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INVESTIGATION REPORT

Serious incident to the AIRBUS - AS 365 - N3 "Dauphin" registered F-GYLH

on 11 February 2021
off the coast of Le Havre (Seine-Maritime)

Time	Around 19:52[1]
Operator	Le Havre - Fécamp pilot station
Type of flight	Aerial work - Helicopter hoist flight
Persons on board	Pilot, hoist operator, two passengers
Consequences and damage	None
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation. As accurate as the translation may be, the original text in French is the work of reference.	

[1] Except where otherwise indicated, the times in this report are in local time.

Near-collision with the water surface, during a night flight

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on the CVFDR[2] combined flight recorder as well as on statements.

The pilot took off from Le Havre-Octeville airport for a night VFR flight at 19:49:19, after announcing on the A/A frequency that they would be taking off from 0 4, climbing 700 ft, making a left turn heading 2 7 0, on an outbound leg of 10 NM. The objective of the mission was to hoist down two marine pilots onto two oil tankers waiting to enter the port of Le Havre (see paragraph 2.1). The hoist operator was in the middle of the central bench seat[3] and the two marine pilots were on the rear bench seat.

At 19:49:42, on passing 760 ft, the autopilot's 'HDG' (heading) upper mode was engaged and the helicopter turned left to the pilot's selected heading of 270°. The pilot thought that he had also engaged the 'ALT' (altitude hold) mode, which was not actually the case. The helicopter started to descend during the turn.

At 19:49:55, the pilot contacted the radio operator of the vessel on which the first set-down was to be made and a dialogue took place concerning the positions and directions of each. The exchanges lasted for about one minute. During this time, the hoist operator also talked with the pilot about the position of the vessel. They focused on identifying the vessel via the AIS[4] (see paragraph 2.3.1) and the helicopter's onboard weather radar.

At 19:50:36, on passing 500 ft, the "DH" aural and visual warnings of the radio altimeter (installed on the right side of the instrument panel) were activated in front of the pilot (see paragraph 2.3.3). These warnings occurred in the middle of a message from the radio operator of the vessel to the pilot. The pilot did not notice them.

[2] The event is present in its entirety in the cockpit voice recording. However, due to numerous breaks in the recording, it is only partially present in the flight data recordings, see paragraph 2.4.

[3] The left front seat of the helicopter was unoccupied.

[4] Automatic Identification System.

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At 19:50:52, the aural warning of the second radio altimeter (installed on the left side of the instrument panel and set to 300 ft) was activated in turn. It also sounded in the middle of a message from the radio operator of the vessel to the pilot and was associated with the "**DH**" visual warning on the second radio altimeter. The pilot did not notice the aural nor the visual warning.

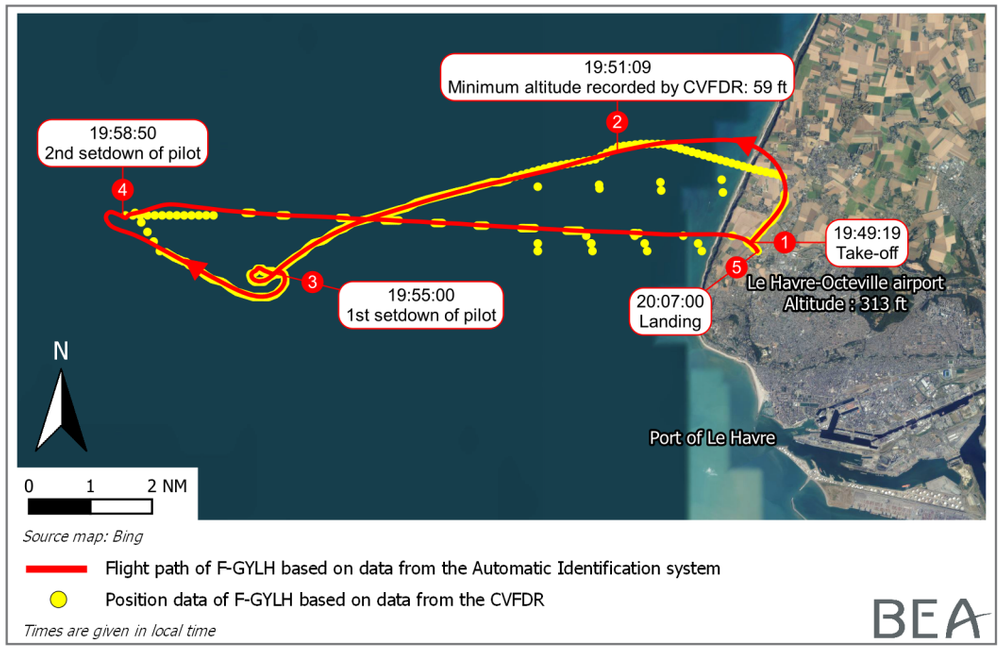
The 16 s interval between the two radio altimeter warnings corresponded to an average vertical speed of about -740 ft/min.

