, and overcast one thousand eight hundred)*.

According to the DOLWIN ALPHA helipad weather report of 0830 hrs the significant wave height was 3.1 m, wind from 250° with 30 to 34 kt, visibility about 3 NM, and cloud base at more than 180 m.



Precipitation radar image at the time of the descent

Source: DWD

Aids to Navigation

Among other things, the helicopter was equipped with a Flight Management System (FMS) Universal UNS 1K and a fixed installation Garmin GPS 500W with Moving Map indication.

Radio Communications

Radio communications, until they had left the frequency at 0905:45 hrs, between the pilots and Bremen Radar had been made available to the BFU as transcript.

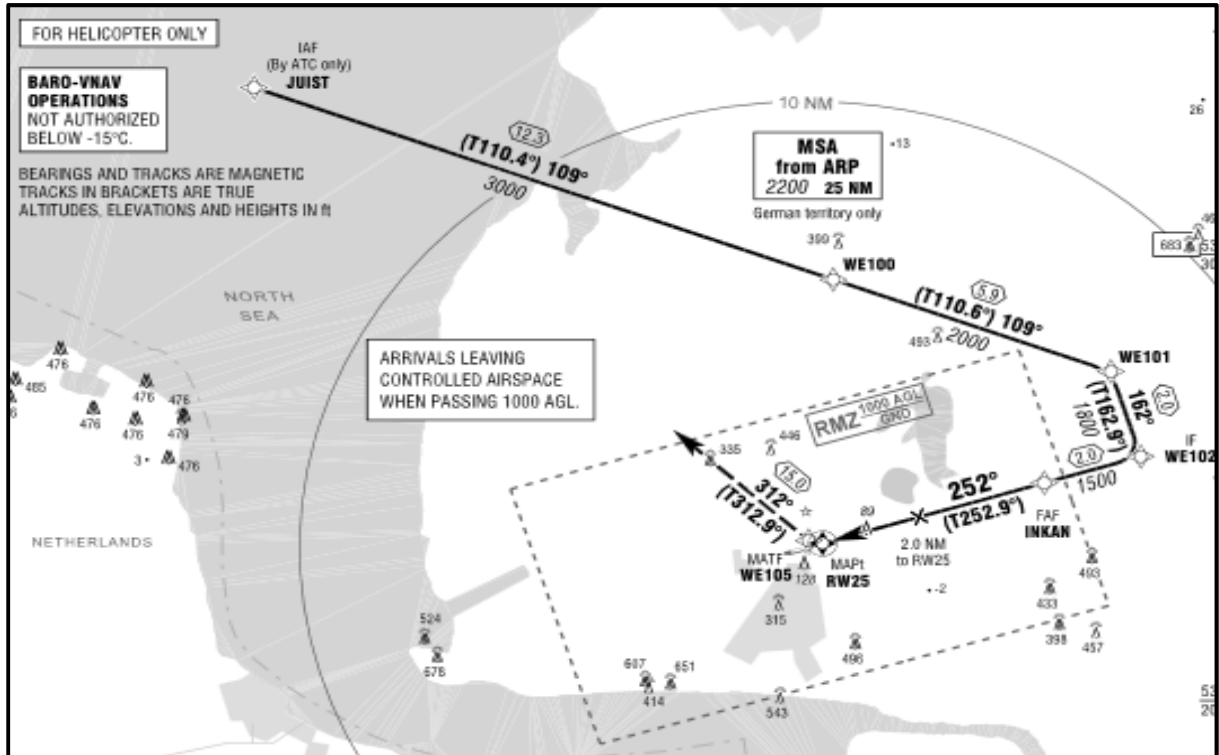
Radio transmissions with the Flugleiter at Emden Airfield had been made available as recording. The BFU was not provided with the recording covering the time between 0907:58 hrs and 0936:32 hrs.

The radio communications were examined in regard to flight conduct and prevailing weather conditions.

Aerodrome Information

Emden Airfield (EDWE) is located about 3 NM north-east of the city centre of Emden. Aerodrome elevation is 2 ft AMSL. It has one asphalt runway with a length of 1,300 m and a width of 30 m and the direction $072^{\circ}/252^{\circ}$ (07/25). The published traffic circuit is north of the runway at 1,000 ft AMSL. The airfield is equipped with approach and runway lighting for night and instrument flight rules operations.

Both runway directions (07 and 25) are equipped with RNAV (GPS) and instrument approach and departure procedures. For helicopters approaching from the north way-point JUIST is the Initial Approach Fix (IAF) for RNAV (GPS) Y RWY 07/25 approaches.



RNAV (GPS) Y RWY 07/25 instrument approach procedure for helicopter

Source: DFS-AIP

At the day of the occurrence between 0800 hrs and 1000 hrs three more helicopters and one airplane departed for VFR offshore flights and one helicopter for an IFR offshore flight.

