KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA

FINAL

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Aircraft Accident Investigation Report

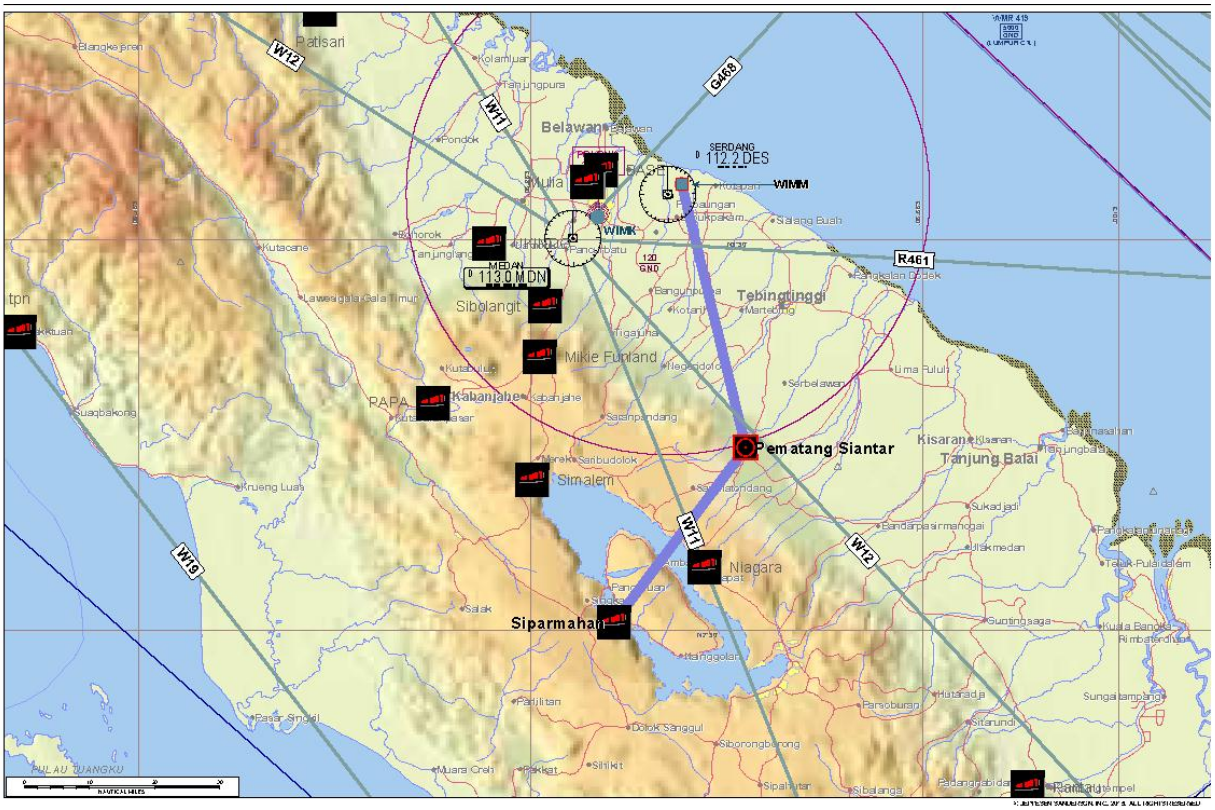
PT. Penerbangan Angkasa Semesta

Eurocopter EC130 B4; PK-BKA

Toba Lake, North Sumatera

Republic of Indonesia

11 October 2015



2016

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The report is based upon the investigation carried out by the KNKT in accordance with Annex 13 to the Convention on International Civil Aviation Organization, the Indonesian Aviation Act (UU No. 1/2009) and Government Regulation (PP No. 62/2013).

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ABBREVIATIONS AND DEFINITIONS

AAIP	:	Approved Aircraft Inspection Program
ALERFA	:	A situation where in apprehension exists as to the safety of an aircraft and its Occupants.
AOC	:	Air Operator Certificate a commercial transport license for airlines
ATC	:	Air Traffic Control
ATS	:	Air Traffic Service
BASARNAS	:	*Badan Search and Rescue Nasional* (National Search and Rescue Agency)
BMKG	:	*Badan Meterologi Klimatologi dan Geofisika* (Meteorological Climatology and Geophysical Agency)
°C	:	Degrees Celsius
CASR	:	Civil Aviation Safety Regulation
CPL	:	Commercial Pilot Licence
DETRESFA	:	A situation where in there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.
DGCA	:	Directorate General Civil Aviation
FH	:	Flight Hours
FIC	:	Flight Information Centre
ft	:	feet
HLO	:	Helicopter Landing Officer
IAS	:	Indicated Airspeed
ICAO	:	International Civil Aviation Organization
IFR	:	Instrument Flight Rules
INCERFA	:	A situation where in uncertainty exists as to the safety of an aircraft and its occupants. Whenever the time of last contact between an aircraft and ATC exceeds 30 minutes, or if an aircraft has not landed 30 minutes after the pilot has received landing clearance at an airfield and no other contact was established.
IMC	:	Instrument Meteorological Condition
Km	:	Kilometer(s)
KNKT	:	*Komite Nasional Keselamatan Transportasi* (National Transportation Safety Committee)
kt	:	knots
LT	:	Local Time
m	:	Meter
Nm	:	Nautical mile

ROD	:	Rate Of Descent
S/N	:	Serial Number
SD	:	Spatial Disorientation
TBO	:	Time Between Overhaul
TSO	:	Time Since Overhaul
UTC	:	Universal Time Coordinate
VFR	:	Visual Flight Rules
VMC	:	Visual Meteorological Condition

INTRODUCTION

SYNOPSIS

The Komite Nasional Keselamatan Transportasi (KNKT) Policies and Procedures Manual, described that reporting of an accident involving fatality shall be published in full report. In this accident, the aircraft wreckage was not recovered and limited information available. The main information was only from the survival passenger. In order to prevent several sub-headings with no information, KNKT publish the investigation report for this accident in short report format. The purposes of the investigation to determine the contributing factors and improve safety are maintained.

Eurocopter (Airbus Helicopter) EC130 B4 helicopter, registration PK-BKA was being operated by PT. Penerbangan Angkasa Semesta (PT. PAS) on 11 October 2015 as unscheduled chartered flight. The flight was planned from Kualanamu International Airport (Kualanamu) – Siparmahan and return. The helicopter departed Siparmahan at 1133 LT, on board in this flight were five persons consisted of one pilot, one engineer, and three passengers which were from the charterer agency.

During the flight the helicopter entered a condition and the visibility decreased significantly that might result in spatial disorientation to the pilot.

The helicopter impacted to the water, all occupants evacuated and floated used the seat cushions. On 13 October 2015 one survived passenger was rescued.

The investigation determines the contributing factors to this accident were:

- The pilot experienced of spatial disorientation during flying on low visibility resulted in the inability to determine aircraft attitude and position;
- Unavailability of individual flotation devices and un-inflated of aircraft flotation device decreased the occupant survivability.

The aircraft operator had performed several safety actions prior to the publishing of this investigation report.

Komite Nasional Keselamatan Transportasi (KNKT) issued safety recommendations addressed to PT. Penerbangan Angkasa Semesta, Directorate General of Civil Aviation (DGCA) and BASARNAS.

1 FACTUAL INFORMATION

1.1 History of the Flight

A Eurocopter (Airbus Helicopter) EC130 B4 helicopter, registration PK-BKA, was being operated by PT. Penerbangan Angkasa Semesta (PT. PAS) on 11 October 2015 on an unscheduled chartered flight. The flight was planned from Kualanamu International Airport[1] – Siparmahan – Kualanamu.

Siparmahan helipad was located approximately 66 Nm South of Kualanamu, at an elevation of approximately 3,200 feet above sea level and the elevation of water surface on Toba Lake is approximately 3,000 feet. There was no navigation aid and communication facility available at Siparmahan helipad.

The satellite image provided by Badan Meteorologi, Klimatologi dan Geofisika (BMKG – National Agency of Meteorology, Climatology and Geophysics) showed that there were some cloud formations and smoke (haze) covering the area including the route between Kualanamu and Siparmahan.

