

AAIU Report No.	2000/011
AAIU File No.	1999/0042
Aircraft Type and Registration:	Eurocopter AS365Fi Dauphin Air Corps No. 248
No. and Type of Engines:	Two, Turbomeca Arriel 1M
Aircraft Serial Number:	6203
Year of Manufacture:	1986
Date and Time (UTC):	01 July 1999, 23:40 hours approx.
Location:	Adjacent Tramore Strand, Co. Waterford 52° 09.061' N 007° 06.081' W.
Type of Flight:	Military Search and Rescue (SAR)
Persons on Board:	Crew - Four
Injuries:	Crew - Four Fatal
Nature of Damage:	Aircraft Destroyed
Commanders Licence:	Military
Commanders Age:	30 Years
Commanders Flying Experience:	Total All Types - 2910 hours Total on Type - 808 hours Last 90 days - 99 hours Last 28 days - 30 hours
Information Source:	ATC Watch Manager, Shannon Airport. AAIU Field Investigation.

SYNOPSIS

The accident was notified to the Air Accident Investigation Unit (AAIU) by the duty Watch Manager, Shannon ATC. It was agreed jointly by the Minister for Defence and the Minister for Public Enterprise that this fatal accident would be investigated under SI No. 205 of 1997 Air Navigation (Notification and Investigation of Accidents and Incidents) Regulations 1997 with the necessary modifications, including the modification that the investigation would be led by Lieutenant Colonel Thomas Moloney, a suitably qualified officer of the Air Corps. The Minister for Public Enterprise appointed Lt Col Moloney as an Inspector of Accidents and he, in turn, was appointed as Investigator-in-

Charge of this accident investigation by the Chief Inspector of Accidents, Mr. Kevin B. Humphreys.

The investigation team consisted of Inspectors of the AAIU, (Messrs Graham Liddy, Frank Russell, Jürgen Whyte and John Hughes), Air Corps Officers (Comdt. Paul Farrell and Comdt. Kevin Daunt), a Principal Inspector from the UK Air Accidents Investigation Branch (AAIB), Mr. R. StJ. Whidborne and the Head of Military Psychology from the Swedish Armed Forces, Ms. Kristina Pollack. As is common practice in investigations of this nature, notices were published in the national media inviting submissions from any interested party.

The Irish Air Corps Dauphin DH248 arrived at Waterford Regional Airport on 01 July 1999 to commence a dedicated 24 hour Search and Rescue (SAR) service based at the Airport. At 21:02 hrs on the same day, the Marine Rescue Co-ordination Centre (MRCC) Dublin phoned SAR Waterford with initial details of a tasking. A 15 foot yellow boat, hereafter called the casualty vessel, had become lost off Dungarvan, Co. Waterford in very bad visibility.

MRCC tasked the Helvick Inshore Lifeboat and the Dauphin crew at Waterford. The Lifeboat went to the scene but was initially unable to find the casualty as the Lifeboat was not radar equipped. DH248 was launched to assist in locating the casualty with its on-board radar equipment. In the event, Helvick Lifeboat located the casualty and subsequently requested DH248 to provide navigational assistance back to Helvick Pier, as the Lifeboat's GPS (navigation system) was not functioning correctly. This assistance was readily provided by DH248 as requested and the Lifeboat, with the casualty vessel in tow, made its way slowly back to Helvick Pier.

The crew were advised that the weather conditions at Waterford Airport were deteriorating and the Aircraft Commander decided to return to base. DH248 carried out two unsuccessful Instrument Landing System (ILS) approaches to Runway (RWY) 21 at Waterford Airport and carried out a go-around after each one. The Aircraft advised Waterford Control Tower that they were then going to carry out a "coastal approach". During a probable go-around from this approach, DH248 impacted sand dunes, some 14 metres high, adjacent to Tramore Strand. There were no survivors. The aircraft was destroyed. There was severe post-impact fire.

1. **FACTUAL INFORMATION**

The accident occurred at approximately 00:40 hrs. local time on Friday 2nd July 1999. However all times in this Report are Co-ordinated Universal Time (UTC) except where otherwise stated. As UTC was one hour earlier than local time, for the purposes of this Report the accident occurred at 23:40 hrs approximately on 1st July 1999.

The Irish Marine Emergency Services (IMES) has, since the date of the accident, become known as the Irish Coastguard. For the purposes of this Report the term IMES is used throughout.

1.1. History of the Flight

1.1.1. Background

The Minister for the Marine initiated a review of East Coast Marine Search and Rescue, which reported in June 1996 with a recommendation that a 24 hour medium load carrying helicopter should be based in Dublin. The report further recommended that, once this helicopter became available at Dublin, consideration should be given to redeploying a Baldonnell based Air Corps Dauphin helicopter to another location to be determined. Subsequently, a contract was awarded to a commercial operator for the Dublin based operation and it was decided by Government that the Dauphin would be re-deployed on the South/Southeast Coast.