Flight Recorder

The helicopter was equipped with a Universal flight CVR30 cockpit voice recorder and a Fairchild F 1000 flight data recorder. According to the test report electronic equipment No: 1001-2017, both recorders had last been tested on 28 August 2017 by a specialised company.

With the help of a specialised avionics company the BFU has downloaded the data of both recorders. It was determined that the FDR had recorded a total of approximately 1,361 hours of data without time stamp, of these only about 15 hours were flight data. The rest of the time only the parameter zero had been recorded. The specialised avionics company determined that the FDR changed into recording mode without recording any parameters or generating an error message. Neither of the recorded flights met the course of the flight at the day of the occurrence.

The download of the CVR showed a recording which is characteristic for a belated deletion of the recording. On enquiry by the BFU the pilots and the technicians stated they had not deleted the CVR recording.

With the aid of the CVR manufacturer in the USA the BFU was able to reconstruct the recording, which is about 30 minutes long. The recording began at about 0858 hrs during the descent shortly before reaching 100 ft GND. It continued until the battery and the engines were switched off after the landing. In the background of the recording the conversation after the landing between the PIC and one of the passengers can be heard. The ground run of the helicopter for engine wash was recorded. Also recorded were two other sign offs from Emden Info via radio transmissions from different crews in other helicopters. So far, these could not be correlated with a time or day.

The flight path was recorded by radar and ADS broadcast. The BFU was provided with the radar and the FlightRadar24 recordings.

Findings on the aircraft

On the afternoon of 23 October 2017 after the occurrence a short ground run for engine wash was conducted.

On 2 November 2017 another ground run, the first after the occurrence, including a DAFCS check was performed. Multiple tests with engaged cyclic stick trim function produced error-free Level 1 and Level 2 results.

Fire

There was no evidence of in-flight fire.

Organisations and their Procedures

The owner of the helicopter was an operator, certified by the Luftfahrt-Bundesamt, with their own maintenance organisation. The main focus of the company was commercial offshore flight operations. The company owned five different twin-engine helicopter types with a total of nine helicopters. Depending on the type flight operations occurred in single or multiple pilot operations. Deployment of the S-76B was only planned until the end of 2017 / or the beginning of 2018. As a result the number of crews for commercial flight operations was reduced to three (three PICs and three co-pilots).

The serious incident occurred at a time where the company was in the midst of reorganisation. It encompassed the postholder positions, the revision of the procedures, the training, and internal reporting.

The Operation Manual (OM) Part A Chapter 8 Operating Procedures included, among others: Chapters 8.1.1 ff Minimum Flight Altitude; 8.1.4 ff Enroute Operating Minima for VFR Flights or Portions of a Flight; 8.3.1 ff VFR/IFR Policy; 8.3.4 ff Audio Voice Alerting Device (AVAD); 8.3.18 ff Policy for Use of Autopilot; 8.9.1 ff Crew Concept and Procedures. The company also had the Standard Operating Procedure (SOP) "Conduct of Multi Crew Operation MCC". Chapter 4.2 describes crew duties, tasks of the PF and the PNF and mutual monitoring.

The OM Part A Chapter 1.4 Authority, Duties and Responsibilities of the Pilot-in-Command/Commander describes among other things: *[...] ensures that flight recorders (if installed): are not disabled or switched off during flight, in the event of an accident or an incident that is subject to mandatory reporting: are not intentionally*

erased, are deactivated immediately after the flight is completed, are reactivated only with the agreement of the investigating authority [...]

Aeronautical Regulations

Commercial helicopter offshore operation generally has to be conducted in accordance with Regulation (EC) 965/2012 and after 1 July 2018 considering the amendments with Regulation (EC) 1199/2016.

SPA.HOFO.110 Operating Procedures requires for an approach, among others:

a) The operator shall, as part of its safety management process, mitigate and minimise risks and hazards specific to helicopter offshore operations. [...] (5) pilots make optimum use of the automatic flight control systems (AFCS) throughout the flight; (6) specific offshore approach profiles are established, including stable approach parameters and the corrective action to be taken if an approach becomes unstable; (7) for multi-pilot operations, procedures are in place for a member of the flight crew to monitor the flight instruments during an offshore flight, especially during approach or departure, to ensure that a safe flight path is maintained; (8) the flight crew takes immediate and appropriate action when a height alert is activated; [...]

Additional Information

Helicopter Offshore Operations in Germany

Since 2010 with the construction and operation of offshore wind energy convertors a new field of activity has developed for helicopter operators in Germany. Helicopters were increasingly used to supply medical emergency aid for offshore workers and transport of personnel and material. In the beginning there were just a few flights, by 2016 the number had increased to about 14,000 per year. Due to the aeronautical regulations and the airspace and procedure specifications these flights have so far essentially been conducted in accordance with Visual Flight Rules (VFR). In the European neighbouring states the offshore flights in connection with oil and gas production are essentially conducted in accordance with Instrument Flight Rules (IFR) due to the unpredictable weather or often marginal visual meteorological conditions.

