aibn Accident Investigation Board Norway

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REPORT SL 2011/15

REPORT ON SERIOUS AIRCRAFT INCIDENT AT BODØ ON 24 FEBRUARY 2008 INVOLVING A SIKORSKY S-61N, G-ATFM HELICOPTER OPERATED BY BRITISH INTERNATIONAL

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As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.

The Accident Investigation Board has compiled this report for the sole purpose of improving flight safety. The object of any investigation is to identify faults or discrepancies which may endanger flight safety, whether or not these are causal factors in the accident, and to make safety recommendations. It is not the Board's task to apportion blame or liability. Use of this report for any other purpose than for flight safety should be avoided.

Photos: AIBN and Trond Isaksen/OSL

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REPORT ON

Aircraft:	Sikorsky Aircraft Corporation S-61N
Nationality and registration:	G-ATFM
Owner:	British International, UK
User:	British International, UK
Crew:	2
Passengers:	16
Incident site:	ENBO
Incident time:	24 February 2008 at 15:40 hours

All times given in this report are local time (UTC + 1 hour) if not otherwise stated.

NOTIFICATION ABOUT THE INCIDENT

The Accident Investigation Board's officer on duty received notification about the incident from Bodø TWR APP on 24 February at 1637 hours. At this stage it was uncertain whether the incident was of a serious nature and should be reported to the Accident Investigation Board Norway (AIBN). The Civil Aviation Authority deemed the incident to be serious and requested that the AIBN investigated the incident. Two days after the incident the Civil Aviation Authority submitted reports from the Civil Aviation Administration Norway (Avinor) and the helicopter's commander to the AIBN.

ABSTRACT

A Sikorsky S-61N helicopter, G-ATFM belonging to a British operator on lease to Lufttransport with call sign LTR004, was in passenger traffic between Værøy and Bodø. The helicopter requested a Special VFR clearance for approach to Bodø. LTR004 was on its return flight from Værøy with 16 passengers and 2 pilots. Air traffic control (ATC) offered an Instrument Landing System (ILS) approach to the crew due to poor visibility. The commander declined this on the grounds that it would entail a risk of icing. The crew continued the visual approach at an altitude of 200-300 ft without achieving visual contact with the runway or land. Runway visibility varied between 350 m and 600 m. The helicopter crew navigated using the Global Positioning System (GPS), but drifted further and further north. The approach path was north of the runway 07 centre line and took the helicopter dangerously close to Lille Hjartøy north-west of Bodø. Air traffic control asked the pilots to initiate an immediate climb and turn towards the south-west. The crew initiated a climbing turn and accepted the air traffic control's offer of an ILS approach from 1 500 ft. The helicopter made an uneventful landing on runway 07 at 1552 hours.

1. FACTUAL INFORMATION

1.1 Sequence of events

1.1.1 Lufttransport's flight LTR004 had filed a flight plan (FPL) for a flight according to visual flight rules (VFR) to Værøy. Before departure the flight was given a special VFR clearance[1] by the air traffic controller (FLL) in the Bodø control tower (TWR). The helicopter took off from Bodø airport (ENBO) at 1400 hours. The helicopter was cleared out of the Bodø control zone at 500 ft. At this time, visibility was 2 km in snow showers and the flight crew perceived the visibility to be improving on the way to Værøy.

1.1.2 At 1419 hours Approach (APP) broadcasted that visibility had been reduced to1 km in snow showers. LTR was then approximately 30 NM over Vestfjorden where visibility was good. The rest of the flight to Værøy proceeded as scheduled in good visibility.

1.1.3 The helicopter did not refuel at Værøy. The commander was familiar with the possibility of refuelling at Værøy in case of an emergency situation. Weather conditions at Værøy were good and the commander did not see a need for extra fuel. The helicopter took off from Værøy at 1457 hours. Flight visibility was good.

1.1.4 At 15:06:20 hours LTR004 checked in at Bodø APP from Værøy at 500 ft and received clearance for a special VFR approach to Bodø. At this time the tower reported that the Runway Visual Range (RVR) was 360 m in snow showers and that aircraft were holding whilst waiting for better visibility and runway conditions. The first officer was Pilot Flying (PF) and the commander Pilot Monitoring (PM).

1.1.5 At 15:16:00 hours the tower (TWR) informed that the visibility was 600 m, whereas aircraft that were in holding had to have a visibility of minimum 650m to be able to initiate an Instrument Landing System (ILS) approach.

1.1.6 At 15:19:09 - 15:20:14 hours APP informed LTR004 that the runway visibility was 600 m. APP had to call up LTR004 several times before they established contact. Based on the poor visibility the air traffic control (LTT) offered LTR004 an ILS approach. This was initially accepted by the commander.

1.1.7 At 15:20:21 - 15:20:56 hours, LTR004 requested aircraft vectoring (course directions/radar vectoring) for ILS. Air traffic control replied that LTR004 was too low for radar vectoring. At the time, LTR004 was 12.5 NM Distance Measuring Equipment (DME) from BOO VOR and was asked to make a right turn towards ILS and was cleared for ILS approach. LTR004 replied and requested a course which they could steer towards the ILS. They were then flying at a course of 115° at 300 ft.

1.1.8 At 15:21:00 - 15:23:22 hours, LTR004 was told that there was an island 5 NM south of the helicopter with a height of 310 ft. The ATC controller therefore requested that LTR004 climb to 500 ft. LTR004 replied that they could not climb to 500 ft due to the temperature and snow. LTR004 informed APP that they found it best to approach according to the special VFR. They informed APP that they reduced speed and

[1] Special VFR is flying at a reduced visibility down to 800 m for helicopters, the minimum height at 500 ft with visual contact with the ground or water.

maintained visual contact with the sea. APP asked LTR004 to continue towards Hjartøy and then proceed according to special VFR. APP asked LTR004 a couple of times to confirm their course, to which LTR replied 115°. LTR004 then reported that they had good visual contact and good visibility ahead. When asked by APP whether Bodø was in sight, LTR004 replied that they had ”about 3 miles vis”. LTR004 was then instructed to proceed towards ENBO and contact TWR on frequency 118.1 MHz

1.1.9 At 15:26:40 hours TWR informed an aircraft that RVR was 540 m. The minimum requirement for special VFR for helicopters is 800 m.

1.1.10 At 15:26:45 - 15:27:29 hours LTR004 was asked to hold at present position. TWR asked LTR whether they could hold while the runway was being cleared, or whether they had to land within the next few minutes. LTR004 replied that they could hold for 15 min and that general and horizontal visibility was poor. TWR reported that they should wait and receive approach clearance in a few minutes.

1.1.11 At 15:28:44 hours LTR004 called up TWR and reported that they were about to lose horizontal visibility and requested to be cleared in directly, and that they were 6 NM out. LTR004 received clearance to initiate the approach. The wind was 22-25 kt from 090-100°. According to radar print-outs, LTR004 had a ground speed of 40 kt.

1.1.12 At 15:29:02 hours LTR004 confirmed that they had received clearance to approach ENBO while at the same time expressing uncertainty as to what the clearance entailed. In the light of this, TWR asked if LTR004 wanted an ILS approach. LTR004 declined the offer as they were concerned about icing higher up. According to the ENBD ICE MESSAGE 01 in force between 0900 and 1500 hours Z that day, the freezing level was at 2000-3000 ft. LTR004 received clearance for special VFR. At 15:29:43 hours TWR informed another aircraft of the conditions stating that RVR was 540 m and visibility from TWR 600-700 m.

1.1.13 LTR004 received clearance for landing at 15:30:38 hours. Between 15:30:38 and 15:40:00 hours the situation took a dramatic turn. LTR004 navigated according to GPS and was heading towards a point they believed was Bodø airport. The air traffic controller at Bodø TWR was concerned about their safety and was very active providing LTR004 with information and advice. Radar print-outs show that the helicopter was heading towards Store Hjartøy, which is approx 310 ft high, at an altitude of approx. 100 ft. This prompted the air traffic controller to ask if they had ground contact and if everything was OK. LTR004 confirmed this and replied that they had "visual contact with the surface."

1.1.14 At15:33:28 hours LTR004 informed Bodø TWR that they had a ground speed of 25 kt and that they were 3 NM out.

1.1.15 At 15:35:21-15:36:20 hours TWR asked if LTR004 could see Hjartøy. LTR004 replied that they did not have visual contact with the island. LTR004 was then told that the island was half a NM ahead and was asked to make a right turn. They were also asked about visibility in the area. LTR004 replied that they could see land approximately half a NM ahead and that they wanted to make a turn and start the final approach. They were asked to report back when they could see the runway lights.

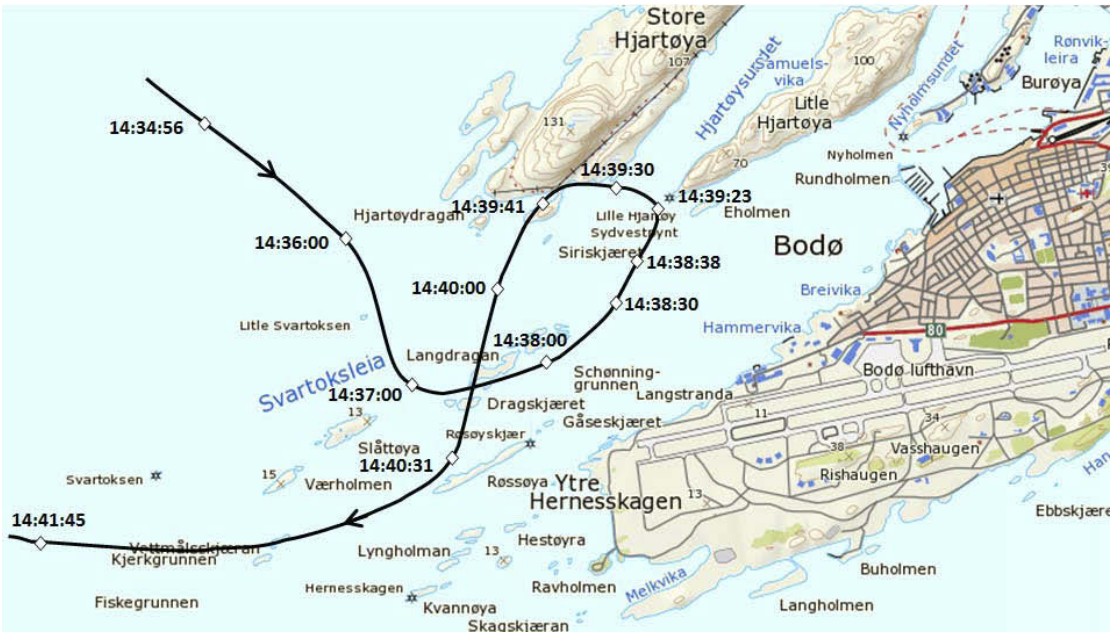


Figure 1: Chart including estimated flight path of G-ATFM based on transcripts of the radar recordings (times in UTC). (Statens kartverk, Geovekst og kommuner).

1.1.16 At 15:37:01-15:37:55 hours, LTR004 was informed that they were a bit north of the runway centre line, and were asked if they could see land. LTR004 replied that they could see lights to the right. TWR replied that these were the approach lights and that, according to the radar, they were located at a clock position of approximately 1 o'clock. LTR004 then requested a course to steer towards the runway. TWR replied that they were heading towards the runway. Immediately after, TWR informed LTR004 that they were still north of the runway, and had to be aware of obstructions west of the runway.

1.1.17 At 15:38:19-15:39:50 hours, LTR004 was informed that they were now north of the runway and approaching the city (Bodø) and high ground. LTR004 replied that this was received and requested a course. During this phase the air traffic controller issued a ”general alert”, which is defined as:

> *”A general alert is issued when it is certain/assumed that an aircraft is experiencing difficulties of such a nature that there is a risk of a crash”.*

TWR followed up with a warning that LTR004 was heading towards high ground and recommended that they initiate a climb immediately. LTR004 repeated the request for a safe course. TWR replied that they should proceed into a left turn and climb. LTR004 misunderstood and confirmed "right turn". TWR repeated the warning and told them to make a left turn to stay clear of the terrain. LTR004 then requested an ILS. TWR replied that they must climb to 2000 ft towards the south-west and proceed to make a left turn. After a while LTR004 reported a course of 180º.

1.1.18 At 15:40:10-15:40:50 hours LTR004 was asked about icing conditions. To this LTR004 replied that they had 0 ºC, and requested a short ILS. TWR replied that they could maintain 1200 ft and set the course at 240º. LTR004 replied that they would maintain 1 500 ft and a course of 240º, whereas the radar print-outs indicate a height of 1600 ft.

1.1.19 At 15:41:10-15:46:35 hours, LTR004 flew through Localizer on a southerly course and came south of Loc. LTR004 then made a turn to the north-west. The air traffic controller asked if LTR004 had Localizer indication (*"do you have the Localizer?"*). LTR004 did not reply and the air traffic controller gave LTR004 course directions for a left turn to enter the Localizer path. TWR asked how many people were on board and was told that the number of people on board was 18. LTR004 then received an ILS clearance.

1.1.20 At 15:47:15 hours LTR004 reported that they were established on the Localizer. The air traffic controller described the Loc flight as "wobbly", with several deviations from Loc. He therefore continued to give LTR004 course instructions for the rest of the approach. LTR landed on runway 07 at 15:52:15 hours.

1.2 Personal injuries

Table 1: Personal injuries

Injuries	Crew	Passengers	Other
Fatalities			
Serious			
Light/none	2	16	

1.3 Damage to aircraft

None

1.4 Other damage

None

1.5 Personnel information

1.5.1 Commander

1.5.1.1 The commander was a 62 years old male. He was trained in the Royal Navy where he served from 1971 to 1983. Whilst in the Royal Navy he flew several types of helicopters and held several pilot positions, including that of instructor and Flight Commander[2].

1.5.1.2 The commander obtained a Commercial Pilots' Licence Helicopters (CPL H) and an Airline Transport Pilot Licence (ATPL H) in 1983. From 1983 to 1988, the commander served with the Qatar Emir Air Force as head of training and senior pilot and adviser for search and rescue and other military aviation operations.

1.5.1.3 From 1988 to 1992 he was employed by Bristow Helicopters as a commander on S-61N and AS 332L.

1.5.1.4 From 1992 to 2000 he was employed by Shell Aviation as a commander on S-61N helicopters and served as Flight Safety Officer.

[2] Flight Commander is a military term for an operative leader of a flight in a flight squadron (corresponding to a "wing leader/vingsjef" in a Norwegian flight squadron).

1.5.1.5 From 2000 to 2001 he worked for Serco Aerospace, RAF Petrol, Oxon, as military instructor on Chinook Mk2As, where he also operated Chinook Dynamic Motion Simulator.

1.5.1.6 The commander was employed by British International Helicopters, Penzance Operation on 30 April 2001. His responsibilities consisted mainly of flying passengers to the Isles of Scilly with S-61N and S-61NM helicopters. In addition to ordinary passenger traffic, the commander had ad hoc offshore assignments and was involved in Naval Support Operations. He also served as Flight Operations Quality Manager.

1.5.1.7 The commander held a JAR FCL ATPL (H) licence valid until 21 October 2012, with type rating for S-61N/NM, AS 332L, Westland SA 341 Gazelle and AB 206A. In addition he held an instrument rating (IR H) valid until 31 May 2008. The commander's Class 1 medical certificate was valid until 20 March 2008.

1.5.1.8 Fartøysjefen fløy siste årlige Aircraft Check (AC) på S-61N 11. april 2007, gyldig til 11. april 2008. Fartøysjefens siste Line Check (LC) ble fløyet 26. april 2007, gyldig til 30. april 2008. Siste Licence Proficiency Check (LPC) ble fløyet 7. mai 2007, gyldig til 31. mai 2008. En Operational Proficiency Check (OPC) ble fløyet 14. november 2007, gyldig til 31. mai 2008.

1.5.1.9 The commander conducted the latest annual Aircraft Check (AC) on S-61N on 11 April 2007 and was valid until 11 April 2008. The commander's last Line Check (LC) was conducted on 26 April 2007 and was valid until 30 April 2008. The latest Licence Proficiency Check (LPC) was conducted on 7 May 2007 and was valid until 31 May 2008. An Operational Proficiency Check (OPC) was conducted on 14 November 2007, valid until 31 May 2008.

1.5.1.10 The commander had more than 5 000 hours of instrument flying experience. He had conducted three instrument approaches (NDB, VOR, ILS) in the last 30 days before the incident. The commander had not conducted any instrument approaches to ENBO before the incident. The commander stated that he felt rested and alert before the flight to Værøy.

1.5.1.11 Flying hours commander:

Table 2: Flying hours commander

Flying hours	All types	Relevant type
Last 24 hours[3]	1:25	1:25
Last 3 days[4]	3	3
Last 28 days	18	18
Last 84 days	64	64
Totalling	14 200	9 500

1.5.2 First officer

1.5.2.1 The first officer was a 36 years old male. He trained as a pilot with Bristow Helicopters Ltd (BHL) in 1997/1998. He received his CPL H and S-61N Type Rating on 18 December 1998 and was employed by BHL on the same day. He received his Instrument

[3] Flying hours 24 February 2008
[4] Including flying hours 24 February 2008

Rating Helicopter (IR H) and Sikorsky S 76 type rating in March 1999 and was employed by BHL until 2000.

1.5.2.2 From 2000 to 2006, he was employed by the Canadian Helicopter Corporation (CHC). He received his ATPL H on 25 January 2005.

1.5.2.3 In 2006, the first officer was employed by British International (BI) as a pilot and first officer. He was not rated as a commander.

1.5.2.4 The first officer held a JAR FCL ATPL (H) licence valid until 6 March 2012, with an S-61N type rating and instrument rating (IR H) valid until 30 June 2008. He held a Class 1 medical certificate valid until 1 August 2008.

1.5.2.5 The first officer conducted the last LPC on 19 June 2007 and was valid until 30 June 2008. The first officer's last LC was conducted on 6 July 2007 and was valid until 31 July 2008. The last annual AC was conducted on 8 August 2007 and was valid until 31 August 2008. He conducted an OPC on 19 December 2007, valid until 30 June 2008.

1.5.2.6 The first officer had 528 hours of instrument hours before the incident. He had not conducted any instrument approaches (NDB, VOR, ILS) in the last 30 days before the incident, nor had the first officer conducted any instrument approaches to ENBO before the incident.

1.5.2.7 The first officer stated that he felt rested and alert before the flight to Værøy.

1.5.2.8 Flying hours first officer:

Table 3: Flying hours first officer

Flying hours	All types	Relevant type
Last 24 hours[5]	1:25	1:25
Last 3 days[6]	1:25	1:25
Last 30 days	32	32
Last 90 days	76	76
Totalling	4,684	797

1.5.3 Air traffic controller

The air traffic controller was a 27 years old male. He was authorized as an air traffic controller at Gardermoen TWR in July 2005 and rated as an air traffic controller at Bodø TWR/APP in March 2007 with Approach Control Surveillance (APS), Aerodrome Control Instrument (RDI) and Approach Traffic Information (ATI) ratings. The air traffic controller stated that he felt rested and alert before he went on duty.

1.6 Aircraft

1.6.1 Sikorsky S-61N, S/N 61270 with registration G-ATFM.

1.6.2 Construction year 1965.

[5] Flying hours 24 February 2008
[6] Including flying hours 24 February 2008

1.6.3 Total flight hours: 37,414.

1.6.4 The helicopter had been operated for 893 hours after the last 9000 hours/10-year-inspection

1.6.5 The helicopter had two General Electric CT58-140-2 engines. LH S/N 295242C, Time Since Overhaul (TSO) 2 784 hr, RH S/N 295151C, TSO 1 361 hrs.

1.6.6 The last maintenance work conducted on the helicopter before the flight on 24 February, was a 30- hour inspection conducted on 6 February 2008 and replacement of the GPS Nav Database Cartridge on 20 February 2008. G-ATFM had installed a GPS with Nav Data Base Cartridge updated on 20 February 2008.

1.6.7 There were no known remarks relating to defects with the G-ATFM, its engines or systems before or during the flight on 24 February 2008.

1.6.8 G-ATFM was certified for IFR-flying and equipped accordingly.

1.6.9 G-ATFM was equipped with a permanently installed GPS system. The GPS display was mounted on the lower part of the mid console and therefore difficult to use for reading direction and distance to a selected navigation point when the flight conditions demanded constant attention outside the cockpit. GPS or NAV signal could be selected individually to the right or left Course Deviation Indicator (CDI). Hence, it was possible for one pilot to select GPS on his CDI while the other pilot could select ILS on his. It was not possible to have both GPS and ILS selected on the same CDI.

1.6.10 In addition each pilot had an Omnidirectional Bearing Selector (OBS) instrument which could indicate NAV 1 or NAV 2 information by choice. One way of using this equipment was that the Pilot Flying (PF), in this case the co-pilot, could have chosen GPS on his CDI, and NAV 1 ILS on his OBS indicator. The commander, who in this case was Pilot Monitoring (PM), could have chosen GPS on his CDI, and NAV 2 on his OBS instrument. On the actual flight the crew had not selected ILS and had therefore individually selected GPS on their CDI, and the ILS was not available on their respective OBS instruments.