The contracted S-61 commenced its Dublin deployment on 01 July 1998 and on the same day, the Air Corps deployed an Alouette III helicopter to Waterford for daylight-only SAR. This was due to a shortage of experienced Dauphin crews to maintain rosters at both Finner and Waterford, due in turn to personnel retiring from military service. The Air Corps undertook to commence the 24 hour service with a Dauphin on 01 July 1999 and DH248 deployed to Waterford Regional Airport on that date.

DH248 departed from the Air Corps base at Casement Aerodrome, Baldonnell at 09:24 hrs and it arrived at Waterford Airport at 10:02 hrs. There was a crew of seven with the Dauphin, the Detachment/Aircraft Commander (P1), the co-pilot (P2), the winch-operator and the winchman along with a three-man technical crew.

On arrival, the Detachment Commander set a standard fuel quantity for the detachment at 600 kg. The background to this standard quantity is given at para 1.18.7. After each flight of the day the aircraft was refuelled back to 600 kg. This was done using the Waterford Airport fuel supply. The Waterford Airport log for 01 July 99 shows three uplifts of Jet A1 Fuel by DH248, 330 litres, 180 litres and finally 360 litres. The fuel quantity was checked by the technical crew switching on the aircraft battery and checking the fuel state on the gauge after each refuelling operation. Fuel quality checks were carried out on the day by airport staff and the fuel was certified as serviceable.

During the day, DH248 performed an RTÉ (the national broadcasting service) publicity flight, airborne at 11:41 hrs and back on the ground at 12:16 hrs.

On the afternoon of 01 July 1999, the crew of DH248 carried out a training exercise over the sea to the Southeast of Tramore. This flight was an in-theatre familiarisation flight and was also part of the assessment of the P2 for Dauphin SAR Command with the Detachment Commander acting in his capacity as an Instructor.

The aircraft departed from Waterford at 14:11 hrs and carried out Trans-downs and simulated emergencies over the sea. The weather was recorded as being "fairly poor" in a proforma signed off by the Detachment Commander following the flight.

At 14:53 hrs DH248 called Waterford Tower level at 300 feet, 12.7 miles Distance Measuring Equipment (DME) from Waterford Airport on the 230° radial. They were routing inbound via Newtown Head and requested the latest weather. At that stage, the visibility was given as "generally 10 km, 4000 metres to the south". DH248 gave its intentions as "one or two approaches from over the water".

At 14:57 hrs Waterford Tower called DH248 and passed an estimated cloudbase at Tramore of 150 feet. The Dauphin had seven miles to run to the Airport at that time. At 14:59:57 DH248 called 3 miles DME level at 200 feet, and the Tower replied that the lights for Runway (RWY) 03 were on.

At 15:00:41, DH248 called 2.2 miles DME with visibility of 1 km. They were on the reciprocal of the 030° radial inbound to Waterford and level at 200 feet. At 15:02:30 DH248 called right downwind for RWY 21 and at 15:04 they were cleared to land. The Dauphin landed at 15:06 hrs. The crew kept the aircraft rotors running, embarked the winch operator, and departed for a reconnaissance of Waterford Regional Hospital landing facilities at 15:10 hrs, returning to the Airport at 15:20 hrs.

After each of the flights during the day, the Dauphin was signed off by the Detachment Commander as serviceable, denoted by the letter "S", on the AF 478 Flying Detail, and on the Aircraft Technical Log. No defects were reported by the P1 to the technical crew, nor were any defects recorded in the Aircraft Technical Log following these flights. A minor repair was carried out on the intercommunications system at one of the rear crew positions to remedy a minor, intermittent defect.

During the day, the Detachment Commander held a detachment brief for all the flying and technical crew members. This took place at approximately 13:00 hrs, and it was described by the senior technician as being a very good brief, with emphasis on the fact that it was the first Dauphin detachment to Waterford, and the need for an effective and efficient response to any call-out. The senior technician stated that there was a very good crew spirit, with a "can-do" attitude from all involved. However, he also stated that the Detachment Commander had expressed his view that the Irish Marine Emergency Service (IMES) might try to "catch them out", especially with respect to the call-out times¹. The call-out times agreed to by the Air Corps for the 24-hour Waterford detachment are set out in paragraph 1.17.7.

¹ The Director of The Irish Coast Guard (formerly IMES), in response to the Draft Final Report, has written to the investigation stating the following:

“References are made in the report to a view, attributed to the Detachment Commander, to the effect that the tasking agency (IMES) might attempt to in some way “catch out” the crew in relation to response times. The Coast Guard wishes to place on record that, at all times and in respect of all taskings of declared facilities in the context of SAR incident management, the interest and safety of the crews are of paramount importance to MRCC and inform all its decisions.

No demands of an unreasonable nature nor any outside the terms of normal mutual understandings are made on declared facility crews.

The Coast Guard very sincerely regrets the loss of the Dauphin crew in the accident at Tramore on 2 July following its completion of a successful SAR mission.”