At 19:51:07, one of the helicopter passengers reported over the intercom that they were flying very low, to which the hoist operator replied that yes, they were flying really low. As the pilot corrected his path to climb back to 800 ft, he saw a height of about 60 ft on the radio altimeter, along with the following autopilot upper mode couplings: CPL, FD and HDG set to ON, ALT[5] set to OFF.

[5] CPL: Coupling; FD: Flight Director; ALT: Altitude. See paragraph 2.3.2.

The minimum recorded altitude was 59 ft. During the descent, the speed reached 158 kt and thus exceeded the maximum never-exceed speed (VNE) by 8 kt (see paragraph 2.3.4).

The rest of the flight was uneventful with the marine pilots being hoisted down onto the two vessels and the landing at Le Havre airport at 20:07. During the return flight, the pilot and the hoist operator talked about the event and the low height reached on the outbound flight.



Source: BEA

Figure 1: F-GYLH flight path and partially invalid CVFDR position data

2 - ADDITIONAL INFORMATION

2.1 Pilot station activity and organisation

2.1.1 Activity

The mission of Le Havre-Fécamp Pilot Station is to set down or pick up marine pilots on vessels entering or leaving the ports of Le Havre, Antifer and Fécamp. It has harbour launches and an AS 365 helicopter.

The pilots are mainly transferred by the harbour launches. The helicopter is used when the vessels are far from the coast or when the sea is rough. The personnel is then transferred by making a deck landing or by hoisting from a helicopter.

2.1.2 Organisation

Le Havre-Fécamp pilot station is managed by a president who is a member of the maritime pilots union. He is elected by his peers and is a marine pilot. The same applies to the head of the helicopter department who is the Accountable Manager according to the meaning of European Regulation (EU) No 965/2012 known as "*AIR OPS*[(6)]". The latter coordinates the activities of the helicopter crews with those of the union's marine pilots. The president and Accountable Manager were elected in April 2020, less than one year before the incident. They had no particular aeronautical experience.

[(6)] Regulation of 5 October 2012 laying down technical requirements and administrative procedures related to air operations.

The two helicopter pilots (respectively Flight Operations Manager and Safety Management System Manager) as well as the two hoist operators are employees of the pilot station. The compliance monitoring function (in particular the carrying out of internal audits) is outsourced.

2.2 Crew information and statements

2.2.1 Pilot-in-command

The 59-year-old pilot held an Airline Transport Pilot Licence - Helicopters (ATPL(H)).

He was a former pilot of the French Army Light Aviation (ALAT) and then of the French Navy. He joined the operator in 2000. He acted as the Flight Operations Manager.

At the time of the incident flight, he had logged 6,650 flight hours, 5,250 h of which in an AS 365 and 1,802 h of which at night. He had logged more than 16,700 hoist operations and more than 4,700 deck landings. His recent experience was 40 flight hours in the last 3 months, 45 minutes of which in the previous 7 days and 12 minutes of which in the previous 24 hours.

The following information is based on his statement and aims to supplement the history of the flight.