1.6.11 The G-ATFM landed with 850 lbs fuel on board, corresponding to a flight time of approximately 45 minutes.

1.7 Meteorological information

1.7.1 TAF

1.7.1.1 TAF (FC) ENBO 240800Z 240918 11025G35KT 9999 FEW020CB BKN040 TEMPO 0918 18015KT 1000 SHSNRAGS VV010=

1.7.1.2 TAF (FT) ENBO 240500Z 241212 10020KT 9999 FEW010 BKN030 TEMPO 1221 18015K BECMG 1822 VRB08KT TEMPO 1212 27025G35KT 1000 SHSNRAGS VV007

The crew were aware of both the above listed TAF forecasts before the departure from Bodø.

1.7.1.3 TAF ENBO 241221 10020 KT 9999 FEW020CB BKN040 TEMPO 1218 10028G40KT 1000 SHSNRAGR VV010 BCMG 1821 24020KT=

1.7.2 METAR

METAR ENBO 241050Z 09026G36KT 9000 – SHSN FEW015CB BKN025 M00/M04 Q0973 TEMPO 1000 SHSNRAGS VV010 (The crew were aware of this MEATAR before the departure from Bodø).

1.7.2.1 METAR ENBO 241150Z 09027G37KT 9999 FEW025 SCT040 00/M04 Q0971 TEMPO 1000 SHSNRAGS VV010

1.7.2.2 METAR ENBO 241350Z 09025KT 1200 SHSN VV010 M01/M02 Q0970 TEMPO 9999 FEW015 CB BKN025=

1.7.2.3 METAR ENBO 241420Z 09029KT 0800 SHSN BLSN VV008 M01/M02 Q0970

1.7.2.4 METAR ENBO 241450Z 09026KT 0500 SHSN BLSN VV004 M01/M02 Q0970

1.7.3 Weather at Værøy

ENVR 1300Z 15020KT 8000 SCT010 BKN015 05/04 Q969.

1.7.4 SIGMET

ENBD SIGMET 06 VALID 240900/241300 ENVN - NORWAY FIR OCNL SEV TURB FCST BTN N6500 AND N6730 BLW FL080. NC.= (Received by the crew before departure from Bodø).

1.7.5 ICE MESSAGE

ENBD ICE MESSAGE 01 VALID 240900/241500 ENVN- NORVAY FIR LOC MOD ICE FCST BTN N6500 AND N6800 BLW FL130. 0-ISOTERM: 2000-3000FT. MOV N. NC.= (Received by the crew before departure from Bodø).

1.7.6 ATIS (as reported by the crew)

ENBO ATIS X-Ray 1352Z 09029KT 800 (missing WX and VV compared to METAR 1350Z) FEW015 BKN 025 M01/M02 Q0970 TEMPO 1000.

1.8 Aids to navigation

1.8.1 BDO DVOR/DME 117.550 MHz. According to NOTAM BDO VOR was out of operation. DME was operational.

1.8.2 BO ILS 110.300 MHz. ILSy required VOR operational. ILS y RWY 07 intended for helicopters flying in from Værøy at 1200 ft is shown in Appendix C. The commander had not been briefed that there was a special ILS procedure for helicopter approaches from Værøy with an approach altitude of 1200 ft. However he was familiar with the standard ILS approach for aeroplanes which he thought had an approach altitude of 2500 ft.

1.8.3 FLEINVÆR NDB FLV 374 kHz

1.9 Communication

Bodø TWR 118.100 MHz

Bodø APP 119.700 MHz

1.10 Airport

ENBO, Bodø Airport, Category A, Runway 07.

1.11 Flight recorders

The G-ATFM was equipped with a Cockpit Voice Recorder (CVR) Penny & Giles Aerospace Ltd. Type 900/D51508, Part Number D51508 Issue 2 MOD1, Serial Number 1059/07/94. CVR was not secured after the incident and data from the relevant flight has not been available for the investigation.

1.12 Wreckage and impact information

Not applicable.

1.13 Medical and pathological information

Blood or breaths samples were not taken after landing.

1.14 Fire

Not applicable.

1.15 Survival aspects

Not applicable.

1.16 Tests and research

No tests or research conducted.

1.17 Organisation and management

1.17.1 Lufttransport AS

1.17.1.1 Lufttransport (LTR) holds a Norwegian Air Operator Certificate (AOC) for passenger transport. As LTR's own helicopter, AB139, Reg. LN-OLV, was being serviced, LTR had entered into a "wet lease" agreement with British International (BI) for the period 10 January - 17 February 2008. The company had also been leased in 2007.

1.17.1.2 "The wet lease" agreement was approved by the Civil Aviation Authority Norway (CAA-N) on 10 January 2008 and was valid for the period 10 January 2008 to 17 February 2008. The approval was contingent on the contractor operator, BI, having technical and operational responsibility.

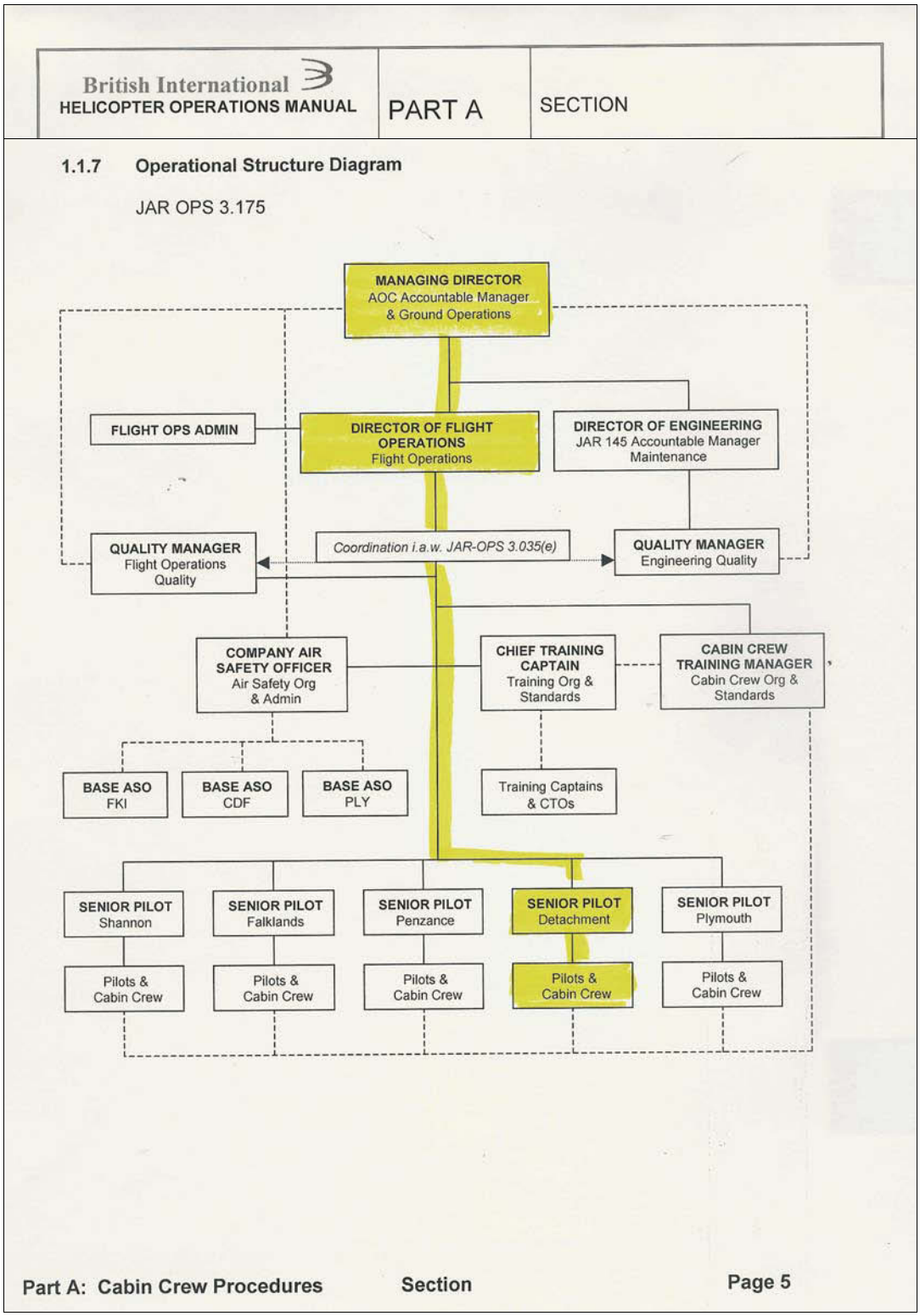
1.17.1.3 The incident in question took place on 24 February 2008. Accordingly, CAA-N's approval had expired at the time of the incident. The delay was caused by the fact that the

maintenance of LTR's own helicopter had not been completed by the deadline on 17 February and LTR had not applied to the CAA-N for an approval to extend the lease agreement. The G-ATFM returned to Cornwall on 27 February 2008.

1.17.1.4 During the first detachment in 2007, the company's pilots flew with an inspector from the CAA-N. LTR's chief instructor for helicopters flew with BI's crew during the first two flights. They were also accompanied by a supernumerary first officer from Lufttransport on several flights. This was done to provide support to the company's own Line Check Pilots who were to check their own pilots. Pilot crew changes were organised in such a way that one pilot was replaced at the time so that the remaining pilot could instruct and update the new pilot. However, IFR training and ILS approaches were not practised. This was because the contract specified VFR only. On the other hand, all pilots had received training in instrument flying, but none of them had practised IFR familiarisation flights in Bodø. The pilots were not briefed on the special climatic conditions in the north of Norway in the winter, with frequent and heavy snow showers. The water content in clouds over the Arctic Ocean is higher than in clouds over the North Sea. This entails that the snowflakes are larger and denser, which significantly reduces visibility. This is important information to pilots who perform VFR operations.

1.17.1.5 The same preparations were not made before the Bodø operations for Lufttransport started in 2008. The first crew from British International (BI) was briefed on the operations by LTR's then chief pilot for Agusta Westland AW139. He went through LTR's operational procedures and made sure that the contracted crews had access to LTR's operative documentation. It was considered from Lufttransport og British International that BI’s crews were sufficiently familiar with the operation and the passenger flying in Bodø from the earlier detachment in 2007, and that further route training was not required. According to LTR, the BI crew the received a thorough review of LTR's passenger operations to Værøy based on VFR operations, including a briefing about refuelling on Værøy. LTR was of the opinion that this met the route briefing requirement. BI did not have access to LTR pilots in 2008.

1.17.2 British International Limited (BI)



1.17.2.1 British International Ltd, (BI) is a British company with a British AOC for operations including IFR-flying, passenger transport and offshore flying.

1.17.2.2 The S-61N, G-ATFM had been leased in accordance with a "wet lease[7]" agreement approved by the CAA-N.

1.17.2.3 BI's operations in Bodø were headed by a senior commander for each crew who was also the commander on the flights.

1.17.2.4 BI had included procedures for Bodø operations in its UK CAA approved Flight Operations Manual (FOM). In addition, the pilots had conducted simulator training for Class 2 take-off and approach procedures for Værøy.

1.18 Other information

1.18.1 The Aviation Act

Section 2-2 of the Aviation Act. Requirements regarding nationalities contain provisions that govern aviation using aircraft registered outside Norway.

Aviation within Norwegian territory may only be undertaken using aircraft that have:

1. Norwegian nationality, except as otherwise provided by this Act, cf. especially Section 16-1, or

2. nationality in a foreign state that has signed an agreement with Norway regarding aviation rights, or

3. special authorisation granted by the civil aviation authority.

Authorisation as mentioned in the first paragraph No. 3 will be granted on such terms and conditions as are deemed necessary in the individual case to ensure that aviation is carried out in a reassuring manner, or as are otherwise deemed necessary in the public interest. The authorisation may be withdrawn at any time.

1.18.2 BSL JAR-OPS 3

BSL JAR-OPS 3.165 Leasing

(a) Terminology

The terms and expressions used in this section shall have the following meaning:

(1) "Dry lease" - When a helicopter operates under a lessee's AOC.

(2) "Wet lease" - When a helicopter operates under a lessor's AOC.

(3) JAA operator – An operator authorised by a JAA member country according to JAR-OPS Section 3.

(b) Leases of helicopters between JAA operators

(1) "Wet lease-out". A JAA operator providing a helicopter and complete crew to another JAA operator, and retaining all functions and responsibilities described in Chapter C, remains the operator of the helicopter.

[7] "Wet lease" means leasing an aircraft with a crew as opposed to "dry lease" which means leasing an aircraft without a crew.

(2) All leases except "wet lease-out"

(i) Except as laid down in subsection (b) (1), a JAA operator using an aircraft from, or providing it to, another JAA operator must obtain prior approval from the relevant aviation authority.

Any terms or conditions that are part of this approval must be included in the lease agreement.

1.18.3 Regulations of 15 July 1994 No. 691 (COUNCIL DIRECTIVE (EEC) No. 2407/92 of 23 July 1992 on licensing of air carriers) usually referred to as the Licensing Regulations

Article 9

1. The granting and validity of an operating licence shall be contingent upon the air carrier's possession of a valid AOC specifying the activities covered by the operating licence and complying with the criteria established in the relevant Council Regulation.

Article 10

1. For the purposes of ensuring safety and liability standards an air carrier using an aircraft from another undertaking or providing it to another undertaking shall obtain prior approval for the operation from the appropriate licensing authority. The terms and conditions of the approval shall be part of the lease agreement between the parties.

2. An EEC member state shall not approve agreements leasing aircraft with crew to an air carrier to which it has granted an operating licence unless safety standards equivalent to those imposed under Article 9 are met.

1.18.4 Appendix 2 to the Licensing Regulations

5.2 Wet-lease

The wet-lease application, including a copy of the lease agreement, must be submitted to the aviation inspection authority, for approval well before the lease enters into force.

The wet-lease is contingent on the lessor being in possession of a valid licence and AOC. It is a requirement that the lessee operates an aircraft of the same category.

Wet-lease from non-EEA-companies is contingent on there not being available capacity within EEA member states. The lessee must be able to document this.

Both the operative and technical responsibility rests with the lessor, whereas the commercial responsibility rests with the lessee

At the 2005 Aviation Conference, the Civil Aviation Authority specified that:

- *All lease agreements must be approved by the aviation authority in advance. This applies to both dry-lease and wet– lease agreements.*
- *It is worth noting that the authority is under no obligation to approve the wet-lease agreement. The authority must be sure that the safety requirements stipulated in Article 9 have been met, cf. Article 10, No. 2.*

1.18.5 REGULATION (EC) No 1008/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL **(Note! Effective 24 September 2008, after the incident)**

of 24 September 2008 on common rules for the operation of air services in the Community (Recast) (Text with EEA relevance)

Article 13

Leasing

1. Without prejudice to Article 4 (c), a Community air carrier may have one or more aircraft at its disposal through dry or wet lease agreement. Community air carriers may freely operate wetleased aircraft registered within the Community except where this would lead to endangering safety. The Commission shall ensure that the implementation of such a provision is reasonable and proportionate and based on safety considerations.

4. The competent authority may attach conditions to the approval. Such conditions shall form part of the wet lease agreement.

1.18.6 Provisions relating to civil aviation (BSL-F) - Relevant excerpts

1.18.6.1 *"**Section 3-3.** Weather minima for VFR operations within control zones and for special VFR flights*

(1)Unless a clearance has been obtained to operate as a special VFR flight, or a flight as mentioned in Section 3-2, VRF flights shall not take place in any control zones when the ground visibility at the airport in question is less than 5 km and/or the cloud cover height is less than 450 m.

(2) If the ground visibility or the flight visibility is less than 3 km, special VFR-flights shall not take place except in the following circumstances:

b) Helicopters may be cleared to operate as special VFR flights provided that the ground visibility is equal to or better than 800 m. At the same time, flight visibility must not be less than 800 m and the helicopter's speed must be adjusted to the relevant flight visibility to allow the pilot to observe obstructions and avoid collision.

1.18.6.2 *"**Section 3-5.** Minimum heights*

(1) Aircraft operated in VFR flights must not fly lower than 300 m (1.000 ft) over the highest obstacles within a radius of 600 m from the aircraft over densely populated areas or open air assemblies or lower than 150 m (500 ft) above the ground or water in other locations.

(2) It is possible to deviate from the minimum height requirements when necessary during take-off and landing and when flights are conducted by helicopters in accordance with "Driftsforskrifter for ervervsmessig luftfart med helikopter" (Provisions regarding Commercial Air Transport with Helicopter) or the Civil Aviation Authority has granted a special authorisation.

1.18.6.3 *"**Section 3-12.** Change from VFR flight to IFR flight*

(1)A commander who is conducting a VFR flight and who wants to change over to IFR must inform air traffic control about any necessary changes to the applicable flight plan. If a flight plan has not been submitted, the commander must submit this to the relevant air traffic control unit when required pursuant to Section 2-19, second subsection.

(2) In addition, the commander must obtain clearance in accordance with Section 2-26 first subsection before changing to IFR flight in controlled airspace."

***Section 4-2.** Rules applying to IFR flights within controlled airspace*

(1) All IFR flights within controlled airspace must take place according to the rules relating to air traffic control service, Sections 2-26 to 2-34.

1.18.7 Statement from the commander

1.18.7.1 The commander had not realised the gravity of the situation. After interviews with ATC, Lufttransport and the CAA-N, he reported the incident to AIBN.

1.18.7.2 In his first report to Lufttransport, the commander states that they made a right turn at 4 NM to stay clear of Hjartøy and flew towards the centre line using the GPS as "back-up". Furthermore, he stated that during the approach they maintained a ground speed of approximately 25 kt, and that they saw a red obstruction light which they later believed to be an obstruction light just north of the centre line. They had not observed the runway lights. They were not satisfied with their horizontal position and chose to climb to conduct an ILS approach from 1 500 ft, which had been offered by air traffic control. The commander commended air traffic control for their good assistance, even though they had not declared an emergency. However, they were very surprised at being met by fire engines and an ambulance on arrival, but presumed that this might be normal procedure in such a situation when a plane must make a "go around" and conduct a new approach under such conditions.

1.18.7.3 During his conversation with the air traffic controllers after the incident he also stated that they had seen the water/ground the whole time and believed that they had had control over the situation. He explained the wobbly instrument approach to be a result of bad weather conditions and a somewhat stressful atmosphere in the cockpit.

1.18.7.4 The Civil Aviation Authority Norway received a report from air traffic control (ATC) who believed this constituted a serious aircraft incident. They had also received a report from the helicopter commander who presented the incident as less serious. On the basis of the differences in the reports from the ATC and the commander, the latter was asked to attend a meeting at the CAA-N’s premises on 27 February 2008. During the conversation with the CAA-N about the report from the ATC, the commander explained that he realized that the incident was more serious than presented in his first report. He explained that they had not established visual contact with Hjartøy, but that the island was indicated on the radar. The commander expressed that he had experienced the incident as very unpleasant.

1.18.7.5 The crew flew the G-ATFM back to Penzance, UK, after the meeting with the CAA-N on 27 February 2008.

1.18.7.6 During the subsequent telephone conversation with the AIBN in 2008, the commander stated that they should have accepted ILS during the initial part of the approach. He stated that he was worried about icing as the reason for not accepting air traffic control's offer of an ILS approach. Furthermore, he explained that the reason why he was so concerned about icing was that early in his career in the Royal Navy, he had been involved in a serious icing situation near Tromsø.

1.18.8 Supplementary statements from the commander/first officer/flight safety officer

1.18.8.1 During the AIBN's investigation, several questions arose concerning the crew's handling of the situation. In an attempt to better understand why the crew acted as they did, the AIBN decided to travel to Penzance, UK, to conduct additional interviews with the commander, first officer and flight safety officer. The AIBN's senior adviser for human factors (HF) and the Investigator In Charge (IIC) conducted additional interviews at British International's main base in Penzance, Cornwall, in January 2010.

1.18.8.2 The AIBN was particularly interested in understanding why they had not accepted climbing to 500 ft after having initially accepted the offer of ILS. The commander had not realised how far from the runway they had been, or how near they had been to the terrain at a very low altitude, before seeing radar print-outs during the conversations with the AIBN. Nor did he realise that he had declined the offer of a safety height of 500 ft until he saw the print-outs from the radio communication. He realised that he might have misinterpreted the altitude clearance to 500 ft as 2500 ft and consequently feared rotor icing, and that this was the reason for twice declining the ILS offer. The commander explained that he had not seen or received any information about a separate helicopter ILS procedure with an altitude of 1200 ft, but ment he had seen the approach chart for aeroplanes which showed an altitude of 2500 ft (the correct altitude was 2000 ft). The crews were not prepared for instrument or ILS flying. The assignment was for "VFR operations" and hence the crews had not received briefing or practised training in ILS approaches to Bodø. During the approach to Bodø they were flying according to the GPS and did not have the ILS approach chart readily available, but it was available in the cockpit.