During the brief, the question of night operations was raised by one of the Air Corps technicians, since the Airport closes at 16:00 hrs UTC Monday to Friday. The Detachment Commander told the technician that the Control Tower and the Airport lighting would be his responsibility for night operations, and a brief with the Airport Manager was arranged. This brief was carried out in the Control Tower during the afternoon.

The technician who was briefed on the Tower and lighting had never before been in Waterford Airport, and he had no formal training in Control Tower, ATC or meteorological procedures, although he had previously carried out ground/air communications duties for the Dauphin SAR detachment when it deployed temporarily from Finner Camp to Carrickfinn Airport, Co. Donegal.

The technician informed the investigation that it was his understanding, from his conversation with the Detachment Commander, that communications/airfield lighting and other Tower functions would be his responsibility for any after hours call-outs. The technician stated that he had carried out a similar function previously in Carrickfinn Airport for a late night call-out, when the Air Corps had temporarily re-located the Finner-based SAR Dauphin to Carrickfinn.

The Airport Manager has informed the investigation that there was “no particular level of detailed discussion” during the day between himself and the Detachment Commander about night call-out roles. He has stated that the Detachment Commander was made aware during the day that there would be no ATC/AFISO personnel on-call for night call-outs. The Airport Manager’s understanding was that the Air Corps technician whom he briefed in the Control Tower would be performing Tower duties for any after-hours call-outs, while the Airport Manager would himself come in to provide a re-fuelling and limited Crash Rescue Service.

One potential problem area that was briefed by the Airport Manager to the Air Corps technician concerned the approach lighting. When this lighting is turned on at full intensity, this can trip a remote circuit-breaker located in the Fire Station, and cause a half pattern of the RWY 21 approach lighting to become inoperative until the circuit breaker is reset. This problem is further described in para 1.10.

While the Dauphin was away on the afternoon training flight, one of the technicians, who had remained at the Airport, could see rolling sea fog in the distance near Tramore. When the Dauphin returned to the Airport, he asked the Detachment Commander if they had been caught up in it but the reply was that the “*conditions had been grand*”.

Following the afternoon training flight, the aircraft was refuelled, washed down and towed into the Hangar, and the crew of seven departed the Airport to their Dunmore East accommodation at 16:15 hrs approx. They stopped at the shops en-route, and on arrival at the accommodation, the crew divided into three houses. The two pilots were in one house, the winch operator/winchman in another and the three technical personnel in the third.

1.1.2 The SAR Mission

A chart of the Waterford/Dungarvan area is attached at **Annex A**.

At **21:02 hrs**, the Marine Rescue Co-ordination Centre (MRCC) Dublin, which is the IMES co-ordination and communications centre, phoned SAR Waterford (at Dunmore East), with the initial details of the mission. The Detachment Commander took the call. The initial brief was that a boat had become lost off Dungarvan in very bad visibility. The skipper had a mobile phone, but there were no VHF Communications with the vessel. The Helvick Inshore Lifeboat was being called out but it was not radar-equipped. The missing boat was thought to be off the Black Rock, Dungarvan and was said to be a 15 foot yellow boat. The Detachment Commander said that the crew would get going and MRCC requested that he ring them from the Airport to get more information. A transcript of this conversation is shown at **Annex B**. The seven crew members departed immediately from Dunmore East and headed for Waterford Airport in what were reported by the senior technician to be foggy conditions, in a minibus driven by the winch operator. Records indicate that en route the Detachment Commander phoned the Airport Manager to inform him of the call-out.

At **21:09 hrs** MRCC again phoned the Detachment Commander as the crew were in transit between Dunmore East and the Airport. The purpose of this call was to stand-down the mission as MRCC had now instructed the casualty vessel how to operate their Marine Band VHF radio via their mobile phone. However, following a discussion between the Detachment Commander and MRCC concerning the local weather and the proximity of the search area to the SAR base, it was decided that the mission would go ahead. A transcript of this conversation is shown at **Annex C**.

On arrival at the Airport the senior technician asked the Detachment Commander whether he was happy with the 600 kg of fuel on DH248. The Detachment Commander, in consultation with the co-pilot, stated that he was happy and no further fuelling was carried out. A fuel load of 800 kg would have brought the Dauphin to its maximum certificated take off weight.

At **21:30 hrs**, the P1 phoned MRCC from the Airport saying they were about to launch, and looking for updated information. MRCC informed them that the Helvick Inshore Lifeboat was now on-scene but was unable to find the casualty vessel. He (the casualty vessel) had communications with MRCC on a mobile phone. He had a young child on board who was "very seasick". MRCC enquired whether the Dauphin could pick up the casualty vessel on radar and the P1 said that they might get a radar return. MRCC were also trying to get Ballycotton lifeboat on-scene with its radar equipment. At 21:31 hrs, MRCC tasked the Dauphin crew "*get under way, we can always call you back*". A transcript of this conversation is shown at **Annex D**.