On the first flight from Kualanamu, the helicopter departed at 0938 LT (0238 UTC[2]). With fuel on board sufficient for three hours flight time. According to the company flight plan, the pilot flew via PEMAT[3] and cruised at an altitude of 7,500 feet. The route selection was based on the lowest terrain and to maintain autorotation distance.

At 1015 LT, the pilot reported to Medan Director (Air Traffic Services - ATS) that the position was at 47 Nm to destination on radial 177 from Kualanamu and the estimated time of arrival at 1035 LT. The flight landed on a helipad at Siparmahan at 1056 LT.

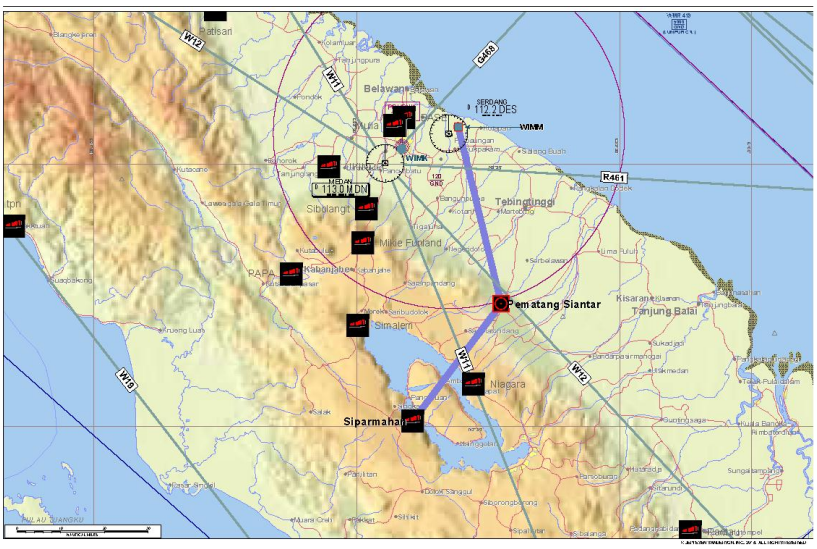


Figure 1: The company route guidance from Kualanamu to Siparmahan

1 Kualanamu International Airport will be named as Kualanamu for the purpose of this report

2 The 24-hour clock used in this report to describe the time of day as specific events occurred is in Coordinated UniversalTime (UTC). Local time for Kualanamu is Western Indonesia Standard Time /*Waktu Indonesia Barat* (WIB) is UTC + 7.

3 PEMAT is a waypoint over Pematang Siantar at approximately 40 Nm South East Kualanamu

The flight continued the second route from Siparmahan to Kualanamu. At 1150 LT, the engineer on board sent a short message to a company personnel at their operation center at Medan which informed them that the aircraft took off at 1133 LT from Siparmahan to Kualanamu and estimated time of arrival was at 1240 LT. On board this flight were five persons consisted of one pilot, one engineer, and three passengers which were from the charter agency.

At 1326 LT, the helicopter had not been contacted and one of the company personnel reported to the Kualanamu ATS personnel. The ATS personnel contacted the controller on duty of Aerodrome Control Tower, Approach Control Unit and Flight Information Center (FIC) but there was no information about the helicopter.

At 1336 LT, the ATS unit declared INCERFA.

At 1459 LT, the ATS unit declared DETRESFA and the ATS personnel reported to the Search and Rescue Agency (BASARNAS), thereafter the local Search and Rescue team assembled.

The helicopter wreckage was not located. 4 persons were deceased and one surviving passenger was located and rescued on 13 October 2015.

Information from the Surviving Passenger

Note: all times are approximate.

The witness was the only occupant that survived the accident. The witness was a Helicopter Landing Officer (HLO). He stayed at Siparmahan on the day prior to the accident.

At 0635 LT on the day of the accident, he provided information to the pilot and the HLO of the PT. PAS in Medan related to the Siparmahan helipad coordinate and pictures of the helipad, area and surrounding location and obstacles. At 0800 LT, he provided additional information of the weather observation on the helipad area.

At 1045 LT, the helicopter was on approach on the east side of the helipad and subsequently landed.

At 1050 LT, the helicopter engine was shutdown. The crew then took rest in the house nearby.

At 1110 LT, he opened the satellite image through the internet and discussed it with the pilot. Weather observation on the helipad area was: wind calm, ground visibility 5 km referred to the hills that was still visible.

At 1130 LT, the crew performed preflight check and the passengers boarded the helicopter. The surviving passenger was seated at the aft left side and from that position the aircraft instruments were visible. He reported that there was no safety briefing conducted.

At 1133 LT, the helicopter took off heading to the west after lift-off then turned to heading east.

At 1135 LT, after takeoff the helicopter was flying on the coast line of the lake. The weather was fine as he could see the lake.

Several minutes after, he felt that the helicopter turned to the right and suddenly the weather changed to dense smoke and the visibility decreased significantly. He could

not see the lake. He noticed the aircraft altitude was approximately 3,500 feet. He felt the helicopter turned to the left twice. On the second turn the helicopter impacted the water.

Afterward the water entered the cabin. One of the passengers then opened the right sliding door and threw out four seat cushions. All occupants evacuated the helicopter. The surviving passenger was unable to find a life vest on the helicopter.

At the first hours, all occupants stayed together and swam using the seat cushions to stay afloat. The group was then separated by big waves. He stayed with one of the other occupants. Both of them stayed together until the second day after the accident.

On the night of 12 October 2015, they separated and the surviving passenger stayed alone until being rescued by the search and rescue team on 13 October at approximately 1230 LT.

1.2 Injuries to Persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	1	3	4	-
Serious	-	1	1	-
Minor/None	-	-	-	-
TOTAL	1	4	5	-

1.3 Damage to Aircraft

The helicopter could not be found and is suspected to be submerged in Toba Lake.

1.4 Pilot Information

Gender	:	Male
Age	:	55 Years old
Nationality	:	Indonesian
Marital status	:	Married
Date of joining company	:	1 April 2013
License	:	CPL
Date of issue	:	19 January 2010
Aircraft type rating	:	EC130 B4
Instrument rating	:	None The pilot records indicated that the pilot did not hold an instrument rating and was qualified for visual flight only in Visual Meteorological Conditions.

Medical certificate	:	Class 1
Last of medical	:	25 August 2015
Validity	:	29 February 2016
Medical limitation	:	The holder shall wear lenses that correct for distant vision and possess glasses that correct for near vision
Last proficiency check	:	27 June 2015

Flying experience

Total hours	:	5020.4 hours
Total on type	:	443.6 hours
Last 90 days	:	17.3 hours
Last 60 days	:	12.4 hours
Last 24 hours	:	1.63 hours
This flight	:	Approximately 17 minutes

1.5 Aircraft Information

1.5.1 General

Aircraft general information as follows:

Registration Mark	:	PK-BKA
Manufacturer	:	Eurocopter / Airbus Helicopter
Country of Manufacturer	:	France
Type/ Model	:	EC130 B4
Serial Number	:	4813
Year of manufacture	:	2009
Certificate of Airworthiness		
Number	:	2699
Issued	:	13 January 2015
Validity	:	12 January 2016
Category	:	Normal
Limitations	:	None
Certificate of Registration		
Number	:	2699
Issued	:	12 January 2013
Validity	:	11 January 2016

Time Since New	:	1,249.99 hours
Cycles Since New	:	2,230 cycles
Last Major Check	:	Mei 2015 (1200 hours inspection).
Last Minor Check	:	21 September 2015 (1 month inspection)
Flight Recorders	:	The aircraft was not fitted with flight recorders, neither required by current Indonesian aviation regulations.