Route System North Sea in the German Area of Responsibility

For helicopter offshore operations in the North Sea area a way-point and route system including stipulated vertical separation and communications procedures were compiled on the initiative of several operators and in agreement with the Deutsche Flugsicherung (German Air Navigation Services, DFS). Since September 2014 a majority of the offshore companies are committed to adhere to this way-point grid and the procedures.

In October 2017 the Deutsche Flugsicherung published the AIP AIC VFR 03/17 *Reporting point network and special alerting service for helicopters in the North Sea of the Bremen Flight Information* as information and recommendation.

The way-point grid connects with the route system of Denmark and the Netherlands. Contrary to Germany, the aeronautical charts (AIP NL ENR 6.3-1 and AIP DK ENR 6.5-1) of these states specify Helicopter Main Routes (HMR), Helicopter Traffic Zones (HTZ) and Helicopter Protection Zones (HPZ) in binding form. The respective AIPs describe helicopter VFR, VFR-Night and IFR flights above sea or the general IFR and VFR procedures were amended accordingly. The way-point grid of Denmark connects with the one of Norway (AIP NOR ENR 6.4-1). Norway issued extensive procedures in their AIP Supplement (AIP AIRAC SUP 10/17, PROCEDURES FOR HELICOPTER OPERATIONS ON THE NORWEGIAN CONTINENTAL SHELF).

Comparable Occurrences

The US American Federal Aviation Administration (FAA) defines Controlled Flight Into Terrain, Loss of Control, and Situational Awareness as follows:

- a. Controlled Flight into Terrain: CFIT occurs when an airworthy aircraft is flown, under the control of a qualified pilot, into terrain (water or obstacles) with inadequate awareness on the part of the pilot of the impending collision.*
- b. Loss of Control: The term, loss of control, refers to emergency situations from which a pilot may have been able to recover but did not, such as problems with situation awareness, recovery from windshear, mishandling of an approach, and recovery from a stall.*
- c. Situational Awareness: Situational awareness means the pilot is aware of what is happening around the pilot's aircraft at all times in both the vertical and horizontal*

plane. This includes the ability to project the near term status and position of the aircraft in relation to other aircraft, terrain, and other potential hazards.

The Flight Standards Directorate of Pakistan describes in AIR SAFETY CIRCULAR ASC-010 STANDARD OPERATING PROCEDURES: *Several studies of crew performance, incidents and accidents have identified inadequate flight crew monitoring and cross-checking as a problem for aviation safety. Therefore, to ensure the highest levels of safety each flight crewmember must carefully monitor the aircraft's flight path and systems and actively cross-check the actions of other crew members. Effective monitoring and cross-checking can be the last barrier or line of defense against accidents because detecting an error or unsafe situation may break the chain of events leading to an accident. Conversely, when this layer of defense is absent, errors and unsafe situations may go undetected, leading to adverse safety consequences. [...] Crew monitoring performance can be significantly improved by developing and implementing effective SOPs to support monitoring and cross-checking functions, by training crews on monitoring strategies, and by pilots following those SOPs and strategies. [...]*

Occurrences and accidents comparable with this serious incident occurred in many cases in the past during marginal visual meteorological conditions or at night.

A short list of similar accidents:

NTSB/AAR-06/02: 23 March 2004, S-76A++, Controlled Flight Into Terrain (W) during Night

AAIB Report 7/2008: 27 December 2006, SA365N, [...] when preparing to land on the North Morecambe platform, in the dark, the helicopter flew past the platform and struck the surface of the sea.

CIAIAC Report A-002/2010: 21 January 2010, AW139, [...] crashed in a controlled flight into water, inadvertently by the crew [...]

AAIB Report 1/2011: 18 February 2009, EC225 LP, [...] the flight crew made a visual approach to the platform during which the helicopter descended and impacted the surface of the sea. [...]

BFU 3X006-14: 28 February 2014, BK117 C-1, crashed into water at night

Investigator in charge: Axel Rokohl

Assistance: George Blau, Thomas Kostrzewa

This investigation was conducted in accordance with the regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (Flugunfall-Untersuchungs-Gesetz - FIUUG) of 26 August 1998.

According to the law the sole objective of the investigation shall be the prevention of future accidents and incidents. It is not the purpose of this activity to assign blame or liability or to establish claims.

Published by:

German Federal Bureau of
Aircraft Accident Investigation

Hermann-Blenk-Str. 16
38108 Braunschweig

Phone ++49 531 3548-0
Fax ++49 531 3548-246

Mail box@bfu-web.de
Internet www.bfu-web.de