Regarding the incident flight, he stated that after take-off, he had not been able to see any light outside nor the coastline. He explained that at night, he follows the instrument flight rules, with his head in the cockpit most of the time, without looking outside.

After having stabilised at an altitude of approximately 700 ft, he thought he had engaged the autopilot's HDG and ALT upper modes in one movement and at the same time, as he usually did. Thus, for him, the helicopter was in altitude hold mode at the current altitude and he continued the flight sequence in a routine way, contacting the vessel and focusing on the weather radar to locate it on a heading of 260° for 7 NM. He did not feel the physiological effects of the helicopter's descent and associated the vertical speed indicator fluctuations with the turbulence of a fairly strong east wind contributing to a relative inaccuracy of the parameters held by the autopilot, especially in altitude hold mode. He thought afterwards that he had not engaged the ALT mode and that he had not noticed the two warnings transmitted by the radio altimeters set to 500 ft and 300 ft. He had not realised that he had exceeded the VNE.

When he returned to his flight instruments, he read a height of 60 ft on the radio altimeter and a vertical speed of -700 ft/min. He immediately applied a 5° nose-up input, without increasing engine power and maintained a zero bank angle. He stated that, at about the same time, one of the passengers said that the aircraft was flying very low.

The flight then continued without further incident with an Airborne Radar Approach (ARA) procedure on the first vessel, followed by a visual approach on the second one and finally a return to the airport.

He added that the operating context with the operator had been socially disrupted for several years, with changes in working conditions for employees that he considered as unsuitable, as well as successive resignations of four hoist operators over the last two years and the recruitment of new operators with no flight and hoisting experience, against the wishes expressed by the helicopter pilots. This situation therefore imposed an in situ and "*on-the-job*" training of new operators after the departure of the most experienced operators. He believed this had degraded flight safety and questioned whether these concerns may have been related to the incident.

2.2.2 Hoist operator

The hoist operator was recruited by the operator in March 2020, just under one year before the event. At the time, he held a Part 66 aircraft maintenance licence but had no hoisting or flying experience. He stated that his predecessor had trained him by sharing his expertise and that based on what he had been taught and had to replicate, he had only to answer the pilot's needs. He added that he did not feel sufficiently comfortable, from an educational and technical point of view, to train the new hoist operator who had just been recruited, with no flight and hoisting experience.

He explained that before the incident, he had already taken steps to leave the operator because his status and employment contract did not meet his expectations. He stated that in his view, his intention to leave the company did not impact his behaviour during the incident flight.

At the time of the incident, he had logged 112 flight hours, all in an AS 365, 50 hours of which at night. He had logged about 600 hoist operations and 50 deck landings. His recent experience was 47 flight hours in the last 3 months, 2.5 hours of which in the previous week and 1.5 hours of which in the previous 24 hours.

On the incident flight, he carried out the cross-check with the pilot after the take-off (see paragraph 2.4), before focusing on the AIS to locate the first vessel and to prepare for the hoist operation.

He stated that, generally, he did not pay attention to the very short cruise flight and focused on his own duties. He did not realise that the helicopter was descending and he did not hear the aural warnings of the radio altimeters.

2.2.3 Passenger who identified low height

The passenger in the left rear place near the window explained that the beginning of the flight had been normal until passing the coastline after take-off, when he had the impression that the helicopter was descending, as he was able to see the Seine and the lights of Deauville and Honfleur. The pilot was busy on the radio and the hoist operator was watching the AIS. After a few seconds, he looked for visual confirmation of the altitude and realised they were low when he saw buoys in the sea and light reflected in the water. He reported his feeling that they were flying low over the intercom and felt the helicopter gain altitude. The flight continued without further incident.

He added that the whole flight had taken place in a very professional atmosphere, as usual.

2.3 Helicopter information

The AS 365 N3 is a twin-engine helicopter with retracting landing gear and a maximum take-off weight of 4,300 kg. It is certified for day and night single-pilot flights under VFR and IFR.

It is equipped with an emergency floatation system and a variable speed electric hoist installed on the right side.