1.18.8.3 The commander had previously flown similar missions in Bodø during two periods (January and February 2007). He had before the detatchment in 2008 reviewed the company's instructions before departure for Bodø. He had also practised take-off and landing procedures for Værøy in a simulator. They did not receive a briefing from Lufttransport in Bodø, nor did they conduct any practice flights in Bodø before the flight. The commander felt that he was not sufficiently prepared for the wintry flight conditions they experienced in Bodø. He confirmed that he had been briefed on the VFR operation by the previous commander, but that the briefing did not include briefing about ILS approaches, nor was it performed route checks.

1.18.8.4 Both the commander's and the first officer confirmed that it had been a while since they had practised IFR flying, and none of them had flown an ILS approach to Bodø.

1.18.8.5 According to the company's UK CAA approved OM the company could descend to 250 ft above the sea with a visibility of 4 km in to a UK-defined Coastal Airport[8]. In later conversations with AIBN the crew explained that they considered Bodø airport to be a

[8] UK CAA may grant dispensation from the VFR requirements for approaches to airports defined as a Coastal Airport.

Coastal Airport and assumed that that they could fly in the same way in Norway. They were used to flying like that and had no problems with flying at a lower altitude than the Norwegian minimum altitude of 500 ft.

1.18.8.6 The BI's S-61N is equipped with an Autopilot Heading Hold function which can be overridden by depressing the tailrotor pedals. The commander believed that the reason why they continued to drift northwards could be that the first officer, who was PF, touched the left pedal. This would have caused the helicopter to make a continuous turn to the left. The commander believed that this, in combination with strong winds, made them drift from the centre line towards the north.

1.18.8.7 When the commander realised that they were north of the airport flying towards high ground, he assumed control, ran the engine at maximum power and initiated a left turn vertical climb. He remember thinking that since they were near high ground he had to climb at a low indicated speed whilst turning more to the left to reduce the turning radius.

1.18.8.8 The radar print-outs from Avinor (the ATC service provider) show that after they climbed to 1 500 ft and flew towards the south, the flight was "a bit wobbly" as observed by the air traffic controller. When flying towards the south he again transferred control of the aircraft to the first officer whilst he started planning the ILS approach. He had to find the correct ILS procedure and enter the correct frequency, and it was the first time he had seen this helicopter procedure. This took some time. In the meantime the first officer flew according to instructions from the air traffic controller and without being aware of the aircraft's exact position. While the commander was busy finding the ILS approach chart and establishing an ILS frequency, they crossed the centre line twice, first towards the south, then towards the north, before turning on to the ILS centre line from the north. The commander explained that this was because they were not prepared for an ILS. After a while they were ready for an ILS and the first officer continued to fly according to the ILS indications and the air traffic controller's instructions. When asked how the communication between the first officer and himself had been, the commander replied that they had not exchanged that many comments. This was because there was continuous communication between the commander and the air traffic controller.

1.18.9 Supplementary statement from the first officer

1.18.9.1 The first officer had not flown in to Bodø previously, but had reviewed the company's provisions for Bodø operations, and had conducted simulator training in Værøy procedures. He had not received any special briefing before the assignment in Bodø. He was going to stay in Bodø for two days and was to fly one flight on the day in question and then be the first officer on the return flight to the UK on the following day, which for various reasons was delayed until 27 February. He did not receive a briefing from Lufttransport in Bodø. Nor had they conducted any practice flights in Bodø before the flight. He felt that he was not sufficiently prepared for the flight conditions they experienced in Bodø.

1.18.9.2 The first officer confirmed that the commander had assumed control of the aircraft when they were requested to climb to a safe altitude and make a turn towards the south (by Lille Hjartøy). As they were climbing towards the south the first officer was again assigned control and the commander found the correct approach chart for ILS y RWY 07.

1.18.9.3 The first officer explained how difficult it was to use the GPS display during navigation at a low altitude and that they had to find their bearings according to external references. The GPS display was installed on the lower part of the console. In the situation they were in, flying at a low altitude with poor flight visibility, they could not risk looking down in to the cockpit. The first officer thought that the GPS display should have been installed at the front of the instrument panel

1.18.9.4 The first officer explained that he did not remember the details of the flight as the incident took place two years ago. However, he did confirm that he had felt stressed and worried to the extent that he had thought about his family and about how they had to manage a successful landing by means of ILS.

1.18.10 Statement from the BI Air Safety Officer

1.18.10.1 The air safety officer had assumed his position in 2009. He had previously been both Chief Pilot and Operations Director for the company.

1.18.10.2 The flight safety officer explained that the company had a corresponding assignment in Bodø in 2007. He stated that two of their commanders and a first officer had been involved in the first Bodø detachment. The most senior commander was in charge of the detachment. The company had an operations order (OMB-Part C) which described the operation in Bodø. The operation was based on ”VFR flight only”. The pilots conducted special simulator flight training to be able to conduct a separate take-off and landing procedure (Class 2 procedure) for Værøy.

1.18.11 Report from the Civil Aviation Administration Norway (Avinor)/Air traffic control.

1.18.11.1 According to the report from air traffic control, the air traffic controller considered the situation to be so serious that he initiated increased preparedness. They experienced a situation where visibility was under the minima for IFR operations and a helicopter was conducting a special VFR approach flying closer to rising terrain near Bodø harbour and Lille Hjartøy and flying at a very low altitude. The crew did not declare an emergency situation, but air traffic control handled the situation as such. LTR004 was given continuous radar assistance during the subsequent ILS approach. The instrument approach was observed on the radar as "wobbly". The air traffic control's description of the course of events is confirmed by print-outs from the radar, Annex D.

1.18.12 Report from Lufttransport

1.18.12.1 The AIBN has received a report from Lufttransport prepared by the chief helicopter pilot. The following is quoted from the report:

> "*... As I understand it, on the basis of the information I have received, the commander actually did everything correctly until the point when the weather turned worse than forecast.*
>
> *According to the information which I/Lufttransport AS have, it is difficult to understand why the commander did not immediately accept an ILS. It is of course always easier to understand a situation in retrospect. I was not in the cockpit and did not experience what the commander did.*

Lufttransport AS has done everything we should with regard to the operation and phase-in of the Veritair/British International helicopter and cannot be blamed for individual errors made by Veritair/British International's pilots, or for the fact that the transfer of information internally in Veritair/British International did not function. We must be able to count on a JAR-OPS 3 operator approved by the UK CAA at least fulfilling the minimum standard..."

1.18.13 International research relating to *"Approach and Landing Accidents"*

1.18.13.1 In recent years there has been relatively extensive research on accidents related to approaches and landing. Cf. http://www.flightsafety.org/asw/dec06/asw_dec06_p28-33.pdf [9] (Reference 4).

1.18.13.2 Three conditions in particular have proven to be difficult during approaches and landings in difficult conditions: *"Plan continuation bias", "expectation bias" and "snowballing workload"*.

1.18.13.3 *"Plan continuation bias"* is an expression for a human tendency to comply with the first adopted decision, even though there is new information which indicates that a new assessment should be made. *"Expectation bias"* means that a person who expects a certain situation is not very receptive to signals which indicate that the situation is not quite as it seems.*"Snowballing effect"* expresses the fact that an increased work load produces stress. *Stress reduces mental capacity and can result in a crew losing situational* awareness *and over-focusing on a work assignment at the expense of other tasks (target fixation/tunnelling).*

1.18.13.4 See also the Flight Safety Foundation's (FSF) Approach and Landing Accident Reduction (ALAR) Task Force report (Reference 5).

1.18.14 British International's measures after the incident

1.18.14.1 Immediately after the incident an internal investigation was instigated by the company's Air Safety Officer at the time. One outcome of the investigation was that the commander had to fly as a first officer for six months. He then had to attend a new flight commander evaluation before being permitted to fly as a commander.

1.18.14.2 The investigating officer made several recommendations to the operative management, for example that pilots should receive Line Oriented Flight Training (LOFT) in connection with a new detachment before regular operative flights. The company has also subsequently introduced a Safety Management System (SMS) including a risk assessment. As a result, all new operations must be subject to risk assessments. The safety officer stated that in future, special conditions relating to flights from foreign bases will be identified and subjected to safety assessments and compensating measures based upon SMS. He therefore believed that the risk of recurrence had been reduced.

1.18.14.3 The outgoing Air Safety Officer's report was assessed by the incoming new Air Safety Officer in a report to the Accountable Manager. It emerges from the report that there was general agreement as regards the outgoing flight safety officer's assessments. However, during the AIBN's conversations with the company's representatives at the main base in

[9] A.Berman and R.Key Dismukes, PhD. Article in the magazine Aviation Safety World, FSF, December 2006.

Penzance, UK, it was established that the proposed measures had not been formalised as recommended.

1.18.14.4 The company's quality system has been revised since 2008. The AIBN was shown how British International had planned to establish a new offshore base in the UK. The company had conducted a comprehensive risk assessment of the new operations. Such a risk assessment had not been conducted prior to the company's operations in Bodø, but from then on a risk assessment was always conducted before starting up new operations or bases.

1.19 Useful or effective investigation techniques

No investigation techniques qualifying for special discussion have been applied in this investigation.

2. ANALYSIS

2.1 Introduction

2.1.1 The Accident Investigation Board Norway considers this aircraft incident to be serious. The G-ATFM crew flew according to visual flight rules, Special VFR, in weather conditions that were below the minimum requirement, at an extremely low altitude in an unknown area, without knowing exactly where they were in relation to the terrain. Due to an observant and competent air traffic controller the crew were directed out of the serious situation they were in and on to ILS approach with a subsequent normal landing.

2.1.2 This is a type of incident where it is easy to criticise the crew in retrospect. When first studying the reports from the crew, air traffic control, operator and the licensed contracting company, it seems as if all parties performed their duty except the crew. By studying the weather conditions, flight rules, standard operation procedures, approach systems, instrument procedures, ground conditions, etc. in retrospect, it is difficult for external parties to understand how an experienced crew could end up in such a situation.

2.1.3 With hindsight it is also easy to focus on what the commander "should" or "should not" have done to prevent the incident. The AIBN has chosen to examine the whole operational system, including the crew, contracted operator (BI), licensing company LTR), local aviation authority (CAA-N) and air traffic control (ATC). We have focused on the personnel's evaluations prior to the incident, based on the information, provisions, knowledge and general framework conditions available at the time of the decision.

2.1.4 During our examination and analyses of this serious aircraft incident we have applied accident investigation theories reflected in the works of Reason (1997) and Dekker (2006 and 2007). (Cf. references 1-3).

> *“Organizational accidents have multiple causes involving many people operating at different levels of their respective companies. By contrast, individual accidents are ones in which a specific person or group is often both the agent and the victim of the accident. The consequences to the people concerned may be great, but their spread is limited. Organizational accidents, on the other hand, can have devastating effects on uninvolved populations, assets and the environment.” (Reason 1997).*

”The challenge is to understand why it made sense to people to continue with their original plan. Which cues did they rely on, and why? When cues suggesting that the plan should be changed are weak or ambiguous, it is not difficult to predict where people’s trade-off will go if abandoning the plan is somehow costly… People need a lot of convincing evidence to justify changing their plan in these cases. This evidence may typically not be compelling until you have hindsight…” (Dekker 2006).

2.1.5 By reference to the foregoing AIBN has analyzed this serious incident in light of organizational and human factors.

2.2 Delimitation of the analysis

2.2.1 In our investigation, we have chosen to analyse the following conditions:

- Weather conditions
- Planning
- Evaluation of the crew's flying
- Evaluation of the air traffic controller's assistance to LTR004
- Evaluation of Lufttransport's lease agreement with British International
- Evaluation of Lufttransport's information to the contracted company before start-up
- Regulations for leasing of aircraft with crew (”wet lease”)
- Human factors

2.3 Weather conditions.

2.3.1 The weather forecast for the day in question was typical for winter conditions in the north of Norway with strong gale-force winds from the south east, snow, snow and rain, and hail showers (CB) with good visibility between showers. However, during snow showers visibility was forecasted to be as low as 1000 m with a vertical visibility of 1000 ft. Cf. section 1.7.1. However, later on in the day snow showers were more frequent and visibility was reduced to 500 meter without this being forecasted.

2.3.2 G-ATFM took off from ENBO at 1300Z hours. METAR ENBO 241150Z (this METAR from 1250 hours local time and approximately one hour before take-off, as well as earlier METAR) indicates winds from the east with gusts of gale force and visibility in snow, snow and rain, and hail showers reduced to 1000 m and a vertical visibility of 1000 ft. The air temperature upon departure was around 0 ºC and the dew point minus 4 ºC. The air temperature above the sea was 2-3 °C higher than over land. The applicable SIGMET indicated that the freezing level was at 2000 – 3000 ft. Formally the TAF and METAR met the requirements for VFR flight to Værøy with return to Bodø, with a special VFR approach to Bodø in flight visibility down to 800 m. The crew received clearance for take-off with a "special VFR" out of the Bodø control zone. For this type of

flight operation BSL JAR OPS 3. 465(a)(2) set a requirement of 600 ft cloud base over water without sight of land in daylight.

2.3.3 The Meteorological Station for North Norway had forecast turbulence and icing. Cf. sections 1.7.3 and 1.7.4.

2.3.4 For a British crew usually operating in the south of England, and with limited experience of flying in weather conditions typical for the north of Norway, and relatively low currency of instrument flying, this could be considered acceptable VFR flight conditions. The AIBN is of the opinion that a more comprehensive briefing on winter conditions typical for the north of Norway could have prepared the British crews better for VFR operations out of Bodø in the wintertime.

2.4 Planning

2.4.1 The crew had planned the flight of the day to Værøy with return to Bodø as an VFR flight, with Special VFR take-off and approach to ENBO. As mentioned in section 2.3, the forecast and actual weather were within the applicable regulations in the planning phase before the flight took off.

2.4.2 In such weather conditions one should be prepared for lower than forecasted visibility in snow showers, both horizontally and vertically, and that an "escape" strategy" might be necessary. Visibility in snow showers largely depends on the temperature and humidity in the air. If the air temperature drops, more and more snow crystals will be released, the snowflakes will become denser and visibility will be reduced. With the freezing level forecasted at 2 000-3 000 ft the crew could have flown an instrument flight to ENBO if the snow shower visibility was too poor for a special VFR. The minimum altitude for VFR flights in Norway is 500 ft above the ground or water. For a special VFR flight the minimum flight visibility requirement is 800 m. There are few references for horizontal flying in snow showers above a grey sea. The result is that one must rely on instrument references at very low altitudes, something which this incident is an example of. With a better knowledge about the climatic conditions in North-Norway during wintertime it is possible that this crew had considered postponing the flight until a better weather forecast was available.

2.4.3 Lufttransport's report to the AIBN claims that the commander did everything correctly up until the point when the weather conditions turned worse than forecasted. The AIBN does not concur with this statement. AIBN is of the opinion that for passenger flights the operator requirements go beyond merely satisfying the minimum requirements for VFR operations (compliance versus safety[10]). Even though operations comply with VFR and special VFR regulations, alternative procedures must be considered if the flight visibility drops below the requirements. In answering AIBN's question to why LTR004 did not return to Værøy the commander answered that Værøy was not considered as an alternative. Værøy was not an ordinary heliport with all required facilities. They did not know how the weather had developed since they left Værøy and they considered the best alternative to continue towards Bodø.

[10]"Compliance versus Safety" is an expression (used by, among others, the Flight Safety Foundation, FSF) meaning that even if a crew or a company comply with the authorities' minimum regulations (compliance), there is no guarantee that safety is properly maintained (safety).

2.4.4 In its incident report to the AIBN (cf. section 1.18.7), Lufttransport's chief helicopter pilot stated that he did not understand why the commander did not accept an ILS approach immediately. Based on the comments in section 2.4.3, the AIBN believes that this is counterfactual (cf. Reference 2) based on facts established in retrospect. This view is evidently also shared by Lufttransport's chief pilot as he adds that it is always easier to understand a situation in retrospect and that he was not in the cockpit and did not experience what the commander did.

2.4.5 The crew's experience was mainly from the south of England, where they for the most part flew VFR flights and special VFR flights in reduced flight visibility in rain and rain showers. Visibility is much better in rain than in snow showers. With their previous experience in mind, we find it natural that the crew should plan for a VFR/special VFR flight to Værøy and back to Bodø. Lufttransport, as a licensing company, had this experience. The AIBN therefore believes that it is incorrect to criticise the British crew for insufficient planning. The crew carried out their tasks according to the assignment they had been given and on the basis of their own experience from scheduled flights in the south of England. The flight to Værøy was to be based on VFR flight and the meteorological information conformed with the formal requirements before departure. Without the required knowledge, experience or training of scheduled flights in winter conditions typical of North Norway, which they could have received from Lufttransport, the crew planned the relevant flight in accordance with their qualifications and procedures.

2.5 Evaluation of the crew's flying

2.5.1 At 1507 hours recordings of the radio communication establish that the runway visibility range (RVR) at Bodø was 360 m in snow showers. The wind at Bodø was reported to be 090/29, max. 35 kt. At 1516 hours TWR reported to a different aeroplane that the runway visibility range was 600 m. It may be questioned why the crew at this time did not reconsidered its situation. The commander has explained to AIBN that based on TAF and earlier METAR, they at that time were not worried that they could not continue towards Bodø with flight visibility to the surface.

2.5.2 At 1520 hours, LTR004 received clearance for an ILS approach and was requested to climb to 500 ft. In order to come in under ILS they had to fly close to Bliksvær (elevation 310 ft) and the air traffic controller wanted to give LTR004 a safety margin. The offer of an ILS was meant as an emergency solution during the present weather conditions. The controller had interpreted the critical situation and tried to assist LTR004 in the best way possible. Based on the icing forecast from the weather service (cf. section 1.7.4) the freezing level was at least 2 000 ft. Climbing to minimum 500 ft should therefore not have given the crew reason to be concerned about icing. As regards flying in snowfall, there is no significant difference between flying at 300 ft with visibility of the surface or flying at 500 - 1 000 ft under instrument conditions. Moreover, there was an air temperature thermometer in the cockpit. The AIBN is of the opinion that this radio communication indicates that the crew wanted to fly with a view of the water and concurrently navigate by means of an ILS/LLZ. This indicates that the crew felt insecure about changing to proper instrument flying and continuing the flight under IMC conditions. During subsequent interviews with the AIBN, the commander has stated that at the time he was not aware of the Copter ILS y with an approach altitude of 1 200 feet, but that he did remember that there was a standard ILS approach with an approach altitude of 2 500 ft (actually 2000 ft). During the same interview, he stated that he could

not remember having declined the offer of climbing to an altitude of 500 ft. This may indicate that he interpreted 500 ft as 2 500 ft and therefore believed that there was a risk of icing and consequently declined the offer of ILS. The AIBN believes that this is an indication of inadequate preparations by both LTR and BI. If BI's crew had been briefed on, and conducted ILS practice flights in to Bodø, they would have been familiar with these altitudes.

2.5.3 Furthermore, LTR004 replied that it was best that they continued towards Bodø on a special VFR clearance and that they reduced the speed and maintain visual contact with the sea. Radar print-outs show that at this time LTR004 was flying towards Store Hjartøy at 100 ft and had a ground speed of 40 kt. The AIBN is of the opinion that this indicates that the flight conditions for LTR004 at the time corresponded to those at Bodø. An altitude of 100 ft indicates that the crew had to fly at such a low altitude to have sufficient flight visibility to maintain visual contact with the sea below. In these conditions the crew had to base their orientation on the basis of instruments and navigate according to the GPS. Radio communications indicate that the crew only had visibility over the sea and were uncertain about the aircraft's horizontal position. They therefore requested a course to steer towards Bodø. Despite this, they reported that visibility was good and confirmed that they could spot Bodø. At this time, it was reported that Bodø had 540 m runway visibility. This indicates that the crew were about to lose control of the situation. The AIBN is of the opinion that the situation for LTR004 at this point was so serious that it would have been justified to declare an emergency situation. Styrmannen derimot, innrømmet for SHT at han hadde vært meget bekymret under siste del av innflygingen. The commander has explained to AIBN that he did not regard the situation as serious and became surprised when they were met by the emergency respons vehicles upon landing. It was in retrospect that the commander realized the seriousness in the situation. The flight officer however, has told AIBN that he was very concerned during the last part of the approach.

2.5.4 According to the AIBN's assessment, it was the air traffic controller who, through his continuous monitoring of LTR004, guided the crew out of several dangerous situations and perhaps prevented an accident. It is clear to AIBN that the crew did not realize the serious situation thay had gotten into, and that it was ATC that could save them from the situation by use of radar guidance. ATC gave all the information which could be expected and handled the flight situation as an emergency situation. Continued flight at low altitude near rising terrain was absolutely an emergency situation. As such, it was also assessed and handled by the ATC controller. The perceived problem for LTR004 was a danger of rotor icing. A timely question (”challenge”) from the ATC regarding the indicated air temperature might possibly have resulted in the crew's reconsideration. However, such conditions are the clear responsibilities of the commander and outside the ATC's area of responsibilities.