The Airport Fire Officer, who responded to the call-out following a phone call from the Airport Manager, was on the ramp when the Dauphin departed. His estimates of surface visibility, along with those of the Air Corps technicians, are included in paragraph 1.7.8. The Fire Officer spoke to the helicopter crew

prior to their departure and he has informed the investigation that there was no formal discussion of the visibility conditions.

At **21:41 hrs**, the Air Corps technician in the Tower passed the windspeed and direction and the QNH (an atmospheric pressure setting) to the crew as DH248 taxied out for take-off, callsign now Rescue 111. The senior Air Corps technician involved in ramp despatch subsequently stated that the P2 carried out a thorough walk-round pre-flight inspection, the aircraft was started using external ground power and that brake checks were carried out during the taxi. The aircraft lifted off from the taxiway, at **21.42 hrs**, and the technician described it as being a normal departure.

The Waterford Control Tower is equipped with a Marine Band radio in addition to the normal ATC transceivers. The personnel in the Control Tower were able to follow the progress of the SAR mission at all times on the marine band radio and therefore they did not feel it necessary to carry out a radio check with DH 248 every fifteen minutes, as is the standard operating procedure in Finner.

A transcript of the radio communications between DH248 and Waterford Tower is shown at **Annex E**. During the mission, the winch operator of DH248 communicated with MRCC Dublin through the Coastal Radio Stations Network and a transcript of these communications is attached at **Annex F**.

At **21:45 hrs**, DH248 called MRCC via Rosslare Radio on Marine Channel 16, en route to the search area, seeking further information. The aircraft fuel endurance and the number of persons on board were not passed to MRCC, nor was this information requested by MRCC. Notification of the SAR mission was not passed by MRCC to the Aviation Rescue Co-ordination Centre (ARCC) in Shannon as is required by MRCC Standard Operating Procedures (SOPs). Since no Flight Plan for the SAR mission was filed, neither ARCC nor Shannon Air Traffic Control Centre were aware of DH248's mission until after it had become overdue.

At **21:46 hrs**, DH248 was directed by MRCC to route to 5204N, 0731W, Carrickapaine Rock at the entrance to Dungarvan Harbour.

At **21:48 hrs**, DH248 passed an estimated time of arrival in the search area of approximately 5 minutes (to MRCC).

At **21.53 hrs**, MRCC advised DH248 that Ballycotton lifeboat was en-route and that Helvick lifeboat had been told to desist from firing flares since the helicopter was arriving.

At **21.55 hrs**, the Airport Manager, who had been phoned by the SAR crew, arrived at the Airport and went to the Control Tower. His presence in the Tower was not made known to the crew of DH248. The Airport Manager holds a Private Pilot's Licence and has extensive experience as a flight instructor. He was formerly a qualified Aerodrome Flight Information Services Officer (AFISO) and had set up that service at Waterford Airport. The Airport Manager has informed the investigation that he and the Airport Fire Officer

had provided voluntary cover for night helicopter SAR missions off the southeast coast for a number of years.

The Airport Manager felt that the technician carrying out the Tower duties was performing satisfactorily and that there was no need to intervene in the communications with the helicopter. He assisted the technician by providing him with horizontal visibility assessments. These assessments were provided by the Airport Manager using his knowledge of distances to known reference points. It is noted that in the Finner Dauphin SAR operation, the detachment includes a qualified Air Corps Radio Operator, who carries out the communication, notification, flight following and visibility assessment functions for SAR missions.

At **21:55 hrs**, the casualty vessel reported that he could see the light of the lifeboat and was coming to it.

At **21:58 hrs**, Helvick lifeboat informed MRCC that they had located the casualty at position 5204294N and 072908W, and that they *"were going to check the tow line"*.

At **21:59 hrs**, this updated position was passed by MRCC to DH248, and that the casualty vessel was being taken in tow. MRCC requested DH248 that *"if the visibility is still satisfactory there, we'd like you to continue to that position, and maybe just monitor it for a while"*.

At **22:00 hrs**, DH248 informed MRCC: *"We're going to route to that position. We're going to maintain 500 feet overhead the target area. We're still in a lot of cloud, a lot of fog here. We'll remain overhead and if they get into trouble at any stage, we will then descend to the scene, over."*

At **22:03 hrs**, Helvick Lifeboat informed MRCC that they had the casualty vessel under tow. There were five persons on board the casualty vessel, four adults and one child. Their ETA at Helvick Pier was 20 minutes. MRCC advised them that the helicopter was on scene and would stay on scene for a while longer, up at 500 ft.

At **22:06 hrs**, MRCC requested Ballycotton Lifeboat: *"We'd like you to keep coming for a while yet please."*

At **22:07 hrs**, another vessel (possibly a trawler) informed the Helvick Lifeboat that the fog had *"lifted a lot around the harbour"*, but the lifeboat replied that he was still a couple of miles from the pier, and at **22:08 hrs** that *"we can't see our hand here now anyway"*.