The passenger cabin has a two-place central bench seat, one place is reserved for the hoist operator, and a four-place rear bench seat. From his position, the hoist operator can see the instruments on the instrument panel.

Figure 2: cabin configuration and view from the hoist operator's place

2.3.1 AIS and weather radar

The AIS equipment has a removable screen that displays the location of vessels and their identification based on their transponder code. It also provides various information such as their heading, speed and rate of turn, as well as the route and distance to reach them. It is used by the crew to unambiguously identify their destination ship when there are a large number of vessels.

Helicopter pilots also use their weather radar to locate the vessels they need to reach.

2.3.2 Autopilot

The autopilot has upper modes that relieve the pilot of certain hold and/or navigation tasks (such as HDG, ALT, VS, AS, NAV, GS, LOC). These modes can be coupled (CPL coupling mode engaged) and in this case the tasks are executed via the autopilot. These modes can also be limited to providing flight information to the pilot via V-bars displayed on the artificial horizon (FD mode only engaged). In this configuration, the parameters continue to be held manually by the pilot.

The ALT upper mode is an altitude hold mode and does not allow the pilot to reach a preselected altitude.

The HDG upper mode allows the pilot to reach the desired heading displayed on the horizontal situation indicator (HSI).

2.3.3 Radio altimeter

The helicopter is equipped with two radio altimeters giving the height of the aircraft: one is located in front of the pilot's seat and the other in front of the co-pilot's seat. The radio altimeter is one of the main flight instruments used by the F-GYLH pilots during flights over the sea and when approaching vessels.

A decision height (DH) can be set for each instrument. During a descent and when passing the set DH, a non-persistent aural warning sounds. A "**DH**" yellow light remains illuminated for the time the value of the radio altimeter is below the DH (see Figure 3).

For the pilot in the right seat, the radio altimeter on the opposite side is not clearly visible.

The operator's procedures require that the DHs of both radio altimeters are set to 300 ft during day flights, and to 300 ft on the LH radio altimeter and 500 ft on the RH radio altimeter during night flights.

Source: BEA

Figure 3: LH and RH radio altimeters circled in yellow; radio altimeter set with DH of 500 ft for a height of 0 ft

2.3.4 Maximum never-exceed speed (VNE)

In 2008, following reports of failed horizontal stabilizers on AS 365 N3s, Airbus Helicopters issued the Emergency Alert Service Bulletin 01.00.60 (which was made mandatory by EASA via airworthiness directive AD 2008-0204[7]) limiting the VNE to 150 kt and the vertical speed to -1,500 ft/min when the indicated airspeed is greater than 140 kt.

A service bulletin (SB AS365-55.00.06) was also available and made it possible to waive this limit by embodying a modification on the horizontal stabilizer. The F-GYLH helicopter did not undergo this modification and thus could not waive these limits.

2.4 Flight recorder information

Current regulations do not make it mandatory to carry a flight recorder on this type of aircraft during this type of operation as this is a non-commercial air transport operation with a complex aircraft, governed by the NCC part of the "AIR OPS" European Regulation, and a hoisting operation governed by the SPO part of the same regulation.

Following the accident to the AS 365 N3 registered F-GYPH on 8 September 2005 off Cap d'Antifer (76)[8], in which the helicopter collided with the water surface during a night flight, the operator decided to purchase a new Dauphin helicopter, F-GYLH, equipped with a flight recorder.

[7] https://ad.easa.europa.eu/ad/2008-0204R1

[8] https://www.bea.aero/fileadmin/documents/docspa/2005/f-ph050908/pdf/f-ph050908_05.pdf

The flight recorder is a Honeywell ARCOMBI combined CVFDR. This recorder is both a voice recorder (CVR) and a flight data recorder (FDR).

The incident flight data has 58 breaks in the recording, 10 of which occurred during the critical phase of the event. There is also invalid data. The minimum altitude recorded was 59 ft, but it is possible that a lower altitude was reached during the breaks in the recording. The AIS data does not contain any altitude information. The radar path data retrieved from the Athis-Mons Area Control Centre (ACC/N) only covers a portion of the return leg.