2.5.5 At 1528 hours, LTR004 reported that they were “losing the horizon” (lost horisontal visibility), that they wanted to head for Bodø and that they were 6 NM out. AIBN interprets this that the snowfall was so dense that they had very low flight visibility. They were again asked by the traffic controller if they wanted an ILS approach. LTR004 declined yet again stating that they did not want ILS due to the risk of icing. Again they received special VFR clearance in to Bodø. From this point onwards, the air traffic controller handled the situation as an emergency. He heightened emergency response at the airport and continued to pay full attention to LTR004 and the terrain using radar. A question which AIBN would like to raise is whether the air traffic controller could

challenge the flight crew in such situations to encourage them to "shake off" unfortunate mindsets. AIBN is aware that this is a difficult issue and that air crews and ATC controllers have clearly defined responsibilities. The AIBN is of the opinion that in such an emergency situation an air traffic controller is a resource which may be part of the CRM collaboration. We find that in this respect the air traffic controller in Bodø performed his duties in a commendable manner. In this case it appears that the controller's advice "suggest climb immediately" to have been such a "wake up call".

2.5.6 At 1531 hours, the air traffic controller asked LTR004 if they had ground contact and if everything was OK. This confirmed that the air traffic controller suspected that LTR004 had poorer visibility than they reported, and consequently monitored LTR004 continuously. LTR004 returned an affirmative reply and said that they could see the surface and that they were 3 NM out. The reason for air traffic control's question was that the radar image indicated that LTR004 was flying at 100 ft at a ground speed of 40 kt. In addition, they were approaching close to Store Hjartøy which is 450 ft high. Consequently, the air traffic controller followed up and asked if they could see Store Hjartøy on the horizon, to which the flight crew replied that they could not. They were informed about the fact that they were 0.5 NM from the island and instructed to make a slight turn to the right. The air traffic controller repeated the question of LTR004's visibility and the crew confirmed that they could see land half a NM ahead. Based on print-outs from the radar and radio communication, the AIBN believes that it is possible that the crew could see the southern point of Store Hjartøy, and not land west of the runway as they might have believed. Store Hjartøy is uninhabited and has few lights. LTR004 was asked to report the lights (approach lights) when in sight.

2.5.7 Radar print-outs from 15:37:00 hours indicate that LTR004 had made a left turn to start the final approach. The altitude was 100 ft and the ground speed 30 kt. The distance to the runway was approximately 2 NM. LTR004 drifted a bit north and was asked to make a slight turn to the right. The AIBN believes that the deviation was caused by quite strong winds from the east-south-east. At the time LTR004 navigated according to GPS and AIBN considers it strange that the crew did not navigated by assistance from LLZ considering the poor flight visibility. With LLZ indication the crew would quickly have noticed the deviation and could have corrected for winds. It is not as easy to observe deviations with a GPS. They also had DME. LTR004 was again asked whether they could see land. To this the commander replied that they could see lights ahead. The AIBN believes that this indicates that they did not see land and that it is unclear which lights they actually saw, and that these lights possibly could have been the obstruction lights north of the runway. TWR reported that the runway lights at the time were located at a clock position of 1 o' clock and that they were north of the centre line and had to be aware of obstructions west of the runway. The print-out of the radar image at 15:38:00 hours showed that LTR004 was approximately 1.5 NM north-west of the runway 07 threshold at an altitude of 0 ft and had a ground speed of 30 kt. In addition, they were close to land north of the runway centre line. This indicates that LTR004 was close to the terrain. The crew were unaware of the position of the aircraft in relation to the obstacles, and they had poor flight visibility in snowfall. In such a situation it is easy to lose one's orientation due to the lack of external visual references, so-called *white out*.

2.5.8 At 15:38:19 hours the air traffic controller saw on the radar that LTR004 was drifting further north of the centre line and warned the crew that they were flying towards Bodø town and towards rising ground. LTR004 replied by requesting a safe course to steer by. AIBN believes this further confirms that the crew had lost their orientation. Radar print-

outs at 15:38:30 hours indicate that they were flying north-east towards the southern point of Lille Hjartøy at an altitude of 0 ft with a ground speed of 40 kt. In addition to the risk of flying into the sea, they were flying towards the entrance to Bodø harbour which is usually heavily trafficked by ships and where there are multi-storey buildings with tall concrete chimneys on the land side. At an altitude of 0 ft and with very poor visibility ahead, there was a high risk of the aircraft colliding with a ship or land installations. The air traffic controller repeated that LTR004 was flying towards rising ground and said *"suggest climb immediately*". LTR004 repeated the request for a safe course and the air traffic controller asked the crew to make a turn to the left. LTR004 confirmed by replying *"right turn to head south, LTR004*". The AIBN is of the opinion that the confirmation to turn right instead of left indicates a high stress level in the cockpit and that the commander had a high work load. The air traffic controller repeated that they should turn left to stay clear of the terrain.

2.5.9 Radar print-outs at 15:38:38 hours show that LTR004 had initiated a climbing left turn and passed 100 ft at a ground speed of 40 kt. At 15:38:54 hours radar print-outs indicate that LTR004 was positioned 200 m south of Lille Hjartøy, on a northerly course at 200 ft with a ground speed of 0 kt. 10 seconds later radar print-outs indicate that LTR004 was in the same position at 300 ft with a ground speed of 20 kt. After another 8 seconds they were still in the same position, maintaining the same altitude and the same speed. The AIBN is of the opinion that the same indicated radar position, at the same indicated altitude over a time period of 18 sec indicates that LTR004 initiated a quick climb at a very low speed. In such a situation it is very easy to lose the remaining speed and the helicopter can go in to a *translational* lift (Effective Translational Lift, ETL). In practice, this means that the helicopter goes in to hover. This may indicate that at this point the crew were about to lose control of the helicopter. Based on radar print outs LTR004 was apparently hovering at 300 ft under instrument conditions without any external references, which is very difficult to control. 11 sec later the radar print outs show LTR004 at 500 ft and 70 kt ground speed.

2.5.10 Radar print-outs from 15:39:30 hours show that LTR004 was half way through a left turn at an altitude of 600 ft and climbing at a ground speed of 60 kt. LTR004 requested to be (radar) guided towards an ILS approach. At that time, the crew no longer had a choice. The AIBN is assuming that at that time the crew realised how close they had been to the terrain and that the only way out was to conduct an ILS approach, even with a risk of icing. LTR004 received clearance to climb to 2 000 ft on a south-western course. Radar print-outs at 15:39:41 show that LTR004 was tangent to Store Hjartøy when coming out of the turn. However, the altitude was then 700 ft whereas the highest obstacle on Store Hjartøy is at 450 ft.

2.5.11 LTR004 continued to climb and levelled off at 1 500 ft. ATC offered an altitude of 1 200 ft which is the normal altitude for ILS y rwy 07. LTR004 replied that they preferred to fly at 1 500 ft. Radar print-outs at 15:41:45 hours show that LTR004 conducted a right turn towards ILS y rwy 07. The indicated radar altitude was 1 600 ft and LTR004 maintained a ground speed of 100 kt in 25-30 kt tailwind. The air traffic controller has explained to the AIBN that the rest of the ILS approach was "wobbly". He therefore kept LTR004 continuously updated on the course and distance to the runway. The AIBN believes that it was very important to calm down the crew who had experienced some frightening seconds in Bodø harbour. The commander has explained that the approach was flown under a combination of a stressful atmosphere in the cockpit and turbulence. The AIBN is of the opinion that this might also indicate the crew's low continuity in instrument flying.

This may also be an alternative explanation as to why the crew were so reluctant to accept an ILS approach at an earlier stage. The AIBN does not rule out that it may have been caused by a combination of a lack of IFR currency and a fear of icing. Another indication of the same is the crew's rejection of the offer to fly at 1 200 ft. The original reason for turning down the offer of an ILS approach was a risk of icing. During the ILS approach at 1 500 ft LTR004 was asked to confirm the air temperature. The crew replied that it was above 0 ºC, which was a bit below the icing warning level which was available before departure from Bodø, but still approx. 1 000 ft margin to icing. However, it was still below by a large margin. LTR004 continued its ILS approach with assistance from air traffic control. They spotted the ground at 600 ft and the runway centre line lights at 300 ft, but had not observed the approach lights.

2.6 Evaluation of the air traffic controller's assistance to LTR004

2.6.1 The air traffic controller only had two years of experience as an air traffic controller in Bodø after receiving his rating. This may not seem much, particularly with regard to handling an emergency situation. AIBN finds that the air traffic controller's handling of the incident was good and may be used by Avinor as a practical example (case study) when training air traffic controllers to handle emergency situations. In this instance the commander did not declare an emergency situation. However, the air traffic controller perceived the situation as such and acted accordingly. He therefore chose to give LTR004 clearance for a special VFR even though visibility at Bodø was below 800 m. The controller considered that a LLZ approach at 500 ft as a support to a special VFR during visibility conditions below minima, to be the safest method to guide LTR004 to Bodø airport. He offered an ILS approach several times, and gave LTR004 continuous updates about their position and courses to Bodø. He could have denied LTR004's request for a special VFR with the consequences that could have led to a situation involving a British crew flying in an unfamiliar area, at low altitude in adverse weather conditions, with passengers on board.

2.6.2 Although the AIBN considers the air traffic controller's handling of the incident as good, it should be considered whether air traffic control may be even more direct in an emergency situation. In this case, a question from the air traffic controller about LTR's indicated air temperature at an earlier time might have prompted the commander to change his mind. Based on the accessible weather information, the AIBN estimates the air temperature at 500 ft at 2-3 °C above the sea. The AIBN is of the opinion that the situation was serious, and in an emergency normal procedures may be set aside. AIBN's comments must not be interpreted as criticism directed at the air traffic controller or Air Traffic Control. The comments are intended as possible input to future training of air traffic controllers in providing assistance to pilots in emergencies.

2.6.3 For an air traffic controller to issue other instructions to an aircraft commander than standard traffic instructions raises a dilemma. Providing clearances to an aircraft within the applicable provisions is one thing. Giving instructions to a crew which are already operating outside applicable rules (in adverse weather conditions, and at lower altitudes than prescribed) is quite another, and not always easy. Owing to the air traffic controller's constant radar monitoring of LTR004, which indicated an altitude of 0 ft just south of Lille Hjartøy, the air traffic controller realised that something could go wrong. In AIBN's opinion, it was at the very last moment that the air traffic controller realised that something drastic had to be done and he proposed "suggest you climb immediately". This

was clearly a "wake-up call" for the commander who assumed control and initiated a climb.

2.7 Evaluation of Lufttransport's lease agreement with British International

2.7.1 The lease agreement was not valid at the time of the incident. This had no impact on the course of events.

2.7.2 Further to this it seems that the lease agreement and the approval included the required formal conditions. However, the serious situation the crew foud themselves in shows that it may be questioned if LTR should have specified special requirements in the lease agreement regarding IFR-training, continuity and familiarization flying at Bodø even though the passenger flying was based on ”VFR only”. In this context AIBN refer to LTR’s comments as referred to in 1.18.12.

2.7.3 However, the AIBN questions how such leases are practised. As mentioned in section 2.1.5 the AIBN considers this incident to be an "organisational incident". Despite all formal aspects being in place (with the exception of the fact that the lease agreement had expired), an accident nearly occurred ("compliance versus safety"). It was not the formal agreements, authority authorisations, procedures or training that prevented a negative development in this incident. The dangerous situation was prevented from developing into a potential accident by positive intervention by air traffic control.

2.7.4 In his comments to the incident, Lufttransport's chief helicopter pilot stated that they had done everything they should as regards the operation and the phase-in of BI's crew, and that LTR could not be blamed for the fact that the transfer of information in BI did not function. Furthermore, he stated that LTR must be able to count on a ”JAR-OPS 3 operator” approved by the UK CAA at least fulfilling the minimum requirements. The AIBN does not concur with this statement. We have commented on this below, in section 2.8.

2.8 Evaluation of Lufttransport's information to the contracted company before start-up

2.8.1 It emerges from the LTR and BI reports that the first crew had been briefed on the operations in Bodø. In addition, pilots from LTR were accompanied by a hired crew during their first flights in 2007. Such flights were not conducted in the relevant lease period in 2008, cf. section 1.17.1.5. However, the AIBN maintains that the operation in Bodø was very different from the Penzance-Scillies operation which the BI crew were most familiar with. Moreover, the conditions in Bodø are completely different from those in the south of England, both in terms of climate and terrain. Snow showers and icing occur infrequently in the south of England, and operations can normally be conducted as VFR or Special VFR. Visibility is much better in rain or rain showers than in snow showers. It also emerged that the commander had only conducted three instrument flights in the last 30 days and had not practised ILS approaches to Bodø before the incident. The first officer had not conducted any instrument flights in the last 30 days and had not practised ILS approaches to Bodø before the incident, nor had he practised VFR flying at Bodø before the actual flight. Currency is generally required for IFR flying, and for instrument flying in helicopters in particular, something this incident may be an example of.

2.8.2 It seems as if the introduction which the first crew received was directed at how Lufttransport conducted VFR operations to Værøy. Consequently, the crew's first impression of the Bodø operation may have been that it was a simple operation. Experienced helicopter pilots in Norway with experience from operations offshore and the north of Norway, know that VFR flights in the north of Norway in the winter can be very challenging. There are strong indications that the British crew were not prepared for how bad the flight conditions could be. ILS training was not conducted for the first flights, nor did Lufttransport have any requirements regarding the leased crew's experience and continuity (currency) in instrument flying based on the contractual requirement of "VFR-only".

2.8.3 LTR is of the opinion that this is the contracted company's responsibility. AIBN agrees that this is formally correct. However, this applies to scheduled flights with passengers on an ordinary Norwegian air service. The only reason why there is only a helicopter service to Værøy is that the airport on the island is not suitable for aeroplanes. Passengers on Lufttransport's helicopter service are entitled to the same safety as passengers on Widerøe and other domestic air services. This is not achieved by special VFR in a visibility of less than 800 m and an altitude below 500 ft as shown by this incident.

2.8.4 LTR considered that the leased operator was approved by the BSL JAR-OPS 3 regulations. LTR did not specify any requirements to the leased company beyond compliance with the requirements set by the authorities. AIBN considers that additional requirements should be set to a leased operator's competence which may have influence on the operations and safety.

2.8.5 As LTR has commented the company considers that the leased operator satisfied the minimum requirements and laid the total responsibility on the leased operator according to the lease agreement.

2.8.6 In its comments regarding the incident LTR's representative questioned the crew's initial rejection of the ILS approach. Considering the leased operator's normal area of operations and that the leased crews should be operating in North-Norway during winter weather, AIBN questions that LTR did not specify additional requirements regarding the crew's instrument flying continuity. Additionally, it is questioned that the leased crews did not receive a thorough briefing on the local climatic conditions which could affect the performance of VFR flying.

2.8.7 The AIBN is of the opinion that this serious aircraft incident shows that it is not sufficient to conform with the minimum JAR-OPS 3 requirements and the regulations relating to enforcement of the EEA Agreement in the area of civil aviation. When contracting another operator on Norwegian passenger routes, the Norwegian licensee should require relevant additional requirements and audit against such requirements. One step in such a safety management system should be to conduct a risk assessment of the contracted operation. Such a risk assessment should be based on scheduled services being conducted as a VFR operation also in winter conditions. The leased operator should perform a risk assessment, preferably with inputs from the leasing operator's own risk assessment, based on the foreseeable and relevant risk factors for the operation. The responsibility for the performed risk assessment should rest with the leased operator, but the leasing operator who knows best the local conditions, should assure that the assessment includes all known and relevant risk factors. This is to ensure that the required aviation safety is maintained.

2.9 Regulations for leasing of aircraft with crew ("wet lease")

2.9.1 The BSL JAR-OPS 3 regulations for wet lease of aircraft with crews are based on the contracted company conforming with the same requirements that apply to the licensed company. It is on this basis that the CAA-N approved the agreement between BI and LTR.

2.9.2 CAA-N had approved the lease agreement based on the statutory requirements. Based on the approval it is not evident that CAA-N had evaluated the safety aspects of the wet lease. According to CAA-N such an evaluation is always part of the approval process and the lease regulations will, according to AIBN's assessment, give the CAA-N the required legitimacy to specify the additional requirements as necessary for the flight operation to be performed in a safe manner.

2.9.3 AIBN is of the opinion that the passenger route Bodø – Værøy operated by helicopter differs significantly from regular air line operations by fixed wing aircraft, which normally is performed according to the instrument flight rules. Bodø-Værøy air line is based on flight according to the visual flight rules. Considering the weather conditions which are typical for the area, it follows that flying at lower altitudes and reduced visibility as special VFR or transition to IFR, will be required from time to time.

2.9.4 Even though such a flight operation is within the scope of a JAA AOC, AIBN considers it not self evident that each AOC operator may perform safely regardless. Not because the operator or his crews are not safe by themselves, but because they may encounter situations or conditions which they are not trained for or have the required experience to master. The challenges become easy to see when one investigates a serious incident like this one with hindsight, but it should also be possible to foresee some of it.

2.9.5 AIBN should perform a real assessment of the individual operator and operation regarding safety and standard. In particular this should apply to lease of foreign operators which one may expect are not familiar with flying in Norwegian conditions. Even though the inspection of a leased foreign operator still rests with the authority who issued the operator's licenses, the CAA-N should assess specifically if the operator has the required equipment, the necessary procedures and competent personnel to perform the operation. This should be performed prior to the approval. During the commenting process of this report CAA-N has informed AIBN that such a professional assessment was performed even in this case.

2.9.6 The legal department of CAA-N was the practical handling party for applications of lease. In the approval of this lease it is only referred to parts of the formal lease regulations, including that the technical and operational responsibility rest with the leased operator. The letter of approval does not say if it is performed an assessment of the safety aspects of the application, and it does not mention anything about additional requirements in order to maintain the required safety. Such an assessment and documentation in the letter of approval would, according to AIBN's assessment, be in line with a so called risk based oversight. In the way the actual letter of approval is written, it does not document the assessment CAA-N has performed, and it may look like the application could have been through a summary treatment. AIBN will underline that the accident investigation board in this connection does not mean that rules and regulations were deviated from, but it may appear that operational and safety assessments were not performed in the required

manner. The approval was ”compliant” but not necessarily ”safe” (”compliance” vs ”safety”).

2.9.7 AIBN realizes that it may be difficult for an employee of the CAA-N in a short time to sufficiently know and evaluate if an unknown, foreign operator can perform the operation with a satisfactory safety level. A risk assessment of the operation beforehand may have uncovered relevant safety aspects and found appropriate mitigations. Many operators perform such risk assessments in order to satisfy their responsibility for a safe operation, even though it is not required by the JAR-OPS regulations. A requirement for such a risk assessment prior to the start of the operation could have been a condition for the lease approval from the CAA-N. This would also have given the employee of the CAA-N a better foundation for the assessment of the operation. It was not performed any risk assessment in this case, but BI has informed AIBN that they on own initiative has revised their procedures so as to always perform such an assessment before start up of a new operation.

2.9.8 The CAA-N comments in the commenting process that it is the lease operator, in this case LTR, which obviously has the responsibility for the leased operator to have the proper equipment, the necessary procedures and competent personnel to perform the operation, and that the CAA-N is not responsible for that. With the exception of Appendix 1 to BSL JAR-OPS 3.1045 which says that an operator shall specify the conditions for the lease agreement in the OM Part A, Chapter 13, AIBN has not been able to find the legal basis for something that appears to AIBN as a mirror image of the lease regulations requirements. Neither had LTR understood the requirements in this way, and referred to the fact that CAA-N had approved the lease agreement and holds that the responsibility must rest with the leased operator (cf. 2.8.4/2.8.5). It is reasonable to assume that an operator who wants to lease someone to perform flights will look for an operator who is qualified, but the regulations do not require the operator to ask for more than an assurance that the necessary licenses are valid, just as LTR has referred to. It is just in such border conditions that misunderstandings and assumptions may lead to weak safety barriers which may not be identified before an accident (nearly) happens.

2.9.9 It is clear that operational oversight must not only be inspection of formalities, but also real assessments of standard and safety. This seems to be in accordance with the Regulation (EC) No 1008/2008, where it is stated: ”*Community air carriers may freely operate wet leased aircraft registered within the Community except where this would lead to endangering safety,”*samt; *”The competent authority may attach conditions to the approval. Such conditions shall form part of the wet lease agreement.”* AIBN is of the opinion that this serious air incident show that the lease approval process in this case did not protect the passenger’s safety sufficiently. If the operational inspection oversight is not revised after the new license regulations of 2008, it is doubtful if the probability of recurrence is reduced

2.9.10 The AIBN is of the opinion that this incident indicates how the safety can unintentionally be reduced, and that there should be specific requirements for a risk assessment when a company is to perform a new operation, including wet lease. As has been the case here, this seems to illustrate that compliance with regulatory rules does not mean that an operation meets the requirements for maintaining the necessary safety level.

2.10 Human factors

2.10.1 As mentioned in section 2.1.5 this is an incident which mainly involves organisational and human factors. According to earlier investigation standards, the incident would probably have been classified as a "pilot error" or "human error" (“The Old View”, see reference 2). As mentioned in section 2.1.5 the AIBN has applied more recent accident theories as described in reference numbers 1 and 2

> *"Organizational accidents have multiple causes involving many people operating at different levels of their respective companies."* (Reason 1997)
>
> *"When cues suggesting that the plan should be changed are weak or ambiguous, it is not difficult to predict where people’s trade-off will go if abandoning the plan is somehow costly."* (Dekker 2006).