The Helvick lifeboat continued to tow the casualty vessel very slowly as the casualty boat was very light, the five persons were still on board, the seas were choppy and the child on the casualty vessel was seasick. DH248 continued to monitor the situation from overhead, and at **22:17 hrs**, it reported to MRCC *"Overhead Helvick Head this time, all ops normal."* Position reports to MRCC were provided by the rear crew as per Standard Operating Procedure (SOP).

At **22:19 hrs**, Waterford Tower called DH248 on a radio check. DH248 responded that they were two miles Southeast of Helvick, and that they would be *"lodged in here for about another fifteen minutes"*.

At **22:20 hrs**, the Helvick Lifeboat requested navigational assistance from DH248 as follows: *"Just wondering what course you are steering at this moment for Helvick Pier. We want to verify it with our GPS, our signal is not that good"*. DH248 took the position of the lifeboat by radio and then flew a pattern to overhead the lifeboat, requesting to be informed at the moment they passed overhead. At **22:24 hrs**, the lifeboat informed the Dauphin, *"You're just over us now"*, and DH248 replied, *"Your heading for Helvick Head would be 240°, over."*

At **22:31 hrs**, one of the lifeboat men went aboard the casualty vessel as the child had become cold. The lifeboat reported to MRCC that it was still taking it very slowly and gave an ETA at Helvick Pier of *"20 minutes maybe"*.

At **22:34 hrs**, the casualty boat reported to the Helvick Lifeboat that the child was OK, suffering a little from seasickness and cold.

At **22:35 hrs**, Ballycotton Lifeboat requested an update from MRCC. He was told that the Helvick lifeboat and the casualty vessel had about 1.5 miles to go in poor visibility. He was requested to standby a little longer by MRCC.

At **22:39 hrs**, DH248 reported to MRCC *"just by Helvick Head, all ops normal"*.

At **22:41 hrs**, DH248 called Waterford Tower, to check *"any update on the weather, has it improved or dis-improved?"* Tower replied, *"Negative, she is staying the same. From what I can see from here out to the lights. QNH is still 1014, wind 220° at 7 knots"*.

At **22:42 hrs**, Helvick Lifeboat reported to DH248 that the helicopter was just above them. DH248 replied that they had the lifeboat in sight, and that they had about a mile to run.

At **22:51:00 hrs**, Waterford Tower called DH248 and informed him that the *"weather (is) deteriorating slightly here, just to let you know"*. DH248 replied, *"Roger copied that. Can you see the lights of Tramore at all?"* Tower replied *"Negative. We can just about hardly see the runway which is a distance of 300 metres from the Tower"*. DH248 replied, *"copied that. Listening out"*.

At **22:51:40 hrs**, DH248 called Helvick Lifeboat: *"Can you see the lights of Helvick Head at this time?"* The lifeboat replied *"Negative on that"*.

At **22:53:30 hrs**, DH248 called MRCC and requested *"permission to route towards Waterford Airport at this time. Conditions there are deteriorating and we'd like to get in before they close, over"*. MRCC replied, *"just standby"*.

At **22:54:00 hrs**, MRCC released DH248 from the SAR mission and thanked them for their help and co-operation. DH248 replied: *"We're taking up a*

heading for Waterford Airport". At 22:55 hrs, MRCC requested Ballycotton Lifeboat to standby the Helvick Lifeboat, until it reached the pier.

At 23:00 hrs, DH248 reported to Waterford Tower that they were just inside six nautical miles from Waterford Airport DME station, and requested QNH. Tower passed him the QNH of 1014 and wind of 210° at 8 Knots. DH248 acknowledged this and reported *"we're just six miles this side of the field. We're going to route overhead out to eight miles and back in for an ILS to two one. Confirm all the lights are on for two one"*. Tower replied, *"Roger that. Full lights, full illumination two one. ILS operational"*. DH248 replied, *"Copied. Call you finals"*.

At 23:06 hrs, DH248 called, *"Just coming up to the turn for inbound"*, and checked the wind which was now 220° at nine knots.

At 23:12 hrs, DH248 called *"Two point five miles out"*, and was given a wind check of 220° at eight knots.

At 23:14:37 hrs, DH248 called that they had overshot the approach and that they were *"going to go around for one more"*. DH248 asked if, *"as a matter of interest, could you see us at all?"* The Tower replied that they had one of the technicians out on the ramp keeping an eye out, but that he couldn't see them at all, and that the visibility was *"about 500 metres"*. DH248 acknowledged, *"Copied"*.

The technician who was outside was actually on the Control Tower veranda, which is 50 feet above ground level. He subsequently described the weather at this stage as being like the "twilight zone". The rotating beacon on top of the control tower was reflecting back off the fog and he could barely see the far side of the ramp. He could just make out the glow of the runway lights; there was no direct visibility of the runway itself. The runway at its closest point is 300 metres from the Tower. The people on the veranda could hear the aircraft quite clearly but they could not tell the exact direction the noise was coming from. The Airport Manager, who was also on the veranda, stated that the approach seemed perfectly normal, but that he saw nothing of the helicopter.

At 23:15 hrs, the Tower asked DH248 *"Did you get the runway lights OK then?"* DH248 replied *"Negative"*. The technician who was acting as Tower Operator said that he could try to assist with a higher beam light from the Tower, but that he didn't know how bright it was going to be (this referred to a spotlight he found in the Control Tower). DH248 replied, that *"If the lights are up full that's the best you can do"*.

At 23:18:35 hrs, DH248 called, *"just turning finals again"*, and requested QNH. This was given as *"still 1014 and wind 220° at eight"*.

At 23:20 hrs, one of the technicians, on his own initiative, phoned Baldonnell Tower and received the actual weather report for Baldonnell. This weather was not passed immediately to DH248 since the technicians in the Tower felt that the crew would be very busy during the ILS approach and they did not want to disturb them.

At **23:27 hrs**, the Tower called DH248. They replied, "*we've overshoot, we're going to go around for a coastal approach*". The Tower replied that they couldn't see the helicopter coming in, but they could hear it going away "*just as I called you*".

Several witnesses contacted the investigation and were interviewed. With the exception of one witness, located at Faithlegg, none of the witnesses saw any sign of DH248, due to the poor visibility. The witness at Faithlegg, some 4.4 nm from the RWY 21 threshold, reported seeing "*a high powered light, like a car headlamp, making a creamy coloured, bright haze in the fog, but not penetrating the fog to the ground*". The witness only saw the light for a brief time, estimated by him to be at 23:24 hrs, and the aircraft moved away southwards towards the airport. Witnesses living in close proximity to the airport heard the Dauphin flying overhead at low level but were unable to see it.

Some of the witnesses commented that the sound of the aircraft was unusual. This was probably their first time to hear a Dauphin helicopter at night. The Dauphin has certain distinctive normal sound profiles particularly a high pitched whine/screech from the fenestron and a high level of main rotor blade "slap" in certain manoeuvres. The technicians at Waterford Airport, who are familiar with Dauphin sounds, heard the aircraft passing on both ILS approaches and reported that the sounds were normal.

At **23:28 hrs**, the Tower asked DH248 if they wanted him to change the approach lights over to RWY zero three. This was agreed, "*yes please*" by DH248, and the lights were changed over by the Air Corps Technician under the supervision of the Airport Manager. Tower reported "*full beam at zero three over*".

At **23:33 hrs**, DH248 asked the Tower to confirm if the weather was improving at the Airport. The Tower replied "*Negative on the weather improving here. QNH same, wind 210° at eight*". DH248 acknowledged this and stated "*we're just er in a left hand er we're descending here now in the bay, and we are going to do a coastal approach in to Tramore. We may land in Tramore*".

At **23:34 hrs**, the Tower informed DH248 that the weather in Baldonnell was "*Fine to get in there if all need be*". DH248 replied "*Roger, don't have the juice*" (at **23:34:13 hrs**), an indication of insufficient fuel remaining to allow for such a diversion.

At **23:35:25 hrs**, DH248 reported to MRCC "*We've had to overshoot Waterford Airport due to weather, we can't get in. We're doing an approach to Tramore Bay this time and if we can get down, we're going to land in the bay area somewhere*". MRCC acknowledged this and requested to be kept updated. This was acknowledged by DH248 (at **23:35:50 hrs**).

This was the last voice transmission from DH248.

At **23:38:30 hrs**, MRCC called DH248 - there was no reply.

At **23:39:27 hrs**, there was a burst of transmission with no voice, on the Waterford Tower frequency. This transmission was analysed by the UK Air Accidents Investigation Branch in Farnborough. There were two elements to this final transmission, a "whoosh" noise and then the rotor blade noise.

At **23:43:20 hrs**, MRCC called DH248 again. There was no reply. Several more calls from both Waterford Tower and MRCC followed, all with no reply. At **23.55 hrs** both MRCC and the Waterford Airport Manager reported the situation to the Gardai in Tramore, requesting a search of the beach. A Mayday relay for the missing helicopter was broadcast by MRCC on Rosslare Radio at **00.05 hrs** and the local IMES coastal rescue teams were called out shortly after that.

When the personnel in the Control Tower realised that the aircraft was missing they tuned one of the Control Tower's VHF airband radios to the emergency frequency 121.5 MHz. However no SARBE (SAR beacon) or ELT (Emergency Locator Transmitter) transmissions were heard on the frequency by the Tower personnel. When the local ATC operator arrived at the Airport later to assist with the arrival of the IMES S61, he adjusted the radio and was able to hear a faint ELT transmission. The ELT was also heard by overflying aircraft in the early hours of the morning of 2 July 1999.

At **01.00 hrs** approximately, the wreckage of DH248 was located by an IMES coastal search team in the sand dunes approximately 3 kilometres east of Tramore town.

1.2. Injuries to Persons

Injuries	Crew	Passenger	Others
Fatal	4	-	-
Serious	0	-	-
Minor/None	0	-	-

1.3. Damage to Aircraft

The aircraft was destroyed.

1.4. Other Damage

The aircraft impacted in an area of sand-dunes and there was an intense post-crash fire. Following removal of the wreckage, damage to the area was repaired.

1.5. Personnel Information

Commander: Male aged 30 years
Licence: Military
Type Ratings: SA316B Alouette 02 Feb 1999
AS365Fi Dauphin 14 Aug 1998 (P1 SAR)

Instructor's Rating:	AS365Fi Dauphin 14 Aug 1998 (Class 1)
	SA316B Alouette 16 Jan 1998 (TRE on type)
Instrument Rating:	AS365Fi Dauphin 15 Oct 1998 (Green)
Last Simulator Check:	24/25 May 1999
Medical:	Fit for Flying Duties
Flying experience :	Total all types 2,910 hours
	Total on type 808 hours, 523 as 1 st Pilot.
	Total on type Night 138 hours
	Total Instrument Flying 305 hours
	Last 90 days 99 hours
	Last 28 days 30 hours
Duty Time:	16 hrs 40 min
Rest period before duty:	15 hrs 40 min
24 hr Stand/By Duties last 60 days:	11 duties.

Co-Pilot:	Male aged 28 years
Licence:	Military
Type Ratings:	SA316B Alouette 02 Feb 1999
	AS365Fi Dauphin 16 June 1999 (one month extension).
Instructor's Rating:	SA316B Alouette 02 Feb 1999 (Class1 TRE)
Instrument Rating:	AS365Fi Dauphin 04 March 1999. (Green)
Last Simulator Check:	Sept 1998
Medical:	Fit for Flying Duties.
Flying experience:	Total all types 2,326 hours
	Total on type 387 hours
	Total on type Night 59 hours
	Total Instrument Flying 215 hours
	Last 90 days 89 hours
	Last 28 days 23 hours
Duty Time:	16 hrs 40 mins
Rest period before duty:	15 hrs 40 mins
24 hr Stand/By Duties last 60 days:	13 duties.

Appendix A summarises the operational experience profiles of the two pilots.

Winch Operator:	Male aged 34 years.
Qualifications:	Winch Operator and SAR Air Crew
Rating Examiner.	
Flying Experience:	3,500 Flying Hours as Rear Crew.

Winchman:	Male aged 25 years.
Qualifications:	Winchman.
Flying Experience:	175 Flying Hours as Rear Crew.

1.6

Aircraft Information

Leading Particulars

Type:	Eurocopter AS365Fi Dauphin
Constructors Number:	6203
Date of Manufacture:	1986
Certificate of Registration:	Registered in the name of Minister For Defence, Ireland
Certificate of Airworthiness:	Military
Total Airframe Hours:	4562:00
Engines (2):	Turbomeca Arriel 1M Free Turbine Turboshaft Engines
Maximum Weight Authorised for Take-off:	4,120 kg
Estimated Start-up Weight:	3,919 kg
Estimated Weight at time of Accident:	3,427 kg
Estimated Fuel Remaining at time of Accident:	108 kg
Centre of Gravity (CG) Limits	3.84 metres to 4.00 m @ 4120 kg.
Centre of Gravity at time of Accident:	3.95 metres (est.) aft of Datum

1.6.1 General Description

The Eurocopter AS365Fi Dauphin is a twin-engined helicopter certified for two pilot IFR operation. The pilot (P1) occupies the front right-hand seat while the co-pilot (P2) occupies the front left-hand seat. Dual flight controls and flight instruments are provided, one set for each pilot. On Search and Rescue (SAR) operations a winch operator and a winchman occupy the rear cabin. The winch operator also operates the Marine Band VHF Radio during a SAR mission, except during winching operations or whilst occupied on other mission-related duties.

The AS365Fi is unique in terms of design, incorporating hybrid analog/digital avionics systems. The only five built were specifically for the Irish Air Corps. Consequences of this fact include difficulty with product support/spares availability as the aircraft age, and non-availability of a representative simulator facility for pilot training.

The engines are two Arriel 1M turboshaft engines mounted side by side aft of the main gearbox (MGB) inside two heat-insulated and fireproof engine bays. The main rotor has four glass-resin laminate blades, which rotate in a clockwise direction when viewed from above at a nominal speed of 350 rpm. They are attached to a semi-rigid fibreglass main rotor head. The diameter of the rotor disc is 11.930 metres (39' 2"). The shrouded tail rotor, known as a "Fenestron" is located in the tail fin and it comprises 11 composite blades rotating in a clockwise direction when viewed from the right hand side of the aircraft. The tail rotor diameter is 1.1 m (3' 7").

The transmission system includes the main gearbox, two engine-to-MGB coupling units, a tail rotor driveshaft and a tail gearbox. The dual input MGB transmits engine power to the main and tail rotors, and it drives the main rotor head at a nominal speed of 350 rpm after reduction from the input speed of 6000 rpm. The tail gearbox, which is mounted at the end of the tail boom in the tail rotor duct, is designed to drive the tail rotor at 3665.4 rpm.

Flight controls include three hydraulic servo units for the main rotor blades and a single servo for the tail rotor. Two primary hydraulic systems supply hydraulic pressure to the servo units controlling the main rotor collective and cyclic pitch, and to the tail rotor servocontrol. These are two separate and independent systems which both continuously supply the main servocontrols and both are capable of compensating for a failure of the other system.

DC electrical power is supplied by two engine-driven 4.8 kW starter-generators and a main aircraft battery. There is also an AC electrical system with power supplied by two alternators, each supplying a three-phase output, and by two transformers supplying single-phase outputs. The single-phase loads are generally avionic equipments while the three-phase supply is used for windshield de-icing and cabin ventilation.

1.6.2 Aircraft Systems

Key aircraft systems, which have been considered in the Analysis are detailed in **Appendix B**. These systems include the fuel system with fuel jettison facility, the Automatic Flight Control System (AFCS) including the ILS approach modes and SAR modes, the airborne radar, the navigation systems, the radio altimeter system and the aircraft hydraulic systems.

1.6.3 Weight Data

The weight figures for the mission have been estimated as follows:

Items	Weight (Kg)
Basic Weight DH248	2740
Hoist	67
Locator	12
SAR kit	180
Crew (4)	<u>320</u>
Total	3319
Fuel	<u>600</u>
Start-up Weight	3919.

The max take-off weight (MTOW) for the AS365Fi is 4,120 kg.

The estimated weight at the time of the accident was 3,427 kg. approximately.

The Centre of Gravity at the time of the accident is estimated to have been 3.95 metres aft of Datum, which is within the limits specified for the aircraft.

1.6.4 Maintenance Records

At the time of dispatch of the SAR Mission, DH248 had accumulated 4,562 flying hours. It was maintained under Air Corps Technical Orders and in accordance with the Maintenance Manuals of the airframe and engine manufacturers. A system of equalised maintenance was in place whereby the 400 hour airframe inspection had been divided into eight modules, two of which were performed together every 100 hours.

The previous Scheduled Maintenance Inspection (SMI) carried out on DH248 was an E5/E6 carried out at a flying time of 4,549.55 hours. The aircraft was returned to service from this SMI on 25 June 1999. The next SMI due was a 50 hour inspection at 4,599.55 hours.

The aircraft had been flown relatively intensively in the days before the accident and a number of Maintenance Deferred Items (MDIs) were notated in the Technical Log. These are minor defects, which are recorded by the flight crew for the information of the maintenance crew and subsequent flight crews but on which maintenance action is deferred and the aircraft thus remains in service. This system is regulated for under Air Corps Technical Order (TO.) No. 25 "Deferred Defects".

On the 28 June 1999, the aircraft flew three times with three different crews. On the first flight of the day, three MDIs were entered on the Technical Log "for information":

Collins Comms (No.1 System), very poor quality
CAP (Caution Advisory Panel) Landing Light not illuminating,
Landing Light "ON"
Coupler Light top right U/S (Unserviceable).

No further defects were entered on the subsequent two flights. The final flight of the day was a winching training detail with the same flight crew as on the accident flight.

On the 29 June 1999, DH248 flew five times, the first three flights were a VIP mission to Belfast with the two pilots from the accident flight as crew. One defect was noted on the Technical Log, concerning the Emergency Locator Transmitter (ELT) and this was rectified on the return to base. The senior technician who was on the 01 July 1999 SAR detachment to Waterford flew as aircrew on the VIP mission. After the mission, the Detachment Commander told him that the aircraft was flying particularly well and to try to get DH248 for the forthcoming Waterford SAR detachment.

The Detachment Commander flew again on DH248 that day on a winching training detail and then a fifth flight was flown by a different crew who noted two MDIs:

Landing Light on CAP U/S (as noted previously)
Coupler Light U/S (bottom right)

On 30 June 1999, DH248 flew once with the Detachment Commander as training captain on another winching detail. No defects were noted. A "100-operations" hoist inspection, required after 100 hoist operations, was also carried out on that date.

The aircraft flew three times on 01 July 1999 before the accident flight, with the SAR detachment crew. On each occasion, no defects were noted in the Technical Log and the aircraft was marked "S" (serviceable) on both the Aircraft Technical Log and on the Flying Detail.

On arrival into Waterford from Baldonnel, DH248 flew an ILS approach to RWY 21. The detachment avionics technician stated that he specifically watched this approach on the P1's EFIS screens and he said that a very accurate approach was displayed and flown.

Other items on the Technical Log include:

24 June 1999	Nadir takes 15 minutes to switch on - Nadir Computer changed
25 May 1999	Nadir unserviceable. Nadir CDU changed
15 May 1999	Radar unserviceable. Antenna drive unit changed twice.

This 15 May 1999 radar defect occurred on SAR detachment at Finner again with the P1 and P2 from the accident flight as crew. The aircraft was flown again on the 16 May 1999 by the same crew and marked serviceable.

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