The audio content recording is complete, with no data breaks.

[9] Multi Flight Data Acquisition Unit.

The helicopter is equipped with a MFDAU[9] which centralises flight parameters and their transmission to the CVFDR.

The helicopter pilots reported that for at least four years, the FDAU light had been illuminating intermittently on the ground and in flight. The MFDAU computer had been replaced in 2017, but the problem persisted. The problem of breaks in the recording had not been identified in the scheduled maintenance checks. The search for this type of failure is not described in the work cards used or in the applicable regulations.

The MFDAU was removed by the BEA and examined at Safran Electronics & Defense, the equipment manufacturer. The examination showed that the MFDAU had a power supply fault which caused a break in the transmission of flight data to the CVFDR and therefore a break in the recording.

The MFDAU was replaced after the event. The FDAU light on the pedestal continues to light up intermittently when the helicopter starts up. The operator and the maintenance operator continue to try to understand and solve the problem.

2.5 Flight procedure information

The Operations Manual (OM) applicable at the time of the incident stated in Part A:

Use and management of upper modes (AMC1 SPA.HOFO.110(b)(5))

In operation, the flight is systematically carried out with the autopilot in operation.

The use of the upper modes is a valuable piloting aid, especially in IMC, degraded or night conditions. Nevertheless, particular attention must be paid to their management in order to avoid confusion between the two modes or an oversight during a critical phase of flight.

At night and under IMC conditions, the pilot systematically calls out the management of upper modes in all flight phases. At the end of the ARA approach at 300 feet, the pilot checks and calls out the status of the upper modes. The hoist operator checks the CPL and FD position as well as the input on the upper mode control pad, and that this input is in accordance with the pilot's call out.

The paragraph was supplemented by the following summary table:

Gestion du pilote automatique et des modes supérieures				
Phases de vol	Commandes PA			Appel Equipage
	PA	CPL	FD	
Avant stationnaire	X	X	X	Pilote : « PA / CPL / FD enclenchés » Mécano : « Checke »
Après décollage	X	X	X	Pilote annonce l'enclenchement des modes supérieurs si utilisés (GA / VS / HDG / NAV)
Transit	X	X	X	Pilote annonce l'enclenchement des modes supérieurs si utilisés (HDG / NAV / ALT / AS) Mécano « checke »
Avant présentation navire de jour	X	X / -	X	Pilote annonce l'enclenchement des modes supérieurs si utilisés (HDG / VS). Pilote annonce les positions « CPL » et « FD » s'il conduit sa présentation en FD Mécano « checke »
Avant présentation navire de nuit	X	X / -	X	Pilote annonce l'enclenchement des modes supérieurs si utilisés (HDG / VS). Pilote annonce les positions « CPL » et « FD » s'il conduit sa présentation en FD Mécano checke la position du CPL et FD conforme à l'annonce du pilote

Source: Le Havre - Fécamp pilot station

Figure 4: excerpt from OM A.8.3 - Management of autopilot and upper modes

Helicopter pilots and operators indicated during the investigation that this part of the OM was only rarely complied with in flight and that the procedures actually used in flight were those in the checklists in Part B of the OM. For example, the call outs with regard to the autopilot upper modes were not systematically made by the pilots and were therefore not checked by the hoist operators. In addition, no "*Transit*" procedures were performed. During the incident flight, no autopilot upper mode call out was made after take-off or in transit.

It should also be noted that there is no requirement to systematically engage the ALT upper mode in transit and that simply calling out the engaged modes may not be sufficient to identify an oversight.

According to the OM and the checklists that were used in flight, the hoist operator had to call out the items and the pilot had to acknowledge. In practice at the operator's, the checklists were performed as to-do-lists and recited by heart by the hoist operator who made the call outs and the acknowledgements.

There was no checklist for the cruise flight phase because this phase was considered too short and therefore did not incorporate the items of the "*Transit*" phase of OM A.