2.10.2 Based on Reason and Dekker, we will try and describe how, in principle, a well qualified crew could end up in such a critical situation, and indicate which safety barriers may contribute to reducing the risk of recurrence. The crew were highly qualified for the assignment. The commander had more than 30 years of experience as a helicopter pilot in the military and civil aviation sector, including many years as an offshore pilot in the UK. He had more than 5 000 hours of IFR experience. The first officer had eight years of experience as an offshore pilot. In spite of this, the crew ended up in a situation which they could not get out of without assistance from a competent air traffic controller.

2.10.3 The crew have good references from the company they were working for. The commander is a trusted commander with additional responsibilities including those of operative quality manager and line instructor. The AIBN considers the crew a professional crew which wanted to carry out the assignment in Bodø to the best of their ability. Based on Dekker's theories, the AIBN believes that the crew drifted in to a dangerous situation without seeing the danger signals ("drifting into failure”, Dekker 2006) The wet lease agreement specified ”VFR ” operations only. Hence, no IFR familiarisation had been scheduled in Bodø. Consequently, the crew were not prepared for flying in adverse weather conditions when they set out on the assignment. Moreover, they had not been made aware of the risks inherent in VFR operations in the north of Norway in the wintertime. They were not briefed by Lufttransport about the risk of poor visibility in snow showers or the risk of icing. However, they were briefed on how VFR operations to Værøy were conducted. This briefing was given to the first crew for the relevant lease period and then transferred verbally between the British crews. It seems as if the earlier crew had not experienced adverse weather conditions with snow showers and potential icing, and their information to the subsequent crews focussed on VFR operations to Værøy. In normal weather conditions this was a simple operation corresponding to the crew's own experiences from the company's VFR operations from Penzance in the south of England. The contract specified VFR operations and, consequently, no briefing was given on IFR operations or ILS approaches.

2.10.4 The AIBN believes that it was natural that the crew should transfer their recent experiences from a similar operation to the operations in Bodø. The crew relied on the forecast and reported weather, without considering the possibility of poorer visibility in snow showers or the risk of rotor icing As mentioned in section 1.7, the meteorological information satisfied the requirements for VFR and special VFR operation before take-off (1 000 m visibility and 1 000 ft cloud base). Without special briefing about the risk of reduced visibility in snow showers or the risk of icing, and without recent experience

from winter or instrument flying, the AIBN believes that it was natural that the crew should plan for a VFR operation to Værøy on the relevant day. Consequently, the crew did not include an alternative airport or extra fuel reserve in their planning. It is evident that the briefing which this crew received before the operation did not cover situations involving reduced visibility in snow showers or the possibility of using Værøy as a VFR alternative airport. Nor did it cover potential refuelling at Værøy. The commander has explained that he through the base instruction was informed that fuel was available at Værøy in “an emergency”. When the crew left Værøy they were not aware that the visibility would be so poor that they could not fly in to Bodø on a special VFR clearance. Nor were they aware that there was a special helicopter ILS y 07 with an approach altitude of 1 200 ft which could be used by helicopters from Værøy in an emergency.

2.10.5 The AIBN finds it somewhat strange that Lufttransport did not assure that new crews were familiar with ILS approaches in to Bodø. Instrument approaches to Bodø were not routine operations for Lufttransport either. However, the special weather conditions in the north of Norway in the winter, with dense snow showers and a relatively low freezing level are well known amongst Norwegian pilots. It would have been natural if Lufttransport had assured that each crew was briefed about these conditions, in addition to accompanying the new crew on their first flight to Værøy with ILS/LOC approach on the return to Bodø. The AIBN believes this should constitute a natural part of the preparations for an operation from an unfamiliar airport. Local pilots know that if visibility is too poor to proceed on a special VFR to Bodø and there is not enough fuel to make it to an alternative airport, a Localizer approach at low altitude via ILS y RWY 07 is the safest way of making a successful landing. This is amply illustrated by the incident in question. AIBN recognizes that this is not a normal instrument approach but may be used as an aid during special VFR or in an emergency situation.

2.10.6 The crew had extensive IFR experience from, for instance, the North Sea. However, these are skills that require currency and regular practice. The crew had insufficient currency and none of the crew members had conducted an IFR approach to Bodø prior to the incident. Consequently, the AIBN believes that it was only natural that the crew should try and avoid IFR operation for as long as possible, and that they felt more comfortable maintaining visual contact with the sea. The commander's background from the Royal Navy meant that he was not unfamiliar with flying at low altitudes above the sea, even if the Norwegian regulations set the minimum altitude at 500 ft.

2.10.7 When the crew contacted Bodø APP the first time, they were informed about the weather conditions in Bodø. At the time the runway visibility was 360 m at Bodø airport. This should have been a "wake-up call" for the LTR004 crew and the air traffic controller, even if TAF and METAR gave the impression that conditions were better. LTR004 was gradually forced down to a lower altitude to maintain satisfactory flight visibility. When the air traffic controller offered an ILS the first time, the crew accepted this. However, this indicated that the crew wanted an ILS/LOC approach as navigational assistance whilst they continued flying at 300 ft. They were already below the minimum altitude for VFR/special VFR, and the ATC controller could not safely guide LTR004 by radar at altitudes below 500 ft, due to some islands with elevation up to 310 ft. When LTR004 was asked to climb to 500 ft the crew declined as they were worried about the risk of icing. During the commander's conversation with the AIBN, it emerged that he was not familiar with ILS y RWY 07 which has an approach altitude of 1200 ft. However, he was familiar with the standard ILS and the approach altitude of 2500 ft (the correct altitude is 2000 ft). This indicates that the commander misinterpreted 500 ft as 2500 ft and that he

was worried about icing at that altitude. In his supplementary statement to the AIBN, the commander stated that he was worried about icing due to an incident he had experienced during an assignment for the Royal Navy near Tromsø. On the other hand, there was nothing to prevent the crew from accepting a slightly higher altitude without experiencing icing problems instead of continuing at 300 ft. The normal temperature drop with increasing altitude is 2 °C per 1000 ft. A quick glance at the temperature gauge in the cockpit would have indicated how close they were to the freezing point. In special weather conditions and circumstances, a Localizer approach is possible at lower altitudes as support to a special VFR approach in weather conditions close to the minimum requirements 500 ft altitude and 800 m visibility. The available icing warning indicated that the freezing level was at 2000-3000 ft. It is important to underline that LTR004 was asked to climb to 500 ft in order to have a safety margin in relation to some islands, and not to 2500 ft, but this was rejected due to risk of icing. As it turned out there were no rotor icing problems at 1500 ft.

2.10.8 After declining the offer of an ILS approach, LTR004 continued at approx. 300 ft on a special VFR clearance towards Bodø. The crew navigated according to GPS and recordings of the radio communication indicate that the crew had not entered the relevant ADF and ILS frequencies (cf. section 1.8). According to radar and communication print-outs, the crew had difficulties finding their orientation and navigating their way on to the 07 runway centre line. They requested, and were given continuous course information from the air traffic controller. When the air traffic controller asked if LTR004 could hold whilst the runway was being cleared, they replied that the general and horizontal visibility was poor. Immediately after, LTR004 reported that they were losing horizontal visibility. They were asked for a second time whether they wanted an ILS approach, but declined. At this time they were approximately 6 NM from Bodø maintaining an altitude of 100 ft towards Store Hjartøy which they could see on their own radar. Visibility at Bodø was still below 800 m and when the air traffic controller asked whether they could see the surface and if everything was OK, LTR004 replied that they had visual contact with the surface. The AIBN believes that this indicates that the crew had entered a mindset where they could not, or did not want to, accept an instrument approach without visual contact with the surface. In their mindsets, they had passed the point where they could rationally think that the flight conditions were too poor to continue on a special VFR approach. The flight conditions had gradually deteriorated as they approached Bodø. The commander had twice declined the offer of an ILS approach, and was forced to keep an increasingly lower altitude above the sea to maintain contact with the surface. This can be described as "drifting into failure" (Dekker 2006).

2.10.9 Experience has shown that for an alternative plan to be adopted there must be a significant change in perception (Cf. section 1.18.13.3).

2.10.10 AIBN is of the opinion that an accident, or a serious incident as in this example, can rarely be explained by one causal factor, such as ”the commander did not abort the approach in time” or ”they should have proceeded to an alternative landing site”. Accident research has shown that there are usually several underlying causal factors (Reason 1997, Dekker 2006). Moreover, it is generally accepted that human errors and misjudgements are contributing factors in approximately 80% of accidents. On the basis of an accident or serious incident that has already occurred, it is relatively easy to analyse an apparent chain of event in retrospect and thus establish what misjudgements have been made. It is then relatively easy to see what should have been done to prevent the accident. We do not doubt that the crew did their utmost to land the helicopter safely at Bodø

airport. The crew did not realise that it would be impossible to complete the approach under special VFR conditions. The weather forecast before take-off indicated that visibility could be reduced to 1000 m, and their experiences from the route they had flown before they started the approach to Bodø were acceptable. On the basis of the accessible and perceived information the crew had at the time when the decision to continue on a special VFR approach was made, the AIBN believes that it is possible to explain why the crew acted as they did and why they ended up in such a serious situation. In their ALAR analysis, (*Approach and Landing Accident Reduction (ALAR) Task Force* (Reference nr. 6), the FSF points out that it is difficult for a crew to abort an approach and landing after the decision to land has been made. This can be explained by the "target fixation" phenomenon or in this case *"landing fixation" (cf.* section 1.18.13).

2.10.11 Research into human factors has shown that once a plan has been adopted, it can be difficult to change it in an urgent situation (*"plan continuation bias"/ "press-on-itis"*, R. K. Dismukes, B. A. Berman, L. D. Loukopoulos, 2006. Cf. section 1.18.13 and Reference 4). Both the FSF's task force and other research have shown that this phenomenon is the reason for several approach and landing accidents and that such "bias" is a result of social/organisational (corporate culture) influences, human qualities and cognitive limitations, in addition to unclear information, procedures or other limitations. Research has shown that if procedures have been issued as strong recommendations, but not as requirements or limitations, and it is up to the commander to make decisions, there is often a preference for seemingly simplified solutions. A special VFR procedure is simpler to follow than an IFR/IMC flight. If the crew are "set" on a certain solution and have extensive experience from such flights, it is easier to accept gradually lower altitudes to maintain visual contact with the ground or water. This is called *"drifting into failure"* (Dekker, 2006).

2.10.12 Another human quality is to expect a certain situation (*"expectation bias"*). This will affect the assessments and decisions that a person makes which means that he or she is less receptive to cues indicating that there are unexpected elements in a situation. In this situation the crew clearly based their assessments on the weather information available before take-off and that it should be possible to fly in to the airport on a special VFR clearance in flight visibilityu of minimum 800 m at an altitude of minimum 500 ft.

2.10.13 A third aspect in this serious incident is that the crew experienced an accelerating work load, (*"snowballing workload"*, cf. section 1.18.13). Visibility was becoming poorer and poorer, which forced the crew to fly at increasingly lower altitudes in order to maintain contact with the surface. This required increasingly more concentration from the crew in order for them to be able to keep control of the helicopter, and they were "fixed" on GPS navigation without applying available standard approach aids like ILS y RWY 07 which was available as an aid to navigation.

2.10.14 A fourth aspect is that BI's lease agreement with Lufttransport and the instructions for the job specified that this was a "VFR-only" operation. This will normally limit the crew's freedom to deviate from the instructions based upon their own assessments. This may have contributed to the commandrers initial rejection of the offer of an ILS from the ATC controller in a critical situation.

2.10.15 A fifth aspect emerged during the commander's conversation with the AIBN (cf. section 1.18.8). When confronted with print-outs from the radio communication showing that the commander stated that he could not climb to 500 ft due to the risk of icing, he explained

that he thought that the minimum altitude for an ILS approach was 2 500 feet (the correct altitude was 2000 ft). He believed that he had misinterpreted 500 ft as 2 500 ft. The AIBN finds this explanation very likely, based on the fact that the commander had registered that the minimum altitude for an ILS approach was 2 500 ft which is correct for aeroplanes (but in reality was 2000 ft). When he finally located the ILS approach chart, he discovered that there was a special Copter ILS y 07 with a minimum altitude of 1 200 ft. This confirms AIBN's explanation as to why it had been possible for the crew to end up in such a situation despite having followed their instructions to best of their intentions (”why did it make sense to them to do what they did”).

2.10.16 In the above the Accident Investigation Board has discussed potential human factors which may have had an impact on the course of events. The factors that we have mentioned are not uncommon from other accident or serious incident investigations. However, it is not possible to identify which individual factors prevailed in this case. The commander had most likely conducted special VFR flights in similar visibility conditions in England without problems. Experience has shown that it is entirely possible to operate with narrow safety margins for a long time without serious consequences, but that it is only a question of time before the limits are exceeded.

3. CONCLUSION

3.1 Investigation results

3.1.1 Weather conditions

3.1.1.1 Forecasted and reported weather prior to departure from Bodø met the requirements for special VFR for helicopters.

3.1.1.2 The forecasted freezing level was 2000-3000 ft.

3.1.1.3 During the approach to ENBO, the weather turned worse and below the minimum requirements for special VFR.

3.1.2 Planning

3.1.2.1 The crew planned the flight as a VFR flight with a special VFR approach to ENBO.

3.1.2.2 The planning did not include any alternative plans for an ILS flight in case they were surprised by reduced visibility in snow showers under special VFR flight.

3.1.2.3 The forecast freezing level was not applied in the crew's perception of safe maximum elevation in relation to the risk of rotor icing.

3.1.3 Crew

3.1.3.1 At the start of the approach, visibility was at the minimum limit for special VFR. The crew flew at an altitude of 300 ft to be able to keep visual references ahead.

3.1.3.2 At the beginning of the approach, the crew were informed that weather conditions had deteriorated at ENBO, and were offered an ILS approach. This was initially accepted, but

later rejected due to the risk of icing. The investigation has indicated that this rejection was founded on the commander's misinterpretation of 500 ft as 2500 ft.

3.1.3.3 The crew continued to fly towards Bodø on a special VFR clearance while the horizontal and vertical visibility gradually deteriorated. This meant that the crew had to fly at altitudes below the minimum altitude for VFR of 500 ft. The navigation was based on GPS without support from standard approach aids such as NDB and ILS (VOR was out of operation).

3.1.3.4 The crew were offered an ILS approach for the second time, but this offer was also rejected due to the fear of icing, although the forecast freezing level was 2000-3000 ft.

3.1.3.5 The crew continued the approach based on GPS navigation and course directions from the air traffic controller. During the short final approach, G-ATFM drifted north and the helicopter had a course towards Lille Hjartøy. The air traffic controller realised that the special VFR approach had failed and that there was a risk of the crew flying towards rising terrain. He suggested that the crew should start climbing immediately and turn left to avoid the terrain.

3.1.3.6 The rest of the approach took place in IFR/IMC at 1500 ft as a combined radar-guided ILS approach with good support from the air traffic controller. The flying was observed to be "wobbly" by the air traffic controller.

3.1.3.7 The investigations have uncovered that stress and communication misunderstandings probably caused the commander to misinterpret 500 ft as 2500 ft. The fact that the commander had not familiarised himself with or had not been briefed on ILS y RWY 07 to Bodø may have been a contributing factor. The commander thought that an ILS would require an altitude of 2500 ft and feared rotor icing.

3.1.4 The air traffic controller

3.1.4.1 In general, the AIBN believes that the air traffic controller's handling of the incident was good and may be used by Avinor as a practical example (case study) in its education and training of air traffic controllers as regards handling of emergencies and CRM. The incident very nearly developed in to an accident, and normal procedures can be waived in emergencies. The AIBN requests that Avinor considers such challenges to the future emergency training of air traffic controllers.

3.1.4.2 The air traffic controller interpreted the situation correctly in that LTR004 had visibility problems and repeated the question of whether they wanted ILS as navigation assistance. Again, LTR004 declined, stating the risk of icing as the reason.

3.1.4.3 At one time, LTR004 was 3 NM from the airport with an indicated altitude on the radar of 100 ft. Runway visibility was then reported to be 540 m. LTR004 was approx. 1 NM from Store Hjartøy and was asked whether it was visible, which it was not. They were then approx. 900 m from the island and were requested to turn right. The air traffic controller demonstrated healthy scepticism by asking LTR004 whether they could see the ground/sea and if everything was OK.

3.1.4.4 The air traffic controller had realised that the situation had taken a serious turn and initiated heightened preparedness. Due to the air traffic controller's constant monitoring of LTR004 on the radar, which indicated an altitude of 0 ft just south of Lille Hjartøy, he

understood that he had to take action. In the AIBN's opinion, it was at the very last moment that the air traffic controller realised that something drastic had to be done and he proposed "suggest climb immediately" to LTR004.

3.1.4.5 The AIBN believes that the air traffic controller saved LTR004 from a potential accident during the approach in question.

3.1.5 Lufttransport's lease agreement with British International

3.1.5.1 The lease agreement was based on applicable rules relating to leasing of aircrafts with crew ("wet lease") within the EEA area. The agreement had been approved by the CAA-N and was valid until 17 February 2008. The agreement was no longer valid at the time of the incident. The AIBN believes that the validity of the lease agreement had no impact on the course of events.

3.1.5.2 LTR specified no additional requirements for the leased operator other than to satisfy the aviation regulations.

3.1.5.3 LTR has pointed out that the regulations require the operator to assure that the necessary licenses and approvals are in place, which they were in this case.

3.1.5.4 CAA-N has in retrospect pointed out that the leasing operator, in this case LTR, obviously had the responsibility for the leased operator to have the proper equipment, the required procedures and competent personnel in order to perform the operation. LTR which did not interpret the regulations in this way, refer to the fact that the lease agreement was approved by the CAA-N and hence the responsibility must rest with the leased operator.

3.1.6 Lufttransport's information to the contracted company before start-up

3.1.6.1 This serious aircraft incident shows that it is not sufficient to conform with the minimum JAR-OPS 3 requirements and the regulations relating to enforcement of the EEA Agreement in the area of civil aviation.

3.1.6.2 The AIBN is of the opinion that Lufttransport's leasing of a different operator on Norwegian passenger routes did not quality assure the leased operator sufficiently. Such quality assurance should include a risk analysis/evaluation of the leased operation, to ensure that the required aviation safety is upheld.

3.1.6.3 The climatic conditions in the north of Norway in winter entail frequent heavy snow showers. The AIBN believes it is important that the Norwegian licensee briefs leased European crews on special climatic conditions in Norway which may deviate from European weather conditions. Such briefing should include the alternative procedures and emergency procedures in connection with weather.

3.1.7 Wet lease regulations

3.1.7.1 LTR did not specify any special requirements relating to the contracted company or its crew, except having to conform with the statutory requirements.

3.1.7.2 The CAA-N letter of approval did not say if it was performed a specific assessment of the safety aspects of the operation as part of the ”wet lease” approval process, and it

mentioned nothing regarding any additional requirements in order to maintain the required level of safety.

3.1.7.3 A risk assessment of the operation in advance could have relieved relevant safety issues and found proper mitigating actions. Requirements for such a risk assessment prior to the start of the operation could therefore have been a possible condition CAA-N could have set before approving the lease agreement.

3.1.7.4 Inspection and oversight must not only be control of the legal formalities, but also include real assessments of standard and safety.

3.1.7.5 This serious incident indicates how the safety unintentionally may be reduced, and that there should be specific requirements for a risk assessment when an operator has planned a new type of operation, including wet lease.

3.1.7.6 AIBN considers this incident as an example of an “Organizational incident”, and an example of that satisfying the authorities’ requirements is not the same as that the operation satisfies the required level of safety ("compliance versus safety").

3.1.8 Human factors

3.1.8.1 The crew were generally very experienced, but had relatively little IFR flight currency.

3.1.8.2 The crew had relatively extensive and recent experience from VFR/special VFR flying from their home base Penzance in England.

3.1.8.3 The crew were not used to operating in areas with heavy snow showers and icing.

3.1.8.4 The crew had not conducted any ILS approaches to Bodø in simulator or in the helicopter in Bodø before the actual flight.

3.1.8.5 Due to limited experience of flying in areas with risk of icing, combined with relatively low IFR flight currency, the crew continued to fly in poor visibility and low altitude towards Bodø.

3.1.8.6 A contributing factor seems to be that the commander misunderstood a request to climb to 500 ft as a request to climb to 2500 ft. He thougt he knew that this was the altitude for a standard ILS to Bodø and assumed that an ILS approach would entail climbing to 2500 ft. Only when he took out the approach map for an ILS y RWY 07 did he realise that the altitude was 1200 ft.

3.1.8.7 The crew were poorly prepared for IFR flying in Bodø and had based their flying on VFR/special VFR operations. They therefore sought to maintain contact with the ground/sea for as long as possible and trusted their GPS.

3.1.8.8 Relatively low currency in instrument flying may have contributed to the crew not crosschecking their position with navigational aids, such as ILS/LOC.

