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NATIONAL  
TRANSPORTATION  
SAFETY  
COMMITTEE

Aircraft Accident Investigation Report

PT. Merpati Nusantara Airline  
De Haviland DHC6 Twin Otter; PK-NVC  
Near Ambisil / Okbibab, PAPUA  
Republic of Indonesia

2 August 2009



NATIONAL TRANSPORTATION SAFETY COMMITTEE  
MINISTRY OF TRANSPORTATION  
REPUBLIC OF INDONESIA  
2010



This Final Accident Investigation Report was produced by the National Transportation Safety Committee (NTSC), Karya Building 7<sup>th</sup> Floor Ministry of Transportation, Jalan Medan Merdeka Barat No. 8 JKT 10110, Indonesia.

The report is based upon the investigation carried out by the NTSC in accordance with Annex 13 to the Convention on International Civil Aviation, Aviation Act (UU No.1/2009), and Government Regulation (PP No. 3/2001).

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## **GLOSSARY OF ABBREVIATIONS**

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AD	:	Airworthiness Directive
AFM	:	Airplane Flight Manual
AGL	:	Above Ground Level
ALAR	:	Approach-and-Landing Accident Reduction
AMSL	:	Above Mean Sea Level
AOC	:	Air Operator Certificate
ATC	:	Air Traffic Control
ATPL	:	Air Transport Pilot License
ATS	:	Air Traffic Service
ATSB	:	Australian Transport Safety Bureau
Avsec	:	Aviation Security
BMG	:	Badan Meterologi dan Geofisika
BOM	:	Basic Operation Manual
°C	:	Degrees Celsius
CAMP	:	Continuous Airworthiness Maintenance Program
CASO	:	Civil Aviation Safety Officer
CASR	:	Civil Aviation Safety Regulation
CPL	:	Commercial Pilot License
COM	:	Company Operation Manual
CRM	:	Cockpit Recourses Management
CSN	:	Cycles Since New
CVR	:	Cockpit Voice Recorder
DFDAU	:	Digital Flight Data Acquisition Unit
DGCA	:	Directorate General Civil Aviation
DME	:	Distance Measuring Equipment
EEPROM	:	Electrically Erasable Programmable Read Only Memory
EFIS	:	Electronic Flight Instrument System
EGT	:	Exhaust Gas Temperature
EIS	:	Engine Indicating System
FL	:	Flight Level
F/O	:	First officer or Copilot
FDR	:	Flight Data Recorder
FOQA	:	Flight Operation Quality Assurance
GPWS	:	Ground Proximity Warning System
hPa	:	Hectopascals

Hrs	:	Hours
ICAO	:	International Civil Aviation Organization
IFR	:	Instrument Flight Rules
IIC	:	Investigator in Charge
ILS	:	Instrument Landing System
Kg	:	Kilogram(s)
Km	:	Kilometer(s)
Kt	:	Knots (nm/hours)
Mm	:	Millimeter(s)
MTOW	:	Maximum Take-off Weight
NM	:	Nautical mile(s)
NTSB	:	National Transportation Safety Board (USA)
KNKT/NTSC	:	Komite Nasional Keselamatan Transportasi / National Transportation Safety Committee
PIC	:	Pilot in Command
QFE	:	Height above airport elevation (or runway threshold elevation) based on local station pressure
QNH	:	Altitude above mean sea level based on local station pressure
RESA	:	Runway End Safety Area
RPM	:	Revolution Per Minute
ROV	:	Remotely Operated Vehicle
SCT	:	Scattered
S/N	:	Serial Number
SSCVR	:	Solid State Cockpit Voice Recorder
SSFDR	:	Solid State Flight Data Recorder
TS/RA	:	Thunderstorm and rain
TAF	:	Terminal Aerodrome Forecast
TPL	:	Towed Pinger Locator
TSN	:	Time Since New
TT/TD	:	Ambient Temperature/Dew Point
TTIS	:	Total Time in Service
UTC	:	Universal Time Coordinate
VFR	:	Visual Flight Rules
VMC	:	Visual Meteorological Conditions



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## **INTRODUCTION**

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### **SYNOPSIS**

On the morning of Sunday, 2 August 2009, a de Havilland DHC-6 Twin Otter aircraft, registered PK-NVC, operated by PT. Merpati Nusantara Airlines as flight number MZ-7960D, departed from Sentani Airport, Jayapura for Oksibil Airport. The flight was planned in accordance with the visual flight rules (VFR). There were 15 persons on board; two pilots, one engineer, 10 adult passengers and two infants.

The estimated flight time was 50 minutes. The fuel on board was sufficient for 2 hours and 50 minutes flight time.

About 15 minutes prior to the estimated time of arrival at Oksibil the crew of another aircraft informed the Twin Otter crew that the weather in the Oksibil area was partly cloudy. There were no further reports of radio transmissions from the Twin Otter, and it did not arrive at Oksibil.

A search was initiated at the time the aircraft would have run out of fuel. On the morning of 4 August 2009, searchers located the wreckage of the Twin Otter at an elevation of about 9,300 feet about 6 Nm from Oksibil. The aircraft was destroyed by impact forces, and all of the occupants were fatally injured.

The pilots did not maintain visual flight procedures when flying below lowest safe altitude, and the aircraft was flown into cloud in the vicinity of gap north west of Oksibil.

The accident was consistent with controlled flight into terrain. It was not survivable.

As a result of this investigation, the National Transportation Safety Committee issued recommendations to address safety issues identified in this report, specifically with respect to: maintenance procedures and maintenance inspection programs, to ensure that Emergency Locator Transmitters are serviceable; and the provision of weather information services for all civilian aircraft operations throughout Papua.

The National Transportation Safety Committee also reissued recommendations to address safety issues identified in this report. (Previously issued on 23 December 2009 in relation to the Pilatus PC-6/B2-H4 Turbo Porter aircraft, registered PK-LTJ, that crashed on Mt Gergaji, Papua, on 17 April 2008).



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# 1 FACTUAL INFORMATION

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## 1.1 HISTORY OF THE FLIGHT

On Sunday, 2 August 2009, a de Havilland DHC-6 Twin Otter aircraft, registered PK-NVC, operated by PT. Merpati Nusantara Airlines as flight number MZ-7960D, departed from Sentani Airport, Jayapura Airport<sup>1</sup> to Oksibil. The flight was planned in accordance with the visual flight rules (VFR). There were 15 persons on board; two pilots, one engineer, 10 adult passengers and two infants.

The accident flight was the second