1.5.2 Engines

Manufacturer	:	Turbomeca
Type/Model	:	Arriel 2B1
Serial Number	:	46342
Time Since New	:	1,249.99 hours

1.5.3 Main Rotor

Manufacturer	:	Eurocopter (Airbus Helicopter)
Type/Model	:	355 A

Gearbox

Type/Model	:	350 A
Reduction Gear, Bevel	:	350A32-0350-02
Part Number	:	355A11-0030-04
Serial Number	:	M4249
Epicyclic Reduction gear Part Number	:	350A32-0120-00
Serial Number	:	M8072
▪ Time Since New	:	1,249.99 hours
▪ Cycles Since New	:	2,230 cycles
▪ Last major Inspection	:	1,200 hours
▪ TBO	:	3,000 hours

Rotor Blade 1

▪ S/N	:	31754
▪ Time Since New	:	1,249.99 hours
▪ Cycles Since New	:	2,230 cycles

Rotor Blade 2

- S/N : 31757
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 3

- S/N : 31746
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

1.5.4 Tail Rotor

Manufacturer : Eurocopter

Type/Model : 350 A

Rotor Blade 1 : 350A33-3002-02

- S/N : M4035
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 2

- S/N : M4052
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 3

- S/N : M4179
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 4

- S/N : M4201
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 5

- S/N : M4237
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 6

- S/N : M4238
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 7

- S/N : M4259
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 8

- S/N : M4269
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 9

- S/N : M4272
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

Rotor Blade 10

- S/N : M4416
- Installed : 17 March 2009
- Time Since New : 1,249.99 hours
- Cycles Since New : 2,230 cycles

1.5.5 Emergency Equipment

According to the ATC flight plan filed by the ground handling, the helicopter was equipped with marine and jungle survival kit consisting of life jacket with light, life raft in yellow color.

According to the company information, the helicopter was equipped with Emergency Floatation Gear on the helicopter skids, jungle survival kit and first aid kit.

The activation procedure for Emergency Floatation Gear was available in the Company Checklist in chapter 2.1.1 and 2.1.2 as follows:

2.1.1 AUTOROTATION PROCEDURE OVER LAND

1. Collective pitch …… REDUCE
2. IAS …… SET to Vy.
3. Twist grip …… IDLE detent
4. Maneuver the helicopter into the wind on final approach.

• At height ≈ 70 ft (21 m)
5. Cyclic …… FLARE

• At 20/25 ft (6/8 m) and at constant attitude
6. Collective pitch…… GRADUALLY INCREASE

To reduce ROD and forward speed.

7. Cyclic …… FORWARD to adopt a Slightly nose-up landing Attitude (< 10˚)
8. Pedal …… ADJUST To cancel sideslip tendency
9. Collective pitch …… INCREASE To cushion touch-down

• After touch-down
10. Cyclic, Collective, pedal…… ADJUST

• Once helicopter has stopped
11. Collective pitch ……. FULL DOWN
12. Rotor brake …… APPLY > 170 rpm

2.1.2. AUTOROTATION OVER WATER WITH EMERGENCY FLOATATION GEAR

Apply same procedure as over land, except items 10, 11 and 12, but maneuver to head the aircraft equally between the wind and waves direction on final approach. Ditch with minimum forward (IAS<30 kt) and vertical speed. Then apply following check list for item 10, 11 and 12.

INFLATION PROCEDURE
[FLOAT ARM]……. ON
[FLOAT ARM]..Lights 1 and 2…… Check ON
[FLOAT FIRE] under guard on collective grip ….PRESS
(recommended firing IAS below 80 kt)

- *After touch-down*

10. Collective pitch…… MAINTAIN
11. Door emergency handles….. PULL-UP
12. Rotor brake …….. APPLY
14. Abandon aircraft once the rotor has stopped

1.5.6 Maintenance Records

According to PT. PAS Approved Aircraft Inspection Program (AAIP) document number PAS-010-C Revision 04, dated March 2015, the last inspection program prior the occurrence for Airbus Helicopter (Eurocopter) EC130 B4 consist of 3 month inspection check, 50 flight hours inspection check, 30 flight hours inspection check, 7 days or 15 flight hours inspection check and 10 flight hours inspection check. All inspections were done in timely manner without any overdue maintenance. The last inspection prior the occurrence was satisfactory without any significant discrepancies and there was no deferred maintenance.

The maintenance log did not record any abnormalities.

1.5.7 Helicopter Instruments

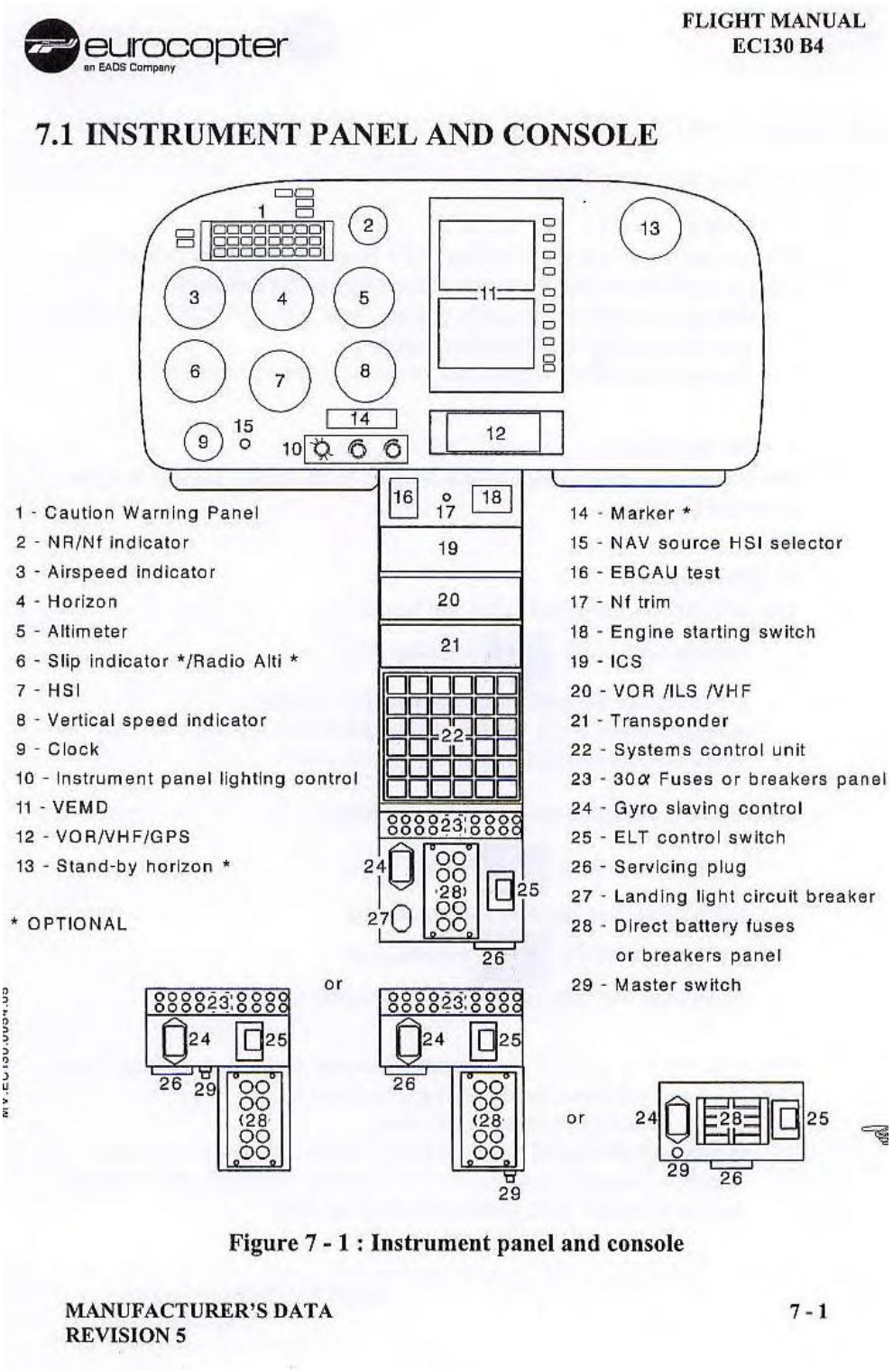


Figure 2: Schematic cockpit instrument layout of EC130 B4

Figure 3: Typical cockpit instrument layout of EC130 B4

The helicopter was equipped with instruments adequate for instrument flying.

1.6 Meteorological Information

The satellite image issued on 11 October 2015, at 0430 UTC and 0500 UTC by BMKG Kualanamu Meteorological Office showed that there were some cloud formations in the area (figure 4).