3.1.8.9 Contributing factors were: an expectation that the weather would improve, that they had decided to continue with a special VFR approach, and increasing stress as a result of continuously deteriorating visibility.

3.1.8.10 The incident is an example of how an experienced flight crew can get into an unintentional situation which can lead to an accident if external correction or input is not received. In this case, rescue came in the form of a ”wake up call” from the air traffic controller on duty.

3.1.8.11 An observant ATC controller perceived the LTR004 situation at an early stage. He kept the helicopter’s position and progress under continuous surveillance and guided the crew in an optimal way without “taking the lead”. The controller realized at an early stage that the situation was developing into an emergency situation and initiated mitigating actions.

3.1.8.12 The controller handled the situation in a good manner. He demonstrated professionalism and good practical CRM, and prevented an even more dangerous flight situation at low altitude towards rising terrain.

3.1.8.13 The controller kept the crew continuously updated with position and course directions. The incident is an example how an ATC controller may function as an “additional crew member” in an emergency situation, and contribute to good CRM without exceeding his own responsibilities or directly override the commander’s responsibilities.

3.2 Significant investigation results

3.2.1 LTR004 returned from Værøy to Bodø in accordance with VFR/special VFR rules. The visibility developed in to poorer than forecasted conditions, and under the minimum requirements, resulting in the crew losing their orientation and navigating towards rising terrain at low altitude.

3.2.2 The air traffic controller handled the situation as an emergency and managed to guide the crew using radar onto an ILS/LOC and to a successful landing at Bodø airport.

4. SAFETY RECOMMENDATIONS

The Accident Investigation Board Norway (AIBN) makes the following safety recommendations[11]

Safety recommendation SL no. 2011/14T

The Civil Aviation Authority Norway’s (CAA-N) approval of the lease agreement documented only assessments regarding legal aspects in relation to the Licensing Regulations and BSL JAR OPS 3. Additional requirements regarding the special challenges related to this operation were not taken into account. This serious incident shows that meeting the specific requirements in the regulations are not neccesarily sufficient (”compliance vs. safety”).

AIBN recommends that the CAA-N with a legal basis in Licensing Regulations, article 9, cf. article 10, no 2 requires a leased company to carry responsibilty for performing and documenting risk assesment and implementing a satisfactory safety compensation plan for the operation.

[11] The Ministry of Transport and Communications is responsible for ensuring that safety recommendations are presented to the aviation authorities and/or other affected ministries for assessment and follow-up, cf. Section 17 of the Regulations relating to public investigation of aviation accidents and aviation incidents in civil aviation.

Safety recommendation SL no. 2011/15T

A "wet lease" agreement had been approved in accordance with the JAR OPS 3 regulations. The agreement assumed that the leased company complied with all formal requirements, which it did. There are, however, large differences between flying in the south of England and the north of Norway during winter.

AIBN recommends that the leasing company sets requirements related to qualifications and training, and gives a more detailed safety briefing to visiting crews for each new detachment of leased companies, with special emphasis on climatic conditions, weather conditions, visibility conditions, helicopter ILS and any alternative procedures, based on the company risk assessment.

The Accident Investigation Board of Norway

Lillestrøm, 7 July 2011

REFERENCES

1. James Reason. Managing the Risks of Organizational Accidents. Ashgate 1997.

2. Sidney Dekker. The Field Guide to Understanding Human Error. Ashgate 2006.

3. Sidney Dekker. Just Culture: Balancing Safety and Accountability. Ashgate 2007.

4. R. K. Dismukes, B. A. Berman, L. D. Loukopoulos. The Limits of Expertise: Rethinking Pilot Error and the Causes of Airline Accidents. Ashgate 2007.

5. Flight Safety Foundation (FSF). Killers in Aviation: FSF Task Force Presents Facts about Approach-and-Landing and Controlled Flight-Into-Terrain Accidents. Flight Safety Digest Volume 17 (November-December 1998) and Volume 18 January-February 1999.

APPENDICES

APPENDIX A

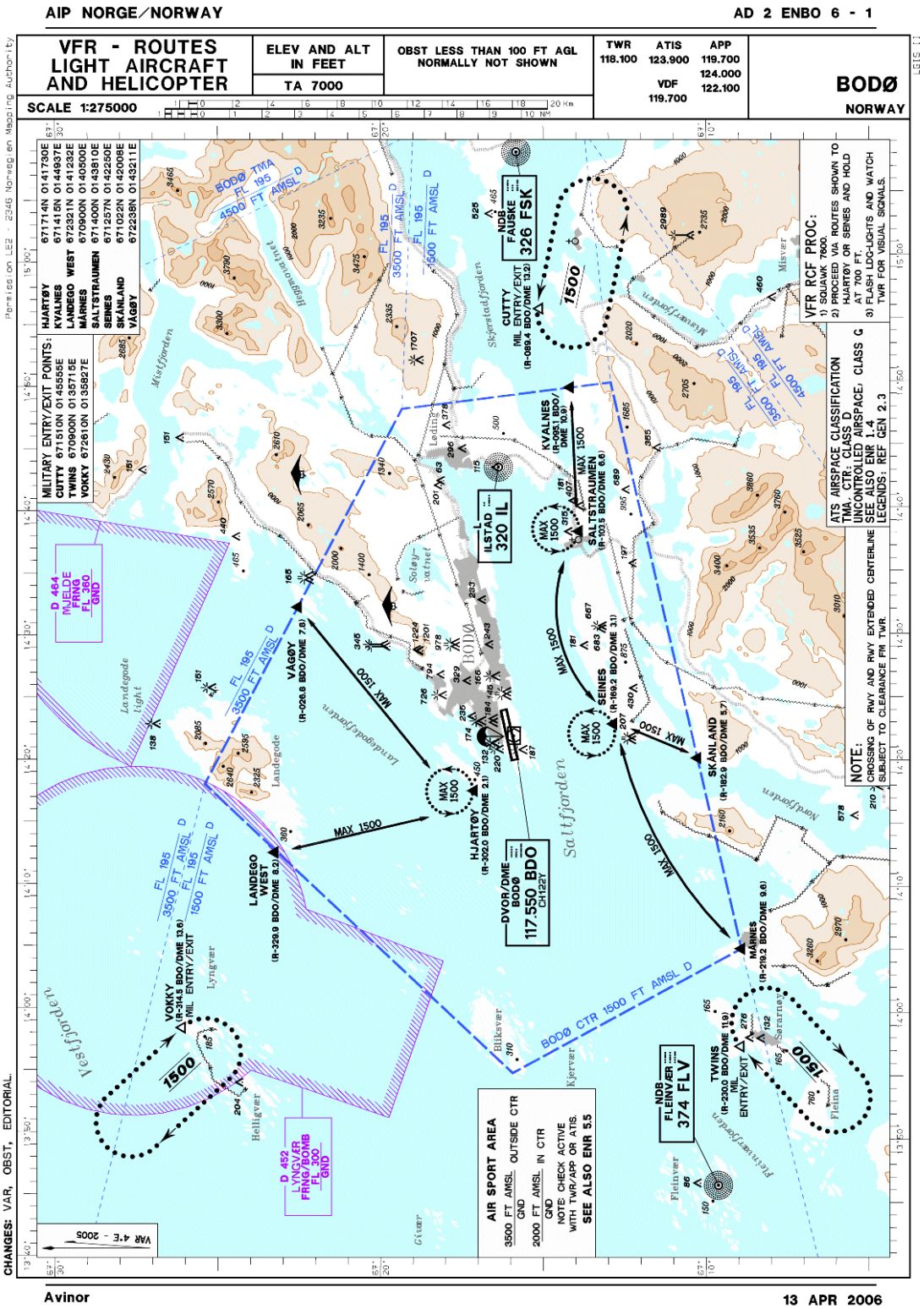
Relevant abbreviations

AC	Aircraft Check
ADI	Approach Control Instrument
AIBN	Accident Investigation Board Norway
ALAR	Approach and Landing Accident Reduction
AOC	Air Operator Certificate
APS	Approach Control Surveillance
ATC	Air Traffic Control (Lufttrafikktjenesten)
ATI	Approach Traffic Information
ATIS	Air traffic Information System
ATPL H	Air Transport Pilot Licence Helicopters
APP	Approach control
BI	British International
BDO	Bodø
CAA	UK Civil Aviation Authority
CDI	Coarse Deviation Indicator
CHC	Canadian Helicopter Corporation
CPL H	Commercial Pilot Licence Helicopters
CRM	Crew Resource Management
CVR	Cockpit Voice Recorder
DME	Distance Measuring Equipment
D VOR	Digital VOR
ETL	Effective Translational Lift
FLL	Air traffic controller
FOM	Flight Operation Manual
FPL	Flight Plan

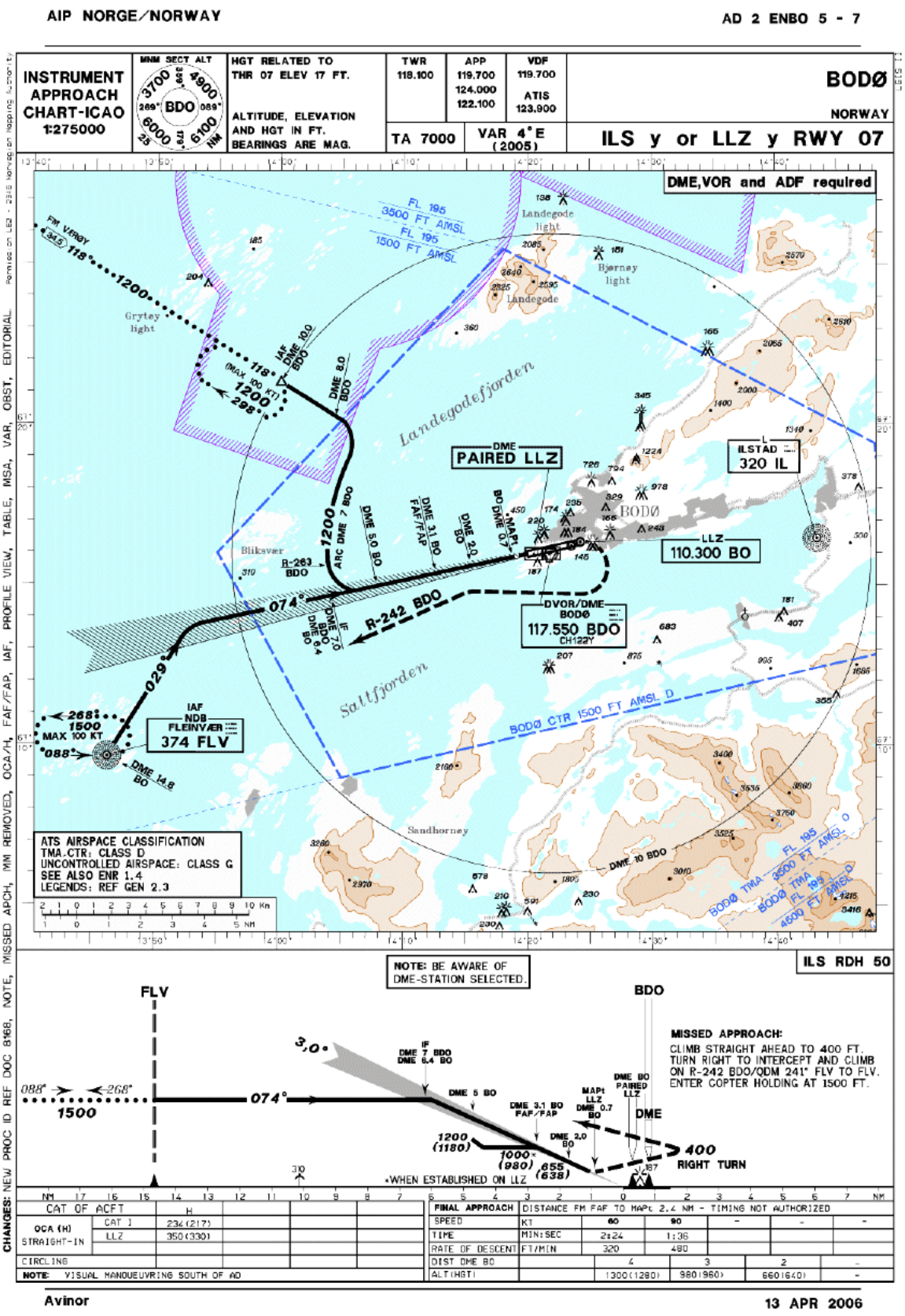
FSF	Flight Safety Foundation
GPS	Global Positioning System
GS	Glide Slope
IAS	Indicated Air Speed
IFR	Instrument Flight Rules
IIC	Investigator In Charge
ILS	Instrument Landing System
ILS/LLZ	ILS/Localizer
IMC	Instrument Meteorological Conditions
JAR	Joint Aviation Regulation
JAR-OPS 3	Joint Aviation Regulation-Operations part 3
KGS	Knots Ground Speed
kHz	kilo Hertz
KIAS	Knots Indicated Speed
KT	Knots (Nautical Miles per Hour)
LC	Line Check
LH	Left Hand
LLZ/LOC	Localizer
LOFT	Line Oriented Flight Training
LPC	Licence Proficiency Check
LTR	Lufttransport
LTT	Air traffic control
METAR	Meteorological Aerodrome Report
MHz	Megahertz
MOD	Modification
NDB	Non Directional Beacon
NM	Nautical Mile

NOTAM	Notice To Airmen
OM A	Operation Manual part A
OMB	Operation manual part B
OPC	Operational Proficiency Check
RH	Right Hand
RVR	Runway Visual Range
SHT	Statens Havarikommisjon for Transport
SIGMET	Significant Meteorological information
S/N	Serial Number
TAF	Terminal Area Forecast
TSO	Time Since Overhaul
TWR	Tower control
UTC	Universal Time Coordinated (GMT)
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omnidirectional Ranging

APPENDIX B


AIP NORGE/NORWAY
AD 2 ENBO 6 - 1
VFR - ROUTES LIGHT AIRCRAFT AND HELICOPTER
ELEV AND ALT IN FEET
TA 7000
OBST LESS THAN 100 FT AGL NORMALLY NOT SHOWN
TWR 118.100
ATIS 123.900
APP 119.700 124.000
VDF 119.700
BODØ
NORWAY
SCALE 1:275000
MILITARY ENTRY/EXIT POINTS:
CUTTY 671510N 0145555E
TWINS 670900N 0135715E
VOKKY 672610N 0135827E
HJARTØY 671714N 0141730E
KVALNES 671418N 0144937E
LANDEGO WEST 672321N 0141232E
MÆRNES 670900N 0140500E
SALTSTRAUMEN 671400N 0143810E
SEINES 671257N 0142250E
SKÅNLAND 671022N 0142008E
VÅGØY 672238N 0143211E
BODØ TMA FL 195 4500 FT AMSL D
FL 195 3500 FT AMSL D
FL 195 1500 FT AMSL D
NDB FAUSKE 326 FSK
CUTTY MIL ENTRY/EXIT (R-069.4 BDO/DME 13.2)
1500
VFR RCF PROC:
1) SQUAWK 7600.
2) PROCEED VIA ROUTES SHOWN TO HJARTØY OR SEINES AND HOLD AT 700 FT.
3) FLASH LDG-LIGHTS AND WATCH TWR FOR VISUAL SIGNALS.
ATS AIRSPACE CLASSIFICATION
TMA, CTR: CLASS D
UNCONTROLLED AIRSPACE: CLASS G
SEE ALSO ENR 1.4
LEGENDS: REF GEN 2.3
NOTE:
CROSSING OF RWY AND RWY EXTENDED CENTERLINE SUBJECT TO CLEARANCE FM TWR.
D 464 MJELDE FRNG FL 360 GND
ILSTAD L 320 IL
KVALNES (R-058.1 BDO/ DME 6.0)
SALTSTRAUMEN (R-103.5 BDO/DME 6.6)
VÅGØY (R-026.8 BDO/DME 7.8)
SEINES (R-169.2 BDO/DME 3.1)
SKÅNLAND (R-182.9 BDO/DME 5.7)
HJARTØY (R-302.0 BDO/DME 2.1)
DVOR/DME BDØ 117.550 BDO CH122Y
LANDEGO WEST (R-329.9 BDO/DME 8.2)
VOKKY (R-314.5 BDO/DME 13.6) MIL ENTRY/EXIT
MÆRNES (R-219.2 BDO/DME 9.6)
TWINS (R-230.0 BDO/DME 19) MIL ENTRY/EXIT
NDB FLEINVÆR 374 FLV
D 452 LYNGVÆR FRNG/BOMB FL 200 GND
AIR SPORT AREA
3500 FT AMSL OUTSIDE CTR
GND
2000 FT AMSL IN CTR
GND
NOTE: CHECK ACTIVE WITH TWR/APP OR ATIS.
SEE ALSO ENR 5.5
BODØ CTR 1500 FT AMSL D
MAX 1500
CHANGES: VAR, OBST, EDITORIAL
VAR 4°E - 2005
Avinor
13 APR 2006

APPENDIX C


AIP NORGE/NORWAY
AD 2 ENBO 5 - 7
INSTRUMENT APPROACH CHART-ICAO 1:275000
HGT RELATED TO THR 07 ELEV 17 FT.
ALTITUDE, ELEVATION AND HGT IN FT. BEARINGS ARE MAG.
TWR 118.100
APP 119.700 124.000 122.100
VDF 119.700
ATIS 123.900
BODØ
NORWAY
TA 7000
VAR 4°E (2005)
ILS y or LLZ y RWY 07
DME,VOR and ADF required
FM VERØY
Grytøy light
Landegode light
Bjørnøy light
Landegode
Landegodefjorden
DME PAIRED LLZ
ILSTAD 320 IL
LLZ 110.300 BO
DVOR/DME BODØ 117.550 BDO CH122Y
BODØ
Bliksvær
Saltfjorden
Sandhornøy
IAF NDB FLEINVÆR 374 FLV
MAX 100 KT
ATS AIRSPACE CLASSIFICATION
TMA,CTR: CLASS D
UNCONTROLLED AIRSPACE: CLASS G
SEE ALSO ENR 1.4
LEGENDS: REF GEN 2.3
BODØ CTR 1500 FT AMSL D
BODØ TMA 3500 FT AMSL D
BODØ TMA FL 195 4500 FT AMSL D
ILS RDH 50
NOTE: BE AWARE OF DME-STATION SELECTED.
FLV
BDO
MISSED APPROACH:
CLIMB STRAIGHT AHEAD TO 400 FT, TURN RIGHT TO INTERCEPT AND CLIMB ON R-242 BDO/ODM 241° FLV TO FLV. ENTER COPTER HOLDING AT 1500 FT.
400 RIGHT TURN
*WHEN ESTABLISHED ON LLZ
CHANGES: NEW PROC ID REF DOC 8168, NOTE, MISSED APCH, MM REMOVED, OCA/H, FAF/FAP, IAF, PROFILE VIEW, TABLE, MSA, VAR, OBST, EDITORIAL.
Avinor
13 APR 2006

APPENDIX D

Print-outs from radar

Print-outs from radar as shown in subsequent figures confirm Air Traffic control's observations.

At 14:34:56Z hours, LTR004 is shown approx. 2 NM north-west of the southern point of Store Hjartøy at 100 ft and with a ground speed of 40 kt.

At 14:36:00 hours, LTR004 is shown approx. 0.5 nm from Store Hjartøy in a right turn, altitude of 100 ft and a ground speed of 50 kt.

At 14:37:00 hours LTR004 is shown following a left turn, position approx. 2 NM from the threshold of runway 07, in parallel with the centre line, altitude 100 ft, ground speed 30 kt.

At 14:37:30 hours, LTR004 is shown in a position approx. 1.5 NM from the threshold of runway 07, 100 ft., 30 KGS, course towards Bodø harbour.

At 14:38:00 hours, LTR004 is shown approx. 1,5 nm west of the runway, on a track almost parallel to the runway's centre line, but with a slight interception course. The altitude is 0 ft and the ground speed 30 kt.

At 14:38:30 hours, LTR004 is shown after a slight left turn towards the north-east with a course towards Lille Hjartøy, altitude 0 ft, ground speed 40 kt.

At 14:38:38 hours, LTR004 is shown approx. 1/8 NM south of Lille Hjartøy on a north-eastern course heading towards the southern point of the island. Altitude 100 ft and climbing, ground speed 40 kt

At 14:38:54 hours, LTR004 is shown approx. 1/16 NM from the southern point of Lille Hjartøy. Altitude 200 ft and ground speed 0.

At 14:39:04 and 14:39:12 hours, LTR004 is shown in the same position, approx. 100 m from Lille Hjartøy at an altitude of 300 ft. with a ground speed of 20 kt (G-ATFM seems to be hovering in strong winds from the east).