The last applicable checklist before the cruise phase was the "*After Take-off*" checklist which did not contain any items about the autopilot:

DEPART TERRAIN

AVANT DECOLLAGE	
Passagers	*Attachés*
Téléphone portable	*Sur arrêt*
Bouchon	*En place*
Radios sondes	*Jour 300Ft gauche et droite* *Nuit 500Ft à droite*
Calages altimètres	*QNH à gauche et à droite*
Chauffage	*Sur arrêt*
Parking	*Desserré*
Roue avant	*Libre*
Phare	*allumé*
PA / CP / FD	***Sur ON***
Paramètres et tous voyants	***Vérifiés / corrects***
Contact radio	*Effectué*
APRES DECOLLAGE	
Train	*Rentré verrouillé,* *Voyants éteints*
Phare	*Eteint*

Source: Le Havre - Fécamp pilot station

Figure 5: excerpt from the Field Departure checklist

2.6 Management system information

Following the implementation of "AIR OPS" regulation Parts NCC and SPO, the operator introduced a compliance and safety management system in 2017. This system highlighted a number of dysfunctions and areas for improvement by the operator.

According to the RCC's annual internal audit report issued in December 2019, this audit had to be delayed due to unforeseen and extraordinary circumstances at the operator's, generating an aircraft downtime. Unusual situation at the operator's: due to managerial difficulties, the operator was facing difficulties with the departure of a hoist operator, the sick leave for "burn-out" of the second hoist operator a few months later and the helicopter downtime due to the absence of operators.

The audit was rescheduled for February 2020 and the following points were mentioned in the audit report.

This audit highlighted a noticeable decrease in the helicopter department's performance level and aircraft dispatch rate over the 2019 period, with numerous helicopter downtimes for technical and human reasons. At the same time, a significant increase in non-conformities was noticeable in this audit in contrast to the previous one.
The operations personnel made increasing demands on the management system part in order to report operating methods and managerial decisions that had a negative impact on the daily operations of the flight crew personnel. These crew reports (verbal and written) highlighted a "human factors" type of problem linked to changes in social conditions within the company.

This problem resulted in the helicopter department personnel gradually, even suddenly, becoming less implicated, associated with communication difficulties with the Accountable Manager and the station's executive branch. This situation, which became firmly established, generated a slow but sure drift in the operational standards of the operator, a decrease in the level of attention during the service time and the crew members lack of professional implication. It created blocking points in the daily operations and fostered a conflictual environment.

Aeronautical history tends to show that the accumulation of these factors within a small entity, with few members operating in crews made up during flight operations and carrying out complex/atypical missions, contributes at best, and even leads at worst, to an increase in human errors and de facto increases the risk of incidents or even accidents.

Meetings were held on several occasions between the crew members and the executive branch. The problem has not yet been solved, and must be monitored closely by all stakeholders.

The French civil aviation safety directorate (DSAC), which is the oversight authority, had been informed in 2019 of the situation, in particular by the questions posed by the helicopter pilots who wanted to know what were the regulatory requirements regarding the training of hoist operators. The DSAC reply indicated that there was little information in the relevant regulations regarding SPO and NCC activities and that they should use the operator's best practices, experience and risk management system[10]. No other specific action was taken by the DSAC prior to the incident.

The internal audit report issued in November 2020, however, showed a real improvement in the operator's performance and a significant decrease in the number of non-conformities compared to the 2019 audit. More importantly, the change of Accountable Manager, which took place in the second quarter of 2020, was the occasion for a new impetus, reviving a culture of openness and taking into account the technical crew.

The risks identified in the previous year, mostly relating to tensions between the technical crew and the executive branch, were, for the most part, resolving themselves due to the renewed collaboration between the two parties.

However, some social difficulties continued, with in particular the recruitment of new hoist operators without flight and hoist operation experience.

2.7 Meteorological information

The flight took place under CAVOK weather conditions, with light to moderate turbulence in an easterly wind of 17 kt with gusts up to 27 kt.

The Le Havre-Octeville airport METAR at 19:30 indicated the following:

LFOH 111830Z AUTO 10015KT CAVOK M00/M08 Q1023 TEMPO 10017G27KT

Météo-France estimated that the luminosity conditions during the flight were those of a dark night: sunset had taken place at 18:11, it was a new moon and a layer of altocumulus was present at 10,000 ft.

3 - CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation. They are not intended to apportion blame or liability.

Scenario

During a night flight and upon entering the cruise phase, shortly after take-off, at approximately 700 ft above sea level, the pilot-in-command thought that he had carried out an action to engage the autopilot 'ALT' (altitude hold) upper mode. He did not check the result of his action and did not detect that the ALT mode was not actually engaged. While turning, the helicopter gradually lost altitude at a vertical speed of about -700 ft/min.

The aural and visual warnings of the two radio altimeters, set to 500 ft and 300 ft, were not noticed by the pilot or the hoist operator who were focused on managing the radio communications and locating the vessel. The pilot did not notice that during the descent, the helicopter's speed exceeded the maximum never-exceed speed (VNE).

[10] A few days before the event, the European Safety Promotion Network - Rotorcraft published a guide giving recommendations for hoist operator training https://www.easa.europa.eu/community/system/files/2021-02/ESPN-R%20T4S%20HOIST%20OPERATOR%20TRAINING%20GUIDE%20V1.0.pdf

A few metres above the water surface, one of the passengers reported to the crew his feeling that they were flying very low. At about the same time, the pilot detected the low height indicated by the radio altimeter and regained control of the path.

The flight continued without any other incident with the setting down of the two passengers by hoist.

Contributing factors

In the context of a short, routine, single-pilot flight in a complex aircraft that took place during a dark night, the following factors contributed to the near collision with the water surface:

- Lack of monitoring of flight parameters such as altitude, speed and autopilot modes engaged, which can be explained in particular, by the pilot's and hoist operator's workload in this very short flight phase.
- The fact that the pilot and hoist operator did not notice the aural and visual warnings of the radio altimeters signalling that the aircraft was getting closer to the ground, which can particularly be explained by the low aural and visual salience of the radio altimeter warnings when passing the decision height (DH).
- Inaccuracies and contradictions in the OM flight procedures, which, for example, did not make it compulsory to engage the ALT mode in cruise phase at night or under IFR conditions and did not require a checklist to be gone through during this very short flight phase.
- Non-application of the OM flight procedures which required the pilot to call out, and the hoist operator to check, the upper modes engaged. This non-application of procedures can be explained by the fact that the written flight procedures were not sufficiently adapted to the reality of operations.
- Operational training of ab initio hoist operators which meant that there was a small tolerance margin for pilot-in-command's errors and omissions in a single-pilot situation.

It is possible that the pilot's concerns about the company's operational and social context, although improving over the past year, may have influenced his situational awareness at the time of the event.

Safety measures taken by the operator

Shortly before the incident, the operator's management system had identified internal weaknesses and brought them to the attention of management and the oversight authority, but these weaknesses had only been partially addressed by these two stakeholders.

Following the incident, the operator implemented a number of flight safety measures including:

- Redesign of flight procedures and associated checklists, particularly with regard to the use of autopilot upper modes:
  - simplification and revision of OM Part A regarding flight procedures and revision of OM B checklists;
  - introduction of a cruise checklist, after take-off and before initial contact with the vessels, then after the last vessel contact and before the return to the airport, with the following items: "*RADAR: ON*" and "*UPPER MODES: ALT + HDG*" must be engaged
  - during night flights or IFR flights;
  - introduction and systematic application of the principle of call-outs for the checklists, particularly where the actions of displaying and changing the autopilot mode are called out by the pilot-in-command and are checked and read back by the hoist operator.

- Implementation of new initial training for hoist operators:
  - Technical Crew Member initial training outsourced to a specialised organisation;
  - initial training in hoist operations outsourced to a specialised organisation;
  - recruitment of a new hoist operator with proven flight and hoist operation experience.
- Search for a solution to make the aural warning of the radio altimeters more obvious or to add an acknowledgement system.