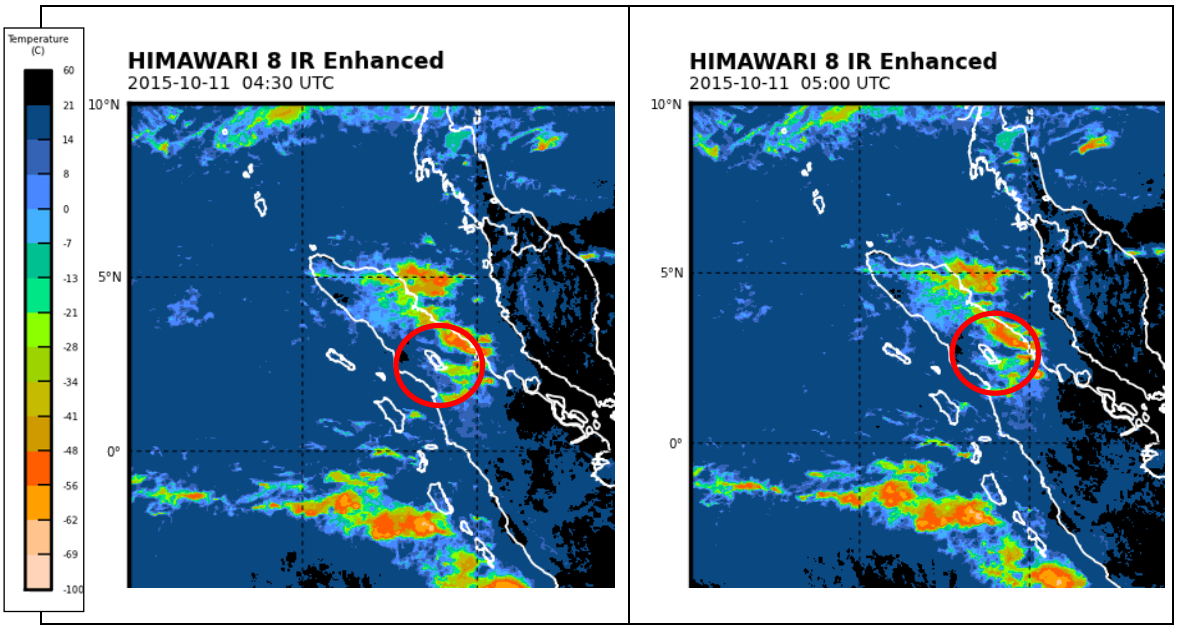


Figure 4: The satellite weather image provided by BMKG

The BMKG satellite image shown that at 0500 UTC, the cloud formations moved northerly.

At the time of the accident, most of Sumatera area, including the route from Siparmahan to Kualanamu was covered by smoke (haze) from the forest fire. The smoke from the forest fire covered almost all area of Sumatera and Kalimantan, the smoke also spread out to Singapore and Malaysia. In some area such as Pekanbaru, Jambi and any other places in Sumatera, the smoke was very dense and the visibility might decrease to 50 meters. The BMKG reported that the smoke over the area was classified as thin smoke.

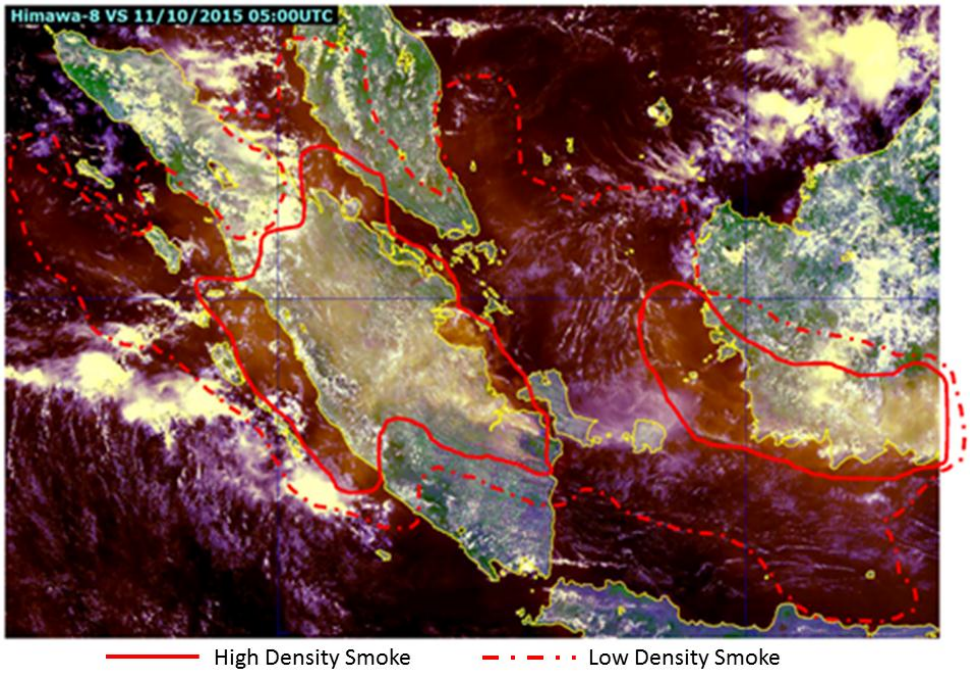


Figure 5: The smoke condition at 0500 UTC on the area provided by BMKG

According to video footage taken by local media showed that the visibility on the area 30 minutes before take-off was considered clear.

Figure 6: The visibility observed based on the local media video footage at about 30 minutes before take off

1.7 Survival Aspects

After the aircraft was reported missing, the National Search and Rescue Agency (BASARNAS – Badan SAR Nasional) did not receive an Emergency Locator Transmitter signal. Following the information of the missing aircraft, the search and rescue operation was assembled. The search operation utilized two helicopters operated by BASARNAS, and eight boats from the BASARNAS, armed forces, police and local government. In addition, PT. PAS chartered one fixed-wing aircraft that conducted search operation since the day of occurrence thereafter one helicopter joined the search operation on 17 October 2015.

The search and rescue operation used one Dolphin AS 365N3+ helicopters and one Bell 412 Army Aviation which were capable for instrument flight rules (IFR) flight. The pilots available for both helicopters were not capable for instrument flying. The aircraft were unable to depart from Medan to the search area due to the weather at Medan was below Visual Meteorological Condition (VMC) minima. The helicopter attempted to go to the search area on 14 October 2015 and returned due to poor weather en-route.

On 13 October 2015, the surviving passenger was found floating using a seat cushion by search team boat near Onan Runggu Village area at approximately 13 Nm South East of Siparmahan.

On 20 October 2015, the search and rescue operation by BASARNAS was terminated. The four other occupants and the helicopter were not found.

The KNKT, in cooperation with the Indonesia Navy, conducted a search operation to find the helicopter wreckage using multi beam echo-sounder, sonar detector and submarine profiler. However, the wreckage was not found.

Figure 7: The search area

1.8 Organizational and Management Information

1.8.1 Aircraft Operator Information

Aircraft owner	:	PT. Penerbangan Angkasa Semesta
Aircraft operator	:	PT. Penerbangan Angkasa Semesta Jl. Komplek L. Yos Sudarso Km. 6 Komplek Citra Graha AA2 Tanjung Mulia Medan – North Sumatera, Indonesia
Air operator certificate	:	AOC/135-026

The aircraft operator was certified under CASR 135 and served regular charter flight utilized three aircraft, consisted of one Cessna Citation 560 XLS, one helicopter Bell 407 and one helicopter EC130 B4.

1.8.2 CASR Part 91: General Operating and Flight Rules

Part 91.205 Powered Civil Aircraft with Standard Category Indonesian Airworthiness Certificates: Instrument and Equipment Requirements

(a) General. Except as provided in Paragraphs (c)(3) and (e) of this section, no person may operate a-powered civil aircraft with a standard category Indonesian airworthiness certificate in any operation described in Paragraphs (b) through (f) of this section unless that aircraft contains the instruments and equipment (or DGCA approved equivalents) specified in those paragraphs for that type of operation, and those instruments and items of equipment are in operable condition.

(b) Visual flight rules (day). For VFR flight during the day, the following instruments and equipment are required:

(1) Airspeed indicator.

(2) Altimeter.

(3) Magnetic direction indicator.

(4) Tachometer for each engine.

(5) Oil pressure gauge for each engine using pressure system.

(6) Temperature gauge for each liquid cooled engine.

(7) Oil temperature gauge for each air cooled engine.

(8) Manifold pressure gauge for each altitude engine.

(9) Fuel gauge indicating the quantity of fuel in each tank.

(10) Landing gear position indicator, if the aircraft has a retractable landing gear.

(11) If the aircraft is operated for hire over water and beyond power off gliding distance from shore, approved flotation gear readily available to each occupant and at least one pyrotechnic signaling device. As used in this section, "shore" means that area of the land adjacent to the water which is

above the high water mark and excludes land areas which are intermittently under water.

(12) An approved safety belt with an approved metal-to-metal latching device for each occupant 2 years of age or older.

(13) For small civil airplanes manufactured after [27 December 1993], an approved shoulder harness for each front seat. The shoulder harness must be designed to protect the occupant from serious head injury when the occupant experiences the ultimate inertia forces specified in Part 23 of the CASRs. Each shoulder harness installed at a flight crewmember station must permit the crewmember, when seated and with the safety belt and shoulder harness fastened, to perform all functions necessary for flight operations. For purposes of this paragraph

(i) The date of manufacture of an airplane is the date the inspection acceptance records reflect that the airplane is complete and meets the DGCA-approved type design data; and

(ii) A front seat is a seat located at a flight crewmember station or any seat located alongside such a seat. (14) An emergency locator transmitter, if required by Section 91.207.

(15) For normal, utility, and acrobatic category airplanes with a seating configuration (not including pilot seats) of 9 or less, manufactured after [date to be determined], a shoulder harness for

(i) Each front seat that meets the requirements of Part 23 of the CASRs in effect on [date to be determined];

(ii) Each additional seat that meets the requirements of Part 23 of the CASRs.

(16) For rotorcraft manufactured after September 16, 1992, a shoulder harness for each seat that meets the requirements of Part 27.2 and Part 29.2.

(c) Visual flight rules (night). For VFR flight at night, the following instruments and equipment are required:

(1) Instruments and equipment specified in paragraph (b) of this section;

(2) Approved position lights;

(3) a landing light;

(4) illumination for all flight instruments and equipment that are essential for the safe operation of the aircraft that are used by the flight crew;

(5) lights in all passenger compartments;

(6) an independent portable light for each crew member station;

(7) An adequate source of electrical energy for all installed electrical and radio equipment;

(8) An approved aviation red or aviation white anticollision light system;

(9) radio communications and navigational equipment appropriate to the ground facilities to be used; and

(10) One spare set of fuses, or three spare fuses of each kind required, that are accessible to the pilot in flight.

(d) Instrument flight rules. For IFR flight, the following instruments and equipment are required:

(1) Instruments and equipment specified in Paragraph (b) of this section, and, for night flight, instruments and equipment specified in Paragraph (c) of this section.

(2) Two-way radio communications system and navigational equipment appropriate to the ground facilities to be used.

(3) Gyroscopic rate of turn indicator, except on the following aircraft:

(i) Airplanes with a third attitude instrument system usable through flight attitudes of 360° of pitch and roll and installed in accordance with the instrument requirements prescribed in Section 121.305(j) of the CASRs; and

(ii) Rotorcraft with a third attitude instrument system usable through flight attitudes of ±80° of pitch and ±20° of roll and installed in accordance with Part 29.1303 (g) of the CASRs. with Part 29.1303 (g) of the CASRs.

(4) Slip/skid indicator.

(5) Sensitive altimeter adjustable for barometric pressure.

(6) A clock displaying hours, minutes, and seconds with a sweep-second pointer or digital presentation.

(7) Generator or alternator of adequate capacity.

(8) Gyroscopic pitch and bank indicator (artificial horizon).

(9) Gyroscopic direction indicator (directional gyro or equivalent).

91.221 Aircraft Overwater Operations

(c) All helicopters intended to be flown over water shall be fitted with a permanent or rapidly deployable means of flotation so as to ensure a safe ditching of the helicopter when engaged in offshore operations.

(d) All helicopters operating in accordance with the paragraph (c) shall be equipped with:

(1) one life jacket, or equivalent individual flotation device, for each person on board, stowed in a position easily accessible from the seat of the person for whose use it is provided;

(2) when not precluded by consideration related to the type of helicopter used, life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken; and

(3) equipment for making the pyrotechnical distress signals.

(f) Each life jacket and equivalent individual flotation device, when carried in accordance with paragraph (d) of this section, shall be equipped with a means of electric illumination for the purpose of facilitating the location of person.

1.8.3 CASR Part 135: Certification and Operating Requirements: For Commuter and Charter Certificate Holders

135.1 Definition and abbreviation

"Extended over water operations" – A flight operated over water at a distance of more than 93 km (50 NM), or 30 minutes at normal cruising speed, whichever is the lesser, away from land suitable for making an emergency landing.

(1) Category A, with respect to transport category rotorcraft, means multiengine rotorcraft designed with engine and system isolation features specified in Part 29 and utilizing scheduled takeoff and landing operations under a critical engine failure concept which assures adequate designated surface area and adequate performance capability for continued safe flight in the event of engine failure.

(2) Category B, with respect to transport category rotorcraft, means single-engine or multiengine rotorcraft which do not fully meet all Category A standards. Category B rotorcraft have no guaranteed stay-up ability in the event of engine failure and unscheduled landing is assumed.

135.305 Flight and Navigation Equipment for IFR

(a) No person may operate an aeroplane under the instrument flight rules unless it is equipped with the following flight and navigational instruments and equipment:

(1) 2 Independent airspeed indicating systems with heated pitot tubes or equivalent means for preventing malfunctioning due to icing,

(2) 2 independent sensitive altimeter systems,

(3) a sweep-second hand clock (or approved equivalent),

(4) a free air temperature indicator,

(5) a gyroscopic bank and pitch indicator (artificial horizon),

(6) a gyroscopic rate of turn indicator combined with an integral slip/skid indicator (turn and bank indicator) except that only a slip/skid indicator is required when a third attitude instrument system usable through 360° of pitch and roll is installed in accordance with paragraph (10) of this section,

(7) a gyroscopic direction indicator (directional gyro or equivalent),

(8) a magnetic compass,

(9) a vertical speed indicator (rate of climb indicator),

(10) on each turbo jet and turbo propeller powered aeroplane two gyroscopic bank and pitch indicators (artificial horizons) for use at the pilot stations. In addition, for turbo jet powered airplanes a third such instrument that complies with the provisions of Paragraph (11) of this section, and

(11) when required by Paragraph (10) of this section, a third gyroscopic bank and pitch indicator (artificial horizon) that:

(i) is powered from a source independent of the electrical generating system,

(ii) continues reliable operation for a minimum of 30 minutes after total failure of the electrical generating system,

(iii) operates independently of any other attitude indicating system:

(iv) is operative without selection after total failure of the electrical generating system,

(v) is located on the instrument panel in a position acceptable to the Director that will make it plainly visible to and usable by each pilot at his or her station, and

(vi) is appropriately lighted during all phases of operation.

135.351 Aircraft Overwater Operation

(c) All helicopters intended to be flown over water shall be fitted with a permanent or rapidly deployable means of flotation so as to ensure a safe ditching of the helicopter when:

(1) engaged in offshore operations, or other overwater operations as determined by Director General; or

(2) flying over water at a distance from land corresponding to more than 10 minutes at normal cruise speed when helicopter operating in performance Category A; or

(3) flying over water beyond auto rotational or safe forced landing distance from land when operating in performance Category B.

(d) All helicopters operating in accordance with the paragraph (c) shall be equipped with:

(1) one life jacket or equivalent individual flotation device with a means of electric illumination for the purpose of facilitating the location of persons, for each person on board, stowed in a position easily accessible from the seat of the person for whose use it is provided. For offshore operations the life jacket shall be worn constantly unless the occupant is wearing an integrated survival suit that includes the functionality of the lifejacket;

(2) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken; and

(3) equipment for making the pyrotechnical distress signals.

135.659 Flight plan: VFR and IFR

No person may takeoff an aircraft unless the operator has filed a flight plan, containing the appropriate information required by Part 91, with the nearest DGCA communication station or appropriate military station or, when operating outside Indonesia, with other appropriate authority. However, if communications facilities are not readily available, the pilot in command shall file the flight plan as soon as practicable after the aircraft is airborne. A flight plan must continue in effect for all parts of the flight.

1.9 Additional Information

Spatial Disorientation

Spatial Disorientation (SD) (Ernsting, 2003) is a term used to describe a variety of incidents occurring in flight where the pilot fails to sense correctly the position, motion or attitude of his aircraft or of himself within the fixed coordinate system provided by the surface of the earth and the gravitational vertical. In addition, errors in perception by the pilot of his position, motion or attitude with respect to his aircraft, or of his own aircraft relative to other aircraft, may also be embraced within a broader definition of SD in flight.

Spatial disorientation is influencing by several factors such as: limited perceptual cues or non-visual condition, limited recent instrument flying, abnormal event not expected and un-existing of autopilot or stabilization system.

If the disorientation phenomenon is not recognized immediately, it may lead to loss of control of the aircraft or controlled flight into terrain with disastrous consequences. Prevention of SD is thus an important step in enhancing flight safety.

If a pilot flying by reference to the aircraft's instruments is distracted from maintaining awareness of the aircraft's attitude, then gradual changes to the aircraft's orientation may go unnoticed. This is because changes at a rate below a certain threshold will not be perceived, possibly leading to spatial disorientation.

1.10 Useful or Effective Investigation Techniques

The investigation was conducted in accordance with the KNKT approved policies and procedures, and in accordance with the standards and recommended practices of Annex 13 to the Chicago Convention.

2 ANALYSIS

As the helicopter wreckage was not located, the main information available for the investigation was the statement of the witness who was one of the passengers. Referring to the witness recollections, the helicopter departed on the flight without any problem, however soon entered an area of low visibility, due to smoke / haze. The witness reported that the helicopter turned to the left twice prior to impacting the water.

The investigation did not find any helicopter system abnormality recorded or reported prior to the flight and the witness did not report any helicopter malfunction prior to the accident. The investigation considered that the helicopter serviceability was not an issue to this accident.

The helicopter was outside the range of two-way communication coverage with Medan Director (ATS) from takeoff until impact. According to CASR 135.659 the flight plan may be filed as soon as two way communications has been established. Therefore, investigation considered that the dispatch was not an issue that contributed to the accident.

The analysis will discuss the operation of the helicopter that led to the accident and the survivability aspects.

2.1 Operation on Significant Weather Changes

On the day of the accident, the Sumatera Island was covered by smoke including the area of the flight. In some area the smoke density decreased the visibility down to 50 meters. The smoke density as reported by the BMKG for the area of the flight was considered thin, it was shown that the visibility of the area reached 5 km prior to the flight. This indicated that the weather when the helicopter departed from Siparmahan was sufficient for VFR flight.

The surviving passenger stated that during the flight the helicopter entered a condition where the visibility decreased significantly and the ground was no longer visible at the helicopter altitude approximately 500 feet above the water surface.

Based on BMKG satellite image shown that the cloud formation movement northerly between 0430 UTC and 0500 UTC which was expected to be covering the area of the flight.

The investigation could not determine precisely the condition that reduced the visibility during the flight. It could have been caused by either smoke or cloud. If an aircraft enters cloud, the visibility may decreases significantly. This condition is similar if the aircraft enters dense smoke. Both conditions result in significantly reduce visibility.

Flying in conditions of low visibility shall be performed by reference solely to the aircraft instruments, called instrument flying. According CASR 91.205, the helicopter instruments were sufficient to conduct instrument flying. However this helicopter was not certified for IFR flight according to CASR 135.305.

To be able to conduct instrument flying, a pilot requires instrument flying training and to be certified for instrument rating. Pilots without instrument rating will not be able to fly under Instrument Meteorological condition (IMC) even though the aircraft is sufficiently equipped for instrument flying.

Pilots without instrument flying experiences will tend to search for ground or visual reference when flying in low visibility conditions, as they are not confident flying by referring solely to the aircraft instruments. The pilot for the accident flight did not hold an instrument rating and was not certified for instrument flying.

At 1150 LT, the operation center staff in Medan received a short message from the engineer on board, which was 17 minutes since the helicopter departure. It indicated that the engineer mobile phone was still active and communicating.

At the time when the visibility decreased, the helicopter had been flown for minimum of 17 minutes from Siparmahan which has an elevation of 3,200 feet. Assuming that the helicopter flew with a normal rate of climb of 500 feet/minute, the helicopter should have reached altitude above 5,000 feet. The statement of surviving passenger that the helicopter was at altitude approximately 3,500 feet indicated that the pilot might have tried to search for a visual reference by descending below the cloud or smoke. At this position, the surviving passenger could not see the ground or water surface while the helicopter was 500 feet above the water surface.

The surviving passenger stated that the helicopter turned to the left when flying in low visibility conditions. This might be an indication of the pilot tried to find visual reference.

A pilot who is not certified for instrument flying might not be able to determine the aircraft attitude such as roll and pitch by referring to the aircraft instrument when flying without visual reference. This condition is called spatial disorientation.

Spatial disorientation is influencing by several factors such as: limited perceptual cues or non-visual condition, limited recent instrument flying experience, abnormal event not expected and un-existing of autopilot or stabilization system.

If a pilot flying by referencing to the aircraft instruments is distracted from maintaining awareness of the aircraft attitude, then gradual changes to the aircraft orientation may go unnoticed. This is because changes at a rate below a certain threshold will not be perceived, possibly leading to spatial disorientation.

The helicopter turning to the left twice prior to impacting the water might indicate that the pilot was disoriented and did not realized that the helicopter was close to the water surface and subsequently impacted the water.

2.2 Survivability

The surviving passenger reported that there was no safety briefing provided prior to departure. The helicopter was relatively intact after the impact which was an indication that the impact speed was relatively low. The available helicopter flotation device (deployable floats) did not inflate and the water entered the cabin. One of the passengers then opened the right sliding door and threw out 4 seat cushions.

The surviving passenger stated that the life vest was not available or not accessible in this helicopter. The ATC flight plan stated that the helicopter was equipped with life vest and life raft. According to CASR 91.221, the aircraft flying over water should be equipped with aircraft flotation device, life jacket or equivalent individual flotation device with a means of electric illumination and equipment for making the pyrotechnical distress signals.

The helicopter flotation device was available as seen on figure 6, however most likely has not been activated by the pilot because he might have been completely surprised by the situation.

All occupants evacuated the helicopter and stayed together floating using the seat cushions. The group was then separated by big waves. The surviving passenger stayed with another occupant until the second day after the accident then they were separated by big waves. The surviving passenger stayed on the water for approximately 50 hours until being rescued.

Most of the occupants did not survive likely due to prolonged stay on the water and not wearing life vests. The delayed rescue was due to the fact that the location of the helicopter and survivor positions was not identified.

The BASARNAS search and rescue operation used one Dolphin AS 365N3+ and one Bell 412 helicopters which were capable for Instrument Flight Rules (IFR) flight. The pilots available for both helicopters were not capable for instrument flying. As a result, the aircraft were unable to depart from Medan to the search area due to the weather at Medan being below Visual Flight Rules (VFR) minima, even though the search area weather was clear.

On the day of the accident, the ground search team deployed, then the following day one fixed-wing aircraft and search team boats deployed. The air search operation used fixed-wing did not successfully find the survivors. This might be due to the typical of fixed wing operation which fly on relatively high speed. The search operation did not utilize other means or equipment used for air searching.

3 CONCLUSION

3.1 Findings[4]

According to factual information during the investigation, the Komite Nasional Keselamatan Transportasi found findings as follows:

1. The helicopter was airworthy prior to departure and the maintenance log did not record any abnormalities or problems.
2. The pilot held valid license and medical certificate. The pilot was not certified for instrument flying.
3. The flight plan contained information that the aircraft was equipped with marine and jungle survival kit, life jacket with light and yellow colored life raft. According to the surviving passenger the life vest was not available.
4. The flight from Kualanamu to Siparmahan about one hour and 18 minutes and on board fuel sufficient for three hours flight.
5. According to BMKG report, the weather condition at the time of the occurrences between Siparmahan and Kualanamu area was partially cloudy and covered by haze.
6. At 1130 LT, the crew performed preflight check and the helicopter took off three minutes after.
7. The surviving passenger seated at the aft left side and from that position the helicopter instrument was visible.
8. The surviving passenger reported that no safety briefing was performed by the crew prior to departure.
9. The helicopter flew on the coast line of the lake and the weather was fine.
10. After several minutes flying, the helicopter turned to the right and the weather changed to dense cloud or smoke and the visibility decreased significantly.
11. The helicopter was at altitude 500 feet above water surface indicated that the pilot might have tried to search visual reference by descending below the cloud prior to impact to the water.
12. The pilot did not find visual reference and could have experienced spatial disorientation.
13. The available helicopter flotation device was not inflated.
14. The surviving passenger stayed on the water approximately 50 hours using a seat cushion until being rescued.

4 Findings are statements of all significant conditions, events or circumstances in the accident sequence. The findings are significant steps in the accident sequence, but they are not always causal, or indicate deficiencies. Some findings point out the conditions that pre-existed the accident sequence, but they are usually essential to the understanding of the occurrence, usually in chronological order.

15. The ATC flight plan had not been filed because the two way communications had not been established.
16. The search and rescue helicopters which were capable for instrument flight rules (IFR) flight did not conduct search operation as the weather at Medan was below VFR minima.
17. There was no other means or equipment used for air searching.

3.2 Contributing Factors[5]

- The pilot likely experienced spatial disorientation during flying in low visibility resulting in the inability to determine aircraft attitude and position.
- Unavailability of individual flotation devices and un-inflated of aircraft flotation device decreased the chances of occupant survivability.
- The search and rescue efforts were limited as the pilots did not hold instrument ratings permitting take-off from Medan.

5 "Contributing Factors" are those events which alone, or in combination with others, resulted in injury or damage. The contributing factor is an act, omission, condition, or circumstance which if eliminated or avoided would have prevented the occurrence or would have mitigated the resulting injuries or damage.

4 SAFETY ACTION

At the time of issuing this final report, the Komite Nasional Keselamatan Transportasi has been informed safety actions following this occurrence.

4.1 PT. Penerbangan Angkasa Semesta (PAS)

On 10 February 2015 PT. PAS had issued safety actions following the internal investigation of this occurrence. The safety actions consisted of:

1. Organizational restructuring by electing experience pilot to a new position as Deputy Director.
2. Conducting the performance evaluation of key personnel.
3. Replaced the accident helicopter with a helicopter full instrument capability and equipped with flotation device comply with CASR 135.
4. Conducted training for helicopter pilot with instrument and mountain flying.
5. Updated the Company Manual to comply with CASR 91 and 135.
6. Updated the training program to include Upset Recovery and High Altitude Stall as a mandatory for recurrent training.
7. The board director emphasized to prioritize safety on decision making.

On 21 April 2016 PT. PAS issued other safety actions as follows:

1. Provide a Portable Locator Beacon in each aircraft.
2. Provide flight tracking system in operation control for dispatch and monitor flight progress.

4.2 Directorate General of Civil Aviation (DGCA)

Following this accident, the Directorate General of Civil Aviation (DGCA) Indonesia had conducted special safety audit to PT. Penerbangan Angkasa Semesta (PAS) on 29 and 30 October 2015. The audit findings have been followed up by PAS and considered closed.

The DGCA will also review to be included in Indonesia regulation related to the personal or portable ELT equipped for aircraft operated over inhabitant area or offshore.

5 SAFETY RECOMMENDATIONS

KNKT acknowledged the safety actions taken by the aircraft operator and considered appropriate to improve the safety. In addition KNKT issues safety recommendation to addressed identified safety issues to related parties.

The Directorate General of Civil Aviation is responsible to monitor the implementation of the recommendations the relevant parties.

5.1 PT. Penerbangan Angkasa Semesta

- **04.O-2016-32.1**

  To ensure the survival equipment is available on the aircraft suitable for area operation and properly use.

- **04.O-2016-58.1**

  To conduct passenger safety briefing prior to every flight.

5.2 Directorate General Civil Aviation

- **04.R-2016-33.1**

  To consider the regulation of using emergency equipment such as personal or portable Emergency Locator Transmitter for personal in aircraft operated in inhabitant terrain and offshore.

5.3 National Search and Rescue Agency (BASARNAS)

- **04.L-2016-34.1**

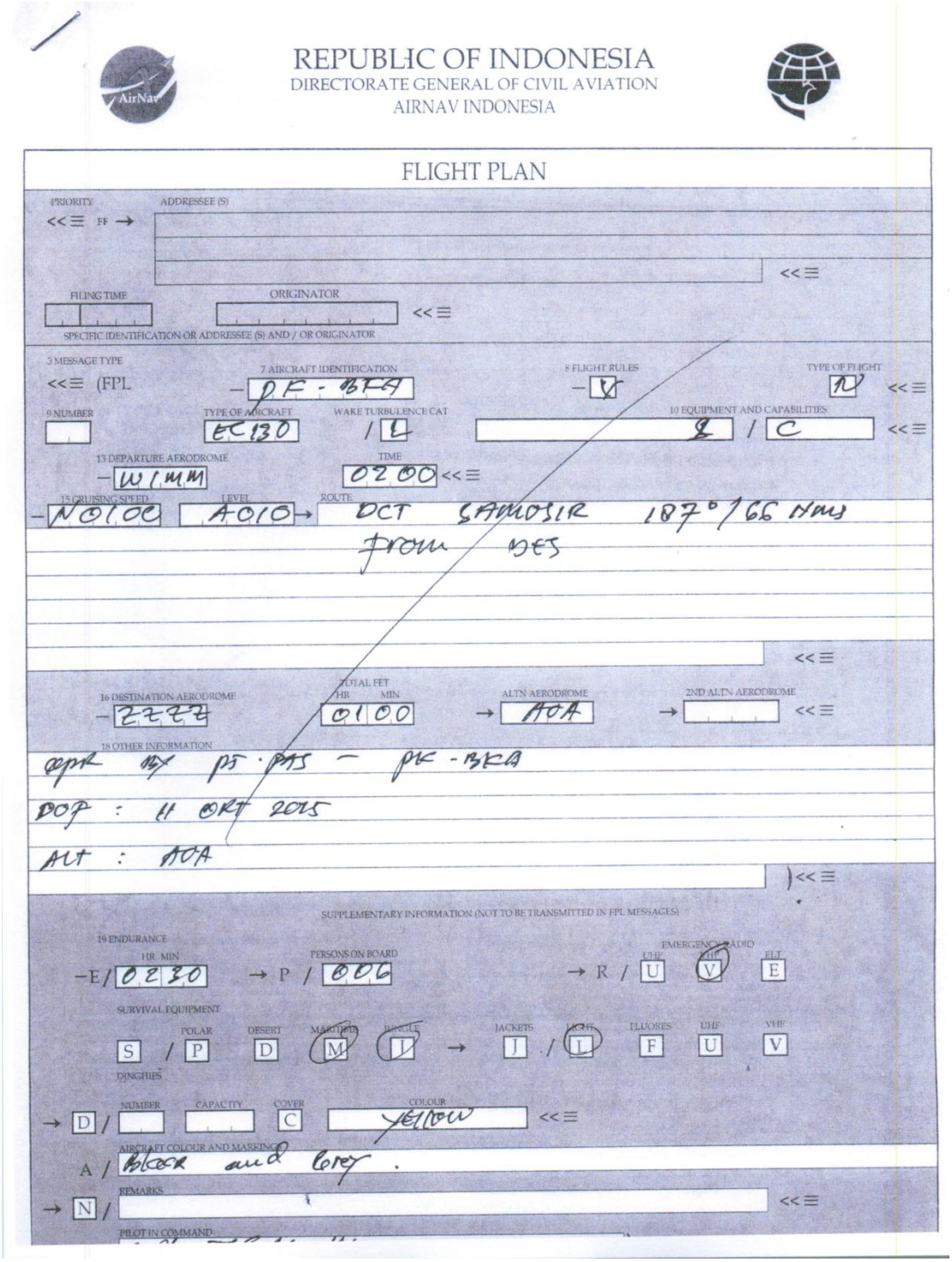
  To consider instrument flight training for search and rescue pilots.

- **04.L-2016-35.1**

  To consider using drone or unmanned aerial vehicle for air search operation.

6 APPENDICES

6.1 Flight plan



REPUBLIC OF INDONESIA
DIRECTORATE GENERAL OF CIVIL AVIATION
AIRNAV INDONESIA

FLIGHT PLAN

PRIORITY: FF
ADDRESSEE (S):
FILING TIME:
ORIGINATOR:
SPECIFIC IDENTIFICATION OR ADDRESSEE (S) AND / OR ORIGINATOR:
3 MESSAGE TYPE: (FPL
7 AIRCRAFT IDENTIFICATION: PF - BKG
8 FLIGHT RULES: V
TYPE OF FLIGHT: N
9 NUMBER:
TYPE OF AIRCRAFT: EC130
WAKE TURBULENCE CAT: L
10 EQUIPMENT AND CAPABILITIES: S / C
13 DEPARTURE AERODROME: WIMM
TIME: 0200
15 CRUISING SPEED: N0100
LEVEL: A010
ROUTE: DCT SAMOSIR 187°/66 NMS from DES
16 DESTINATION AERODROME: ZZZZ
TOTAL EET HR MIN: 0100
ALTN AERODROME: AOA
2ND ALTN AERODROME:
18 OTHER INFORMATION:
OPR BY PT. PAS - PK-BKG
DOF : 11 OKT 2015
ALT : AOA

SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED IN FPL MESSAGES)

19 ENDURANCE HR MIN: E/ 0230
PERSONS ON BOARD: P / 006
EMERGENCY RADIO: R / U V E
SURVIVAL EQUIPMENT: S / P
POLAR: P
DESERT: D
MARITIME: M
JUNGLE: J
JACKETS: J / L
LIGHT:
FLUORES: F
UHF: U
VHF: V
DINGHIES: D /
NUMBER:
CAPACITY:
COVER: C
COLOUR: YELLOW
AIRCRAFT COLOUR AND MARKING: A / BLACK and GREY.
REMARKS: N /
PILOT IN COMMAND:

6.2 Aircraft Operator Corrective Actions

IMPLEMENTATION OF KNKT PRELIMINARY REPORT SAFETY ACTION AND SAFETY RECOMMENDATION

SAFETY ACTION:

1. ***For all operation of flight personnel shall be available at destination as dispatcher,***

   Corrective Action:

   Provided a mobile dispatch:

   a. The dispatcher personnel have to arrive at destination at least one day before operation day.

   b. Personnel will provide with Portable radio ground to air communication.

   c. Except for Helicopter self-dispatch, the HLO shall be available

2. ***To anticipate weather changing on route and destination refer to the information from the information personnel,***

   Corrective Action:

   a. Reduce interval pilot report in operation normal from every 30 minutes to every 15 minutes,(refer to COM PT. PAS)

   b. Personnel (flight follower), frequently update to the pilot the latest weather condition en-route and destination, if any.

   c. Provide the dispatcher/HLO a portable radio to inform the pilot the actual Weather at destination

   d. Base and Remote dispatchers communicate each other with any communication devices, in order to provide the latest information to the pilot.

3. ***Instrument rating training at simulator and aircraft to improve the flight crew to be able to handle marginal weather condition,***

Corrective Action:

a. Now, we are sending Instrument Rated Pilots to get new type rating helicopter that has Full Instrument capability.
b. Recruited at least CPL I/R license holder.

4. ***Improve the High Frequency radio communication coverage,***

Corrective Action:

a. Add the HF Linear Amplifier to the radio unit,(IC-PW1 HF+50 MHz 1Kw HF LINIER AMLIFIER):
    - ✓ Provides clean stable out put
    - ✓ Automatic antenna finder

b. In addition to, provide the dispatcher with portable radio communication when operation at remote area.

5. ***Improve the dispatcher's knowledge and skill.***

Corrective Action:

a. Refreshing course FOO and HLO, special emphasis to Weather, Flight Planning, radio communication and ICAO Flight Plan, and

b. Implemented in On Job Training

SAFETY RECOMMENDATION:

1. ***To ensure the survival kit available on the aircraft suitable to the area of operation and the information provide on the flight plan equivalent to the aircraft condition.***

   Action Has Been Taken:

   a. Retrained the FOO and HLO, how to fill in ICAO / ATC flight plan form according with existing equipment on the aircraft.

   b. Company issued Safety Circular Letter to all operation personnel. Refer to: CASR 91 amendment 4, CASR 135 amendment 9 and Company Operation Manual.

2. ***To ensure the operation of the aircraft under Visual Flight Rules (VFR) conducted under the Visual Meteorological Condition (VMC)***

   Action Has Been Taken:

   a. Noticed to the crew and FOO , when the Weather Instruments Meteorological Condition (IMC):

      - No aircraft/Helicopter to be schedule when certified VFR only.

      - No pilot may release to dispatch unless he/she hold current IFR certificate.

6.3 Aircraft Operator Safety Actions

Langkah langkah yang dilaksakan PT. Penerbangan Angkasa Semesta (PT. PAS) post-accident PKBKA Airbus Helicopter EC 130-B4

1. Untuk meningkatkan dan membudayakan safety di PT. Penerbangan Angkasa Semesta, maka Management PT. PAS melakukan restrukturisasi organisasi PT. PAS dengan menambakan Deputy Director.
2. Telah mengangkat seorang yang berpengalaman di dunia Penerbangan, yang menguasi Safety Mangement System dan regulasi sebagai Deputy Director
3. PT. PAS, melakukan performance evaluation tentang kinerja dan qualifikasi key personal, dan melakukan pergantian.
4. Belajar dari kejadian yang lalu, demi meningkatkan keselamatan terbang, maka PT. PAS, menambah armada Airbus Helicopter EC 145-T2, dengan kemampuan full instrument.
5. Agar comply terhadap CASR 135 amendement 9, Operation over Water, maka PT. PAS melengkapi EC 145-T2 dengan Floating Devise, yang dapat mengapung jika terjadi pendaratan darurat di air.
6. PT. PAS mengirim semua pilot helicopter untuk mengikuti Type rating course EC 145-T2, agar dapat menguasai Helicopter yang berkemapuan Full Instrument.
7. Melakukan sosialisasi “Moutain Flying” kepeda semua Flight Crew di PT. PAS.
8. Melakukan revisi terhadap Manual manual di PT. PAS agar comply terhadap CASR 135 amendment 9, dan CASR 91, amendment 4.
9. Merevisi Training Progam PT. PAS, menjadikan UPSET RECOVERY dan HIGH ALTITUDE STALL sebagai mandatory setiap melelakukan recurrent training.
10. Direksi PT. PAS menekankan kepada seluruh jajaran di PT. PAS agar mengambil keputusan dalam setiap tindakan harus mengutamakan keselamatan (Safety First).

6.3.1 BEA Draft Report Comments

Indeed according to the testimony of the survived passage (paragraph 1.1 page 11: *"Several minutes after, he felt that the helicopter turned to the right and suddenly the weather changed to dense smoke and the visibility decreased significantly. He could not see the lake. He noticed the aircraft altitude was approximately 3,500 feet. He felt the helicopter turned to the left twice. On the second turn the helicopter has impacted to the water."),* the helicopter suddenly impacted the water in a turn configuration without the pilot was aware of the situation. He would have been totally surprised and very probably did not apply the inflation procedure of the flotation device.

Consequently we propose the 2 following modifications:

Page 29 paragraph 2.2:

Delate "*The available aircraft flotation device did not inflate and the water infiltrated the cabin" and replace by "****The helicopter flotation device was probably available but has highly probably not been activated by the pilot because he has been completely surprised by the situation and the water infiltrated the cabin****".*

Page 31 paragraph 3.1:

Delate *"The available aircraft flotation device did not inflate after the impact" and replaced by "****The helicopter flotation device was probably available but has highly probably not been activated by the pilot".***

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