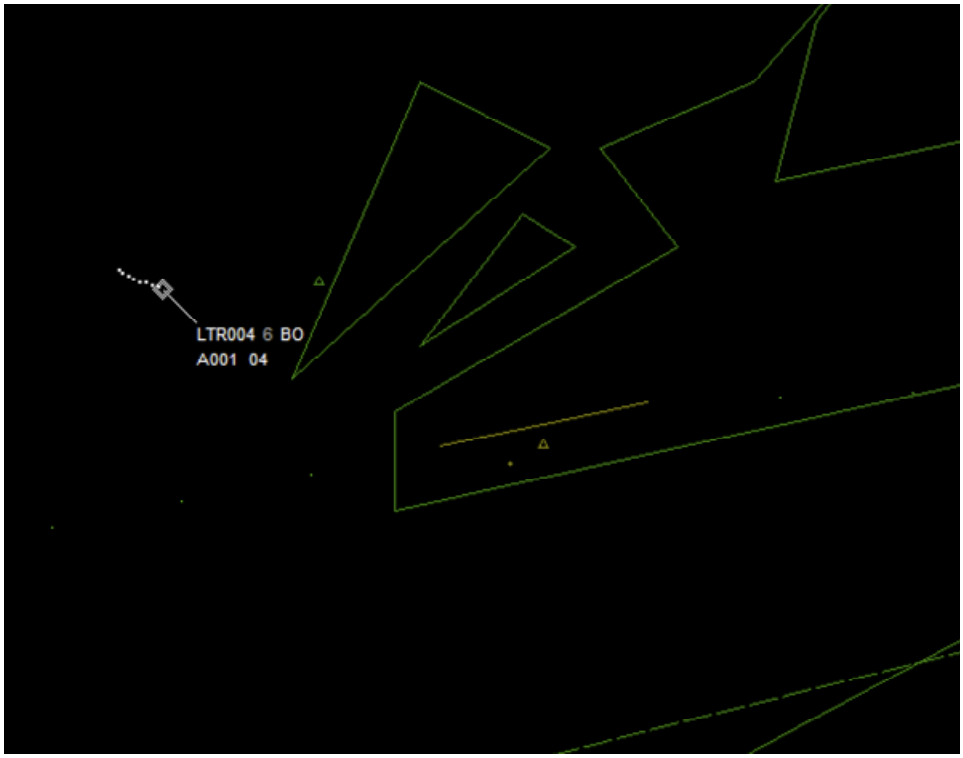
At 14:39:23 hours, LTR004 is shown in a position approx. 1/16 NM west of the southern point of Lille Hjartøy, in a left turn from a northern course, altitude 500 ft with a ground speed of 70 kt. in strong tailwind.

At 14:39:30 hours, LTR004 is shown on a north-western course towards Store Hjartøy, altitude 600 ft and climbing, ground speed 90 kt.

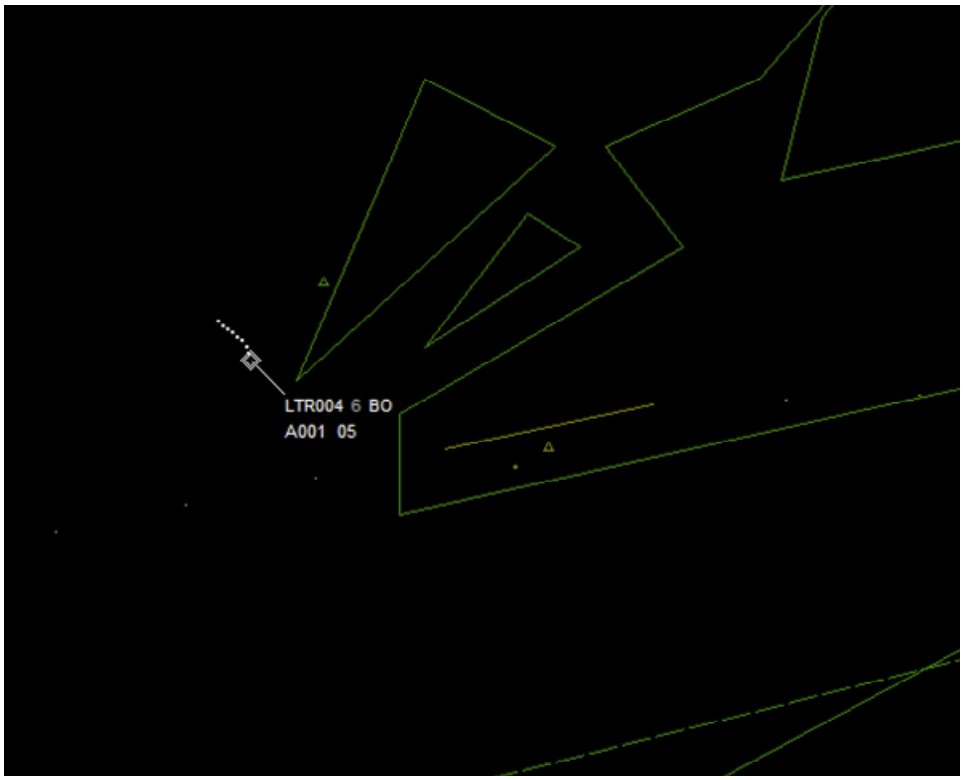
At 14:39:41 hours, LTR004 is shown in a left turn towards the south-west, on a tangent with Store Hjartøy at an altitude of 700 ft and a ground speed of 70 kt.

At 14:40:00 hours, LTR004 is shown on a south-western course just south of the southern point of Store Hjartøy, altitude 1 000 ft. and climbing and a ground speed of 60 kt.

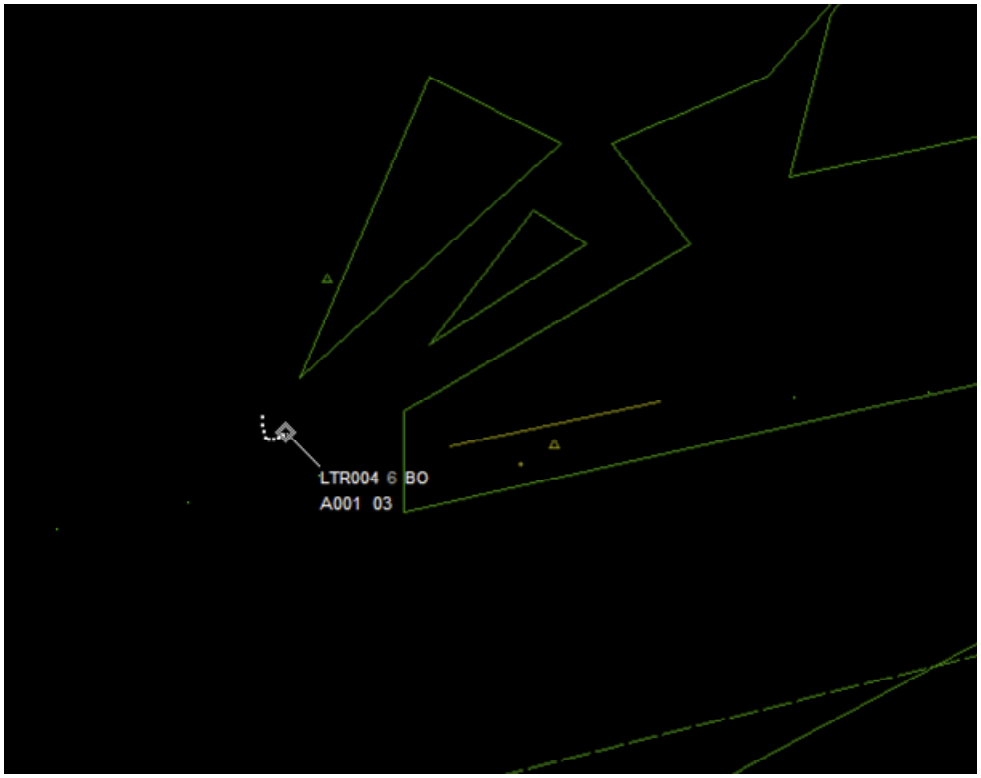
At 14:40:31 and 14:41:45 hours, LTR004 is shown at 1 500 ft and climbing with a ground speed of 70 kt, and at 1 600 ft and 100 kt, under radar vectoring towards ILS y 07.



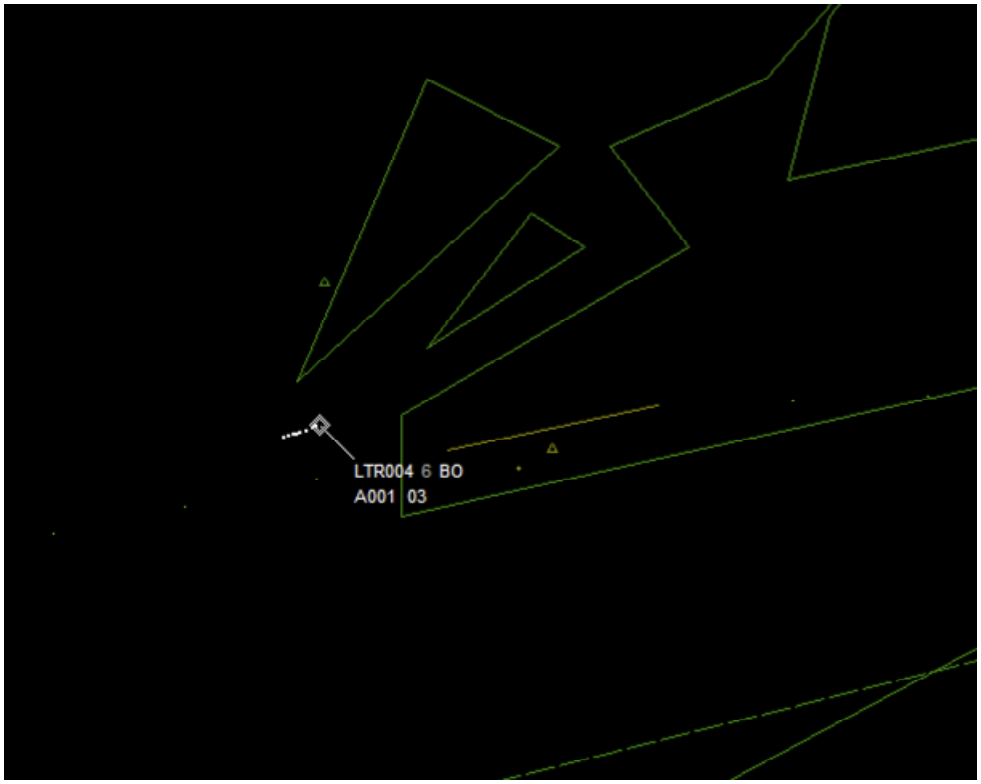
Radar print-out at 14:34:56Z. Position approx. 2 nm NM from Store Hjartøy, 100 ft, 40 KGS.



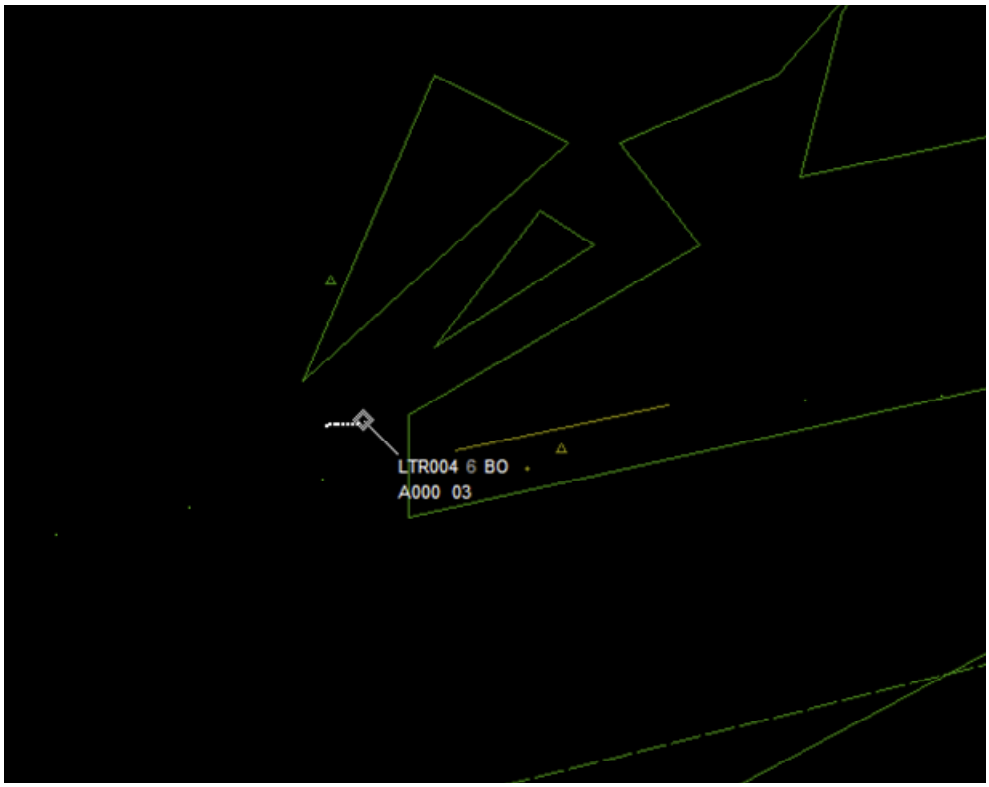
Radar print-out at 14:36:00Z. Position approx. 0.5 NM from Store Hjartøy, 100 ft, 50 KGS.



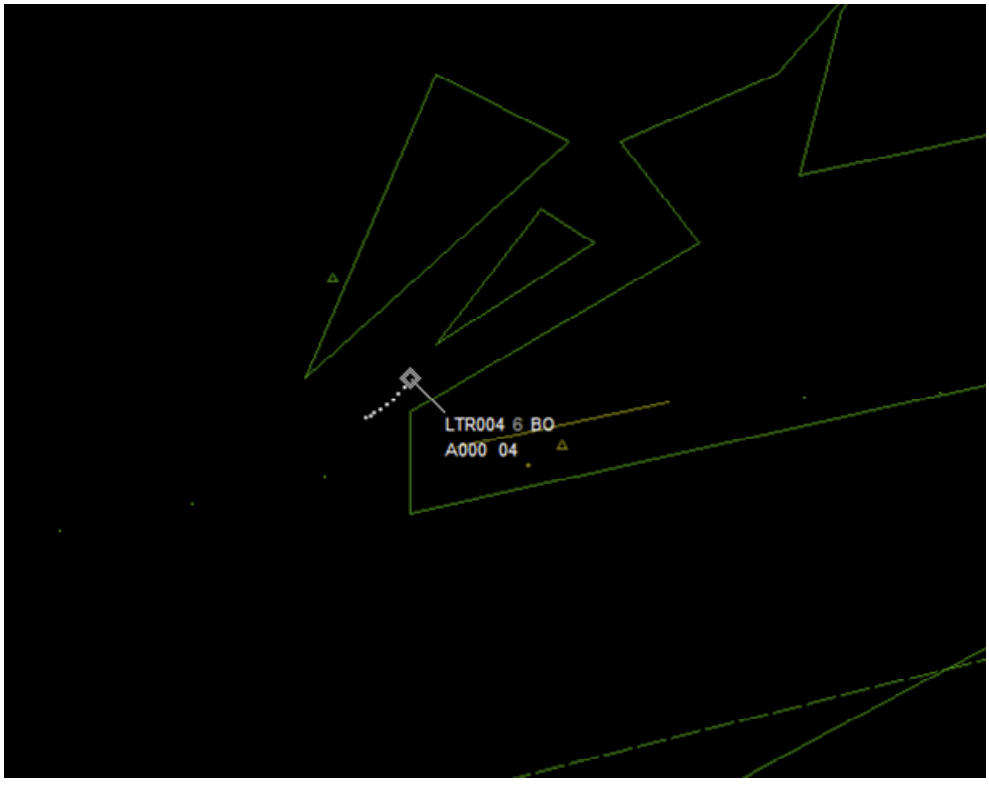
Radar print-out at 14:37:00Z. Position approx. 2 NM from runway threshold 07,100 ft, 30 KGS, parallel centre line towards Bodø harbour.



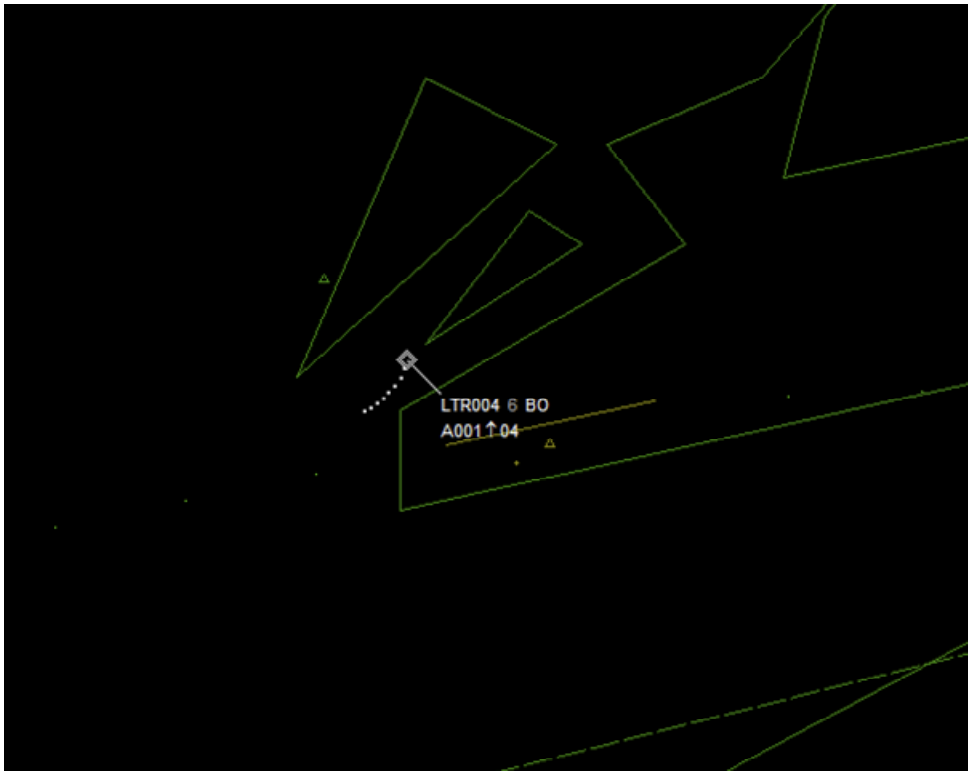
Radar print-out at 14:37:30Z. Position approx. 1.5 NM from runway 07 threshold, 100 ft, 30 KGS, course towards Bodø harbour.



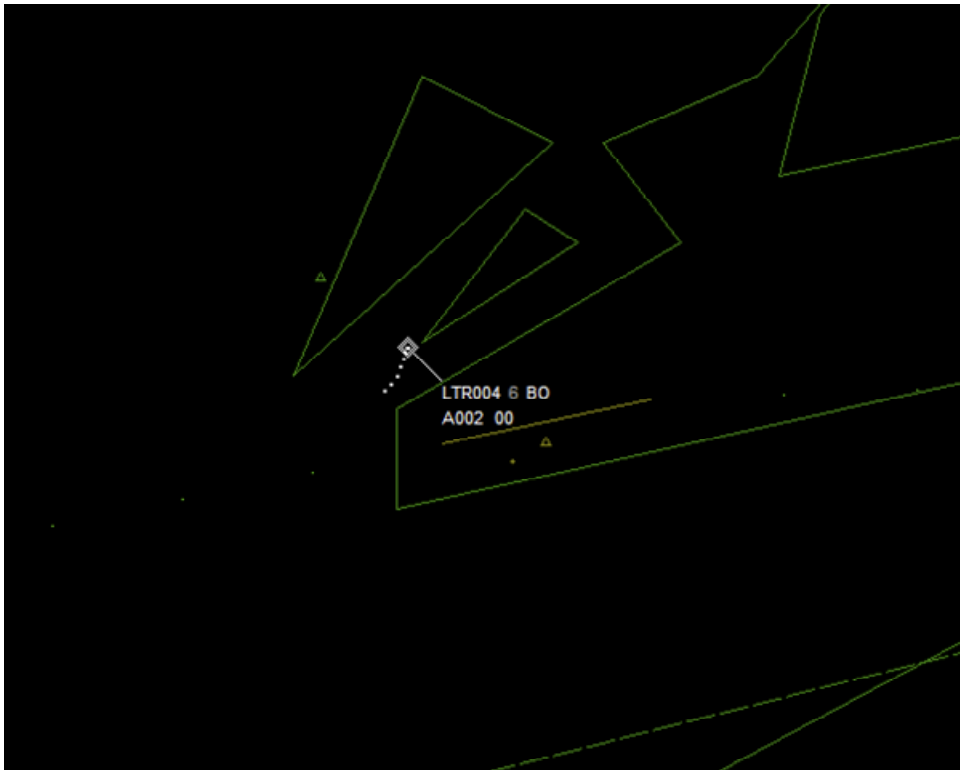
Radar print-out at 14:38:00Z. Position approx. 1.5 NM from runway 07 threshold, altitude 0 ft, ground speed 30 KGS. Course correction from TWR/Radar towards runway.



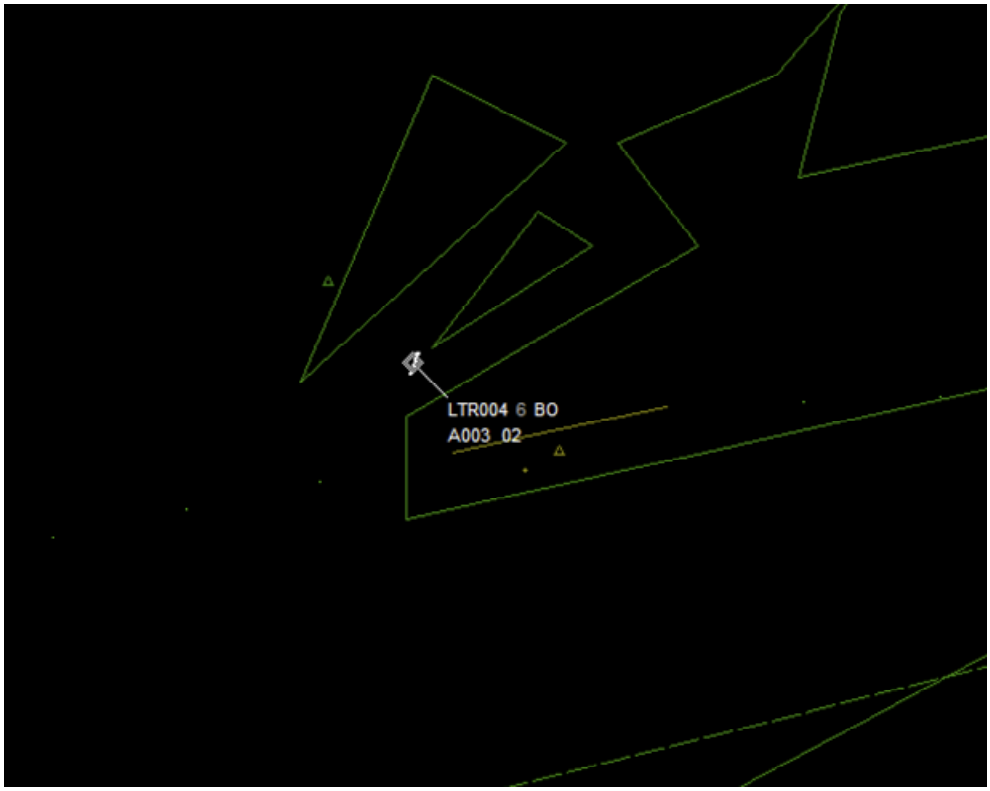
Radar print-out at 14:38:30Z. Position approx. 1 NM from runway 07 threshold, altitude 0 ft, 40 KGS. Course towards Lille Hjartøy.



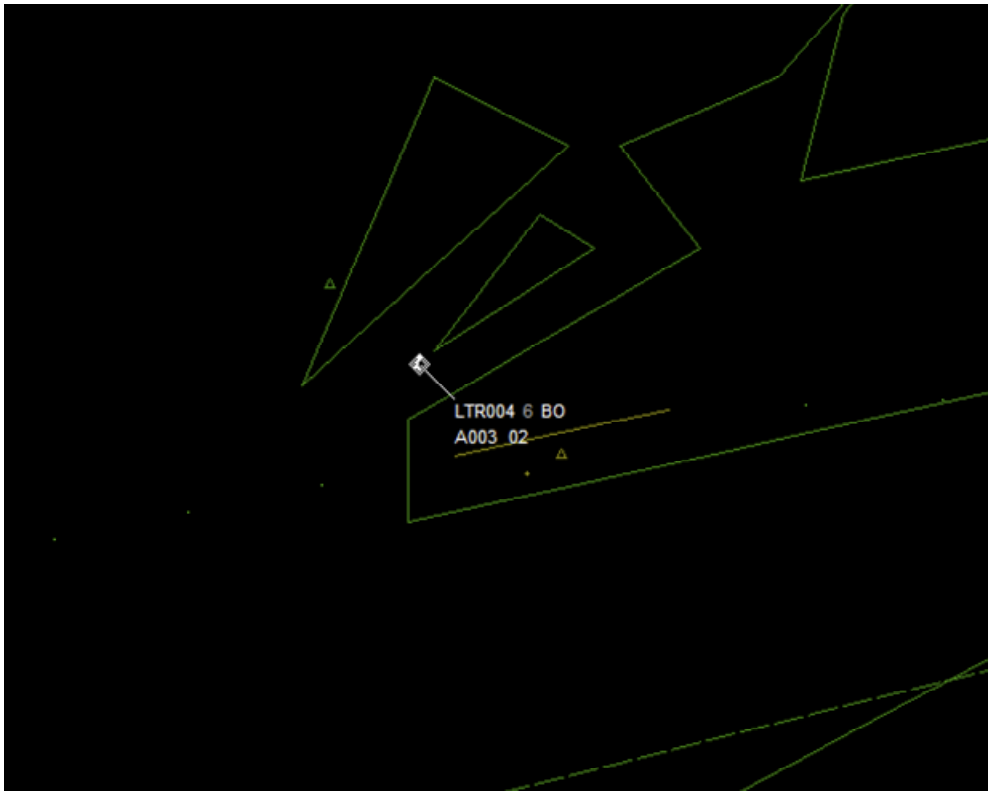
Radar print-out at 14:38:38Z. Position approx. 200 m from Lille Hjartøy, altitude 100 ft in a climbing left turn following request from TWR/Radar, 40 KGS.



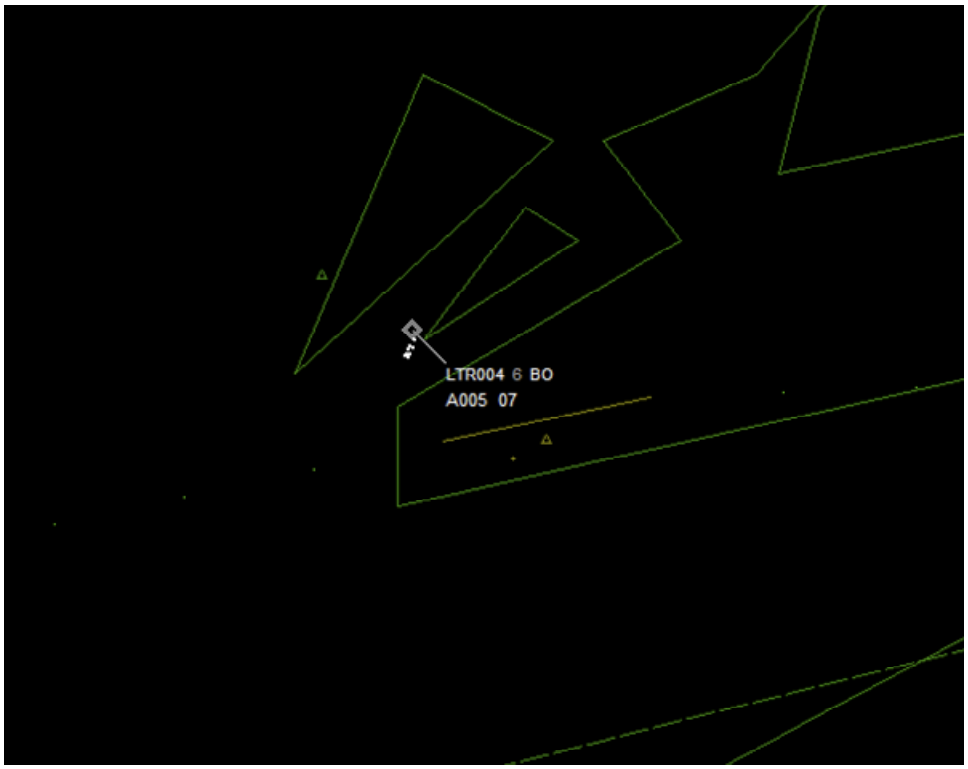
Radar print-out at 14:38:54Z. Position approx. 100 m from Lille Hjartøy, altitude 200 ft, ground speed 0 KGS with winds from approx. 090° 25-30 kt.



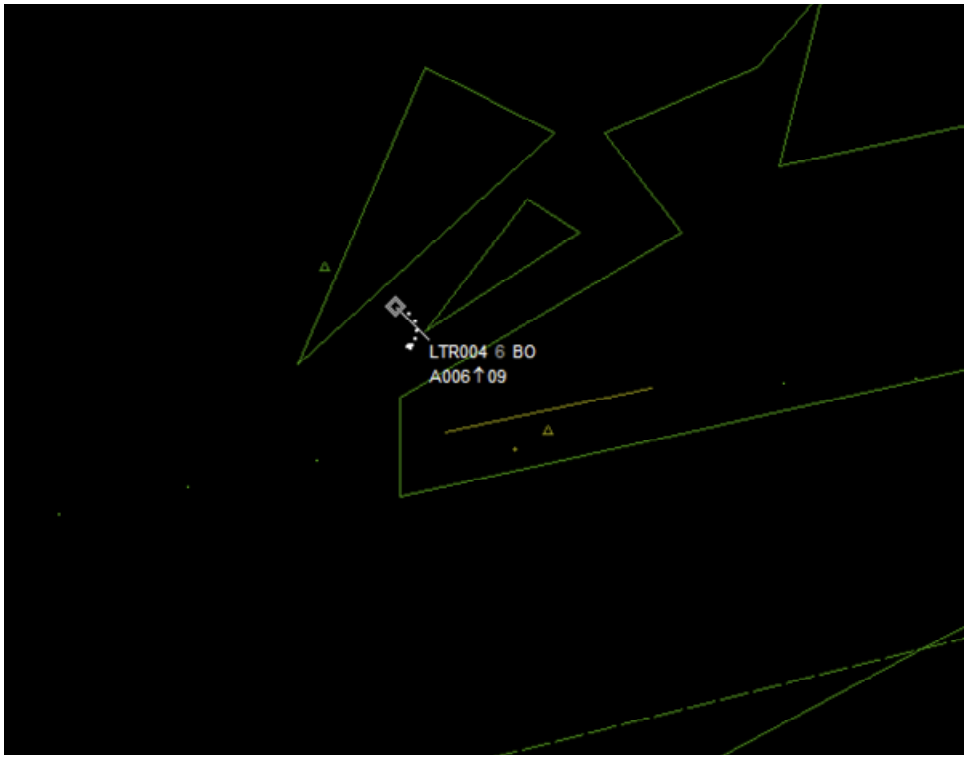
Radar print-out at 14:39:04Z. Position approx. 100 m from Lille Hjartøy, hover at 300 ft.



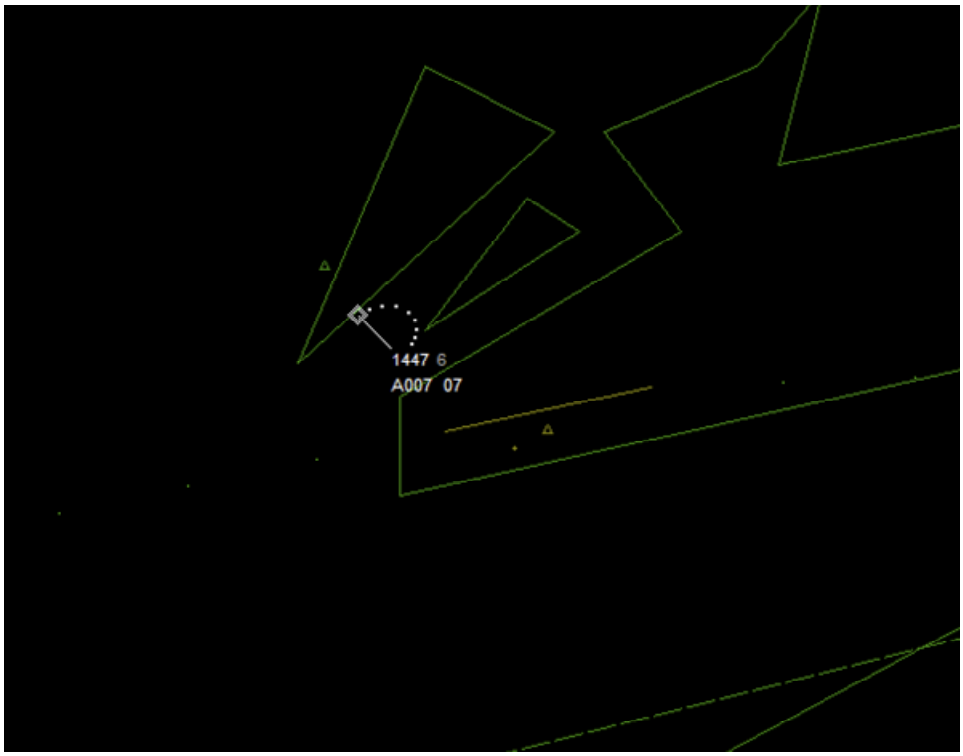
Radar print-out at 14:39:12Z. Position approx. 100 m from Lille Hjartøy, hover at 300 ft.



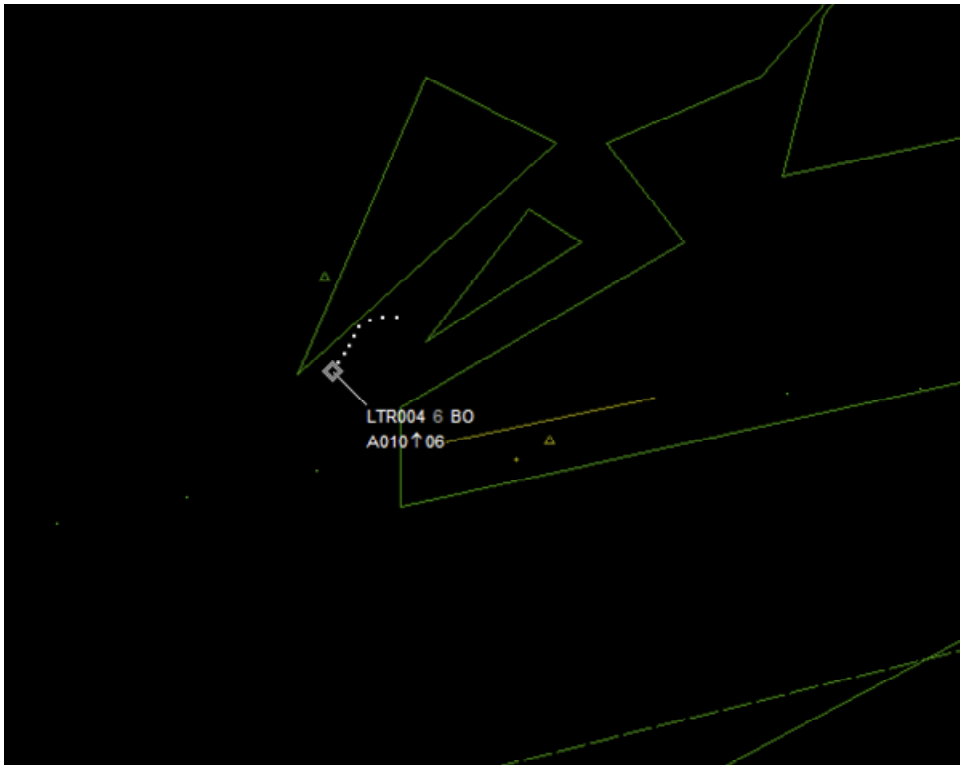
Radar print-out 14:39:23Z. Position approx. 100 m west of Lille Hjartøy in a climbing left turn after a strong request from TWR/Radar. Altitude 500 ft, ground speed 70 KGS with tailwind.



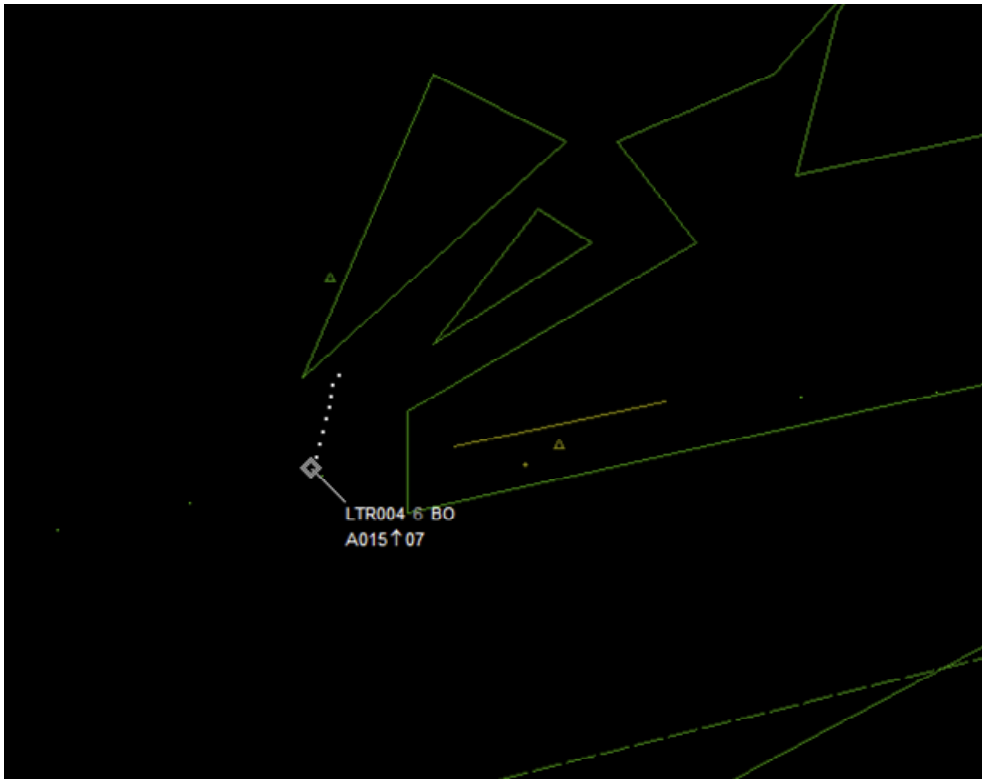
Radar print-out at 14:39:30Z. Position approx. 100 m east of Store Hjartøy in a left climbing turn, altitude 600 ft, ground speed 90 KGS in tailwind.



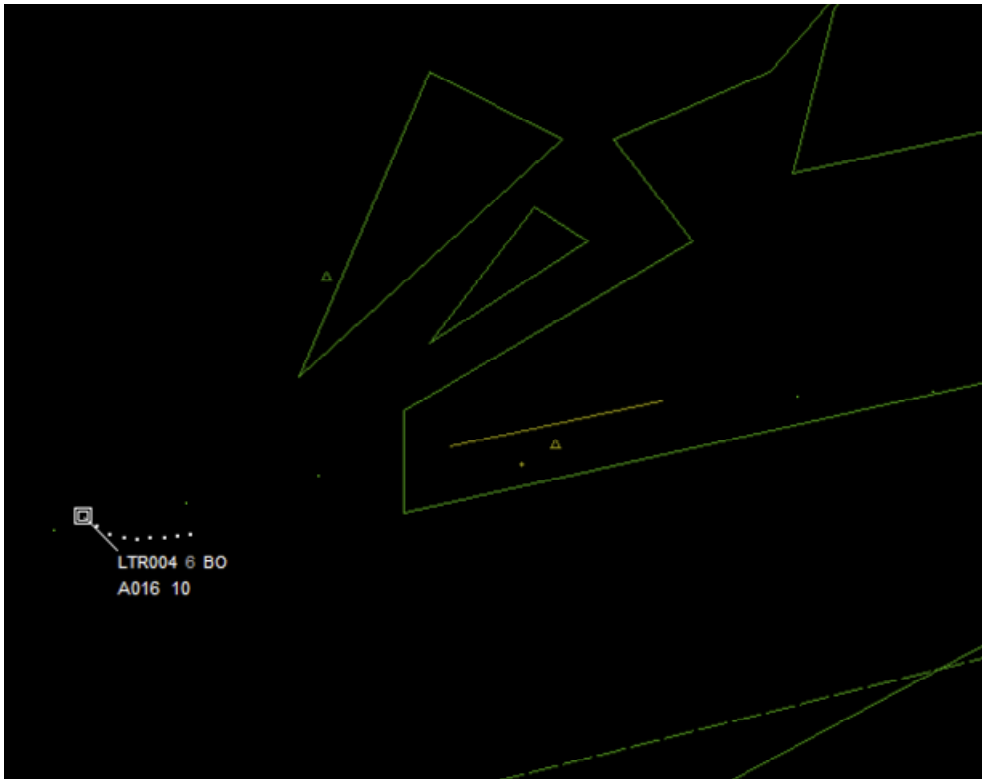
Radar print-out at 14:39:41Z. The position is tangential to the east side of Store Hjartøy, altitude 700 ft, ground speed 70 KGS, course 180°.



Radar print-out at 14:40:00Z. Position approx. 100 m east of the southern point of Store Hjartøy, altitude 1 000 ft. and climbing, ground speed 60 KGS, course 180°.



Radar print-out at 14:40:31Z. Position approx. 2 NM west of runway 07 threshold, crossing Localizer towards the south, altitude 1 500 ft and climbing, ground speed 70 KGS, course 180°.



Radar print-out at 14:41:45Z. Position approx. 4 nm NM west of runway 07 threshold, altitude 1 600 ft, ground speed 100 KGS in approx. 30 kt of tailwind, course north-west through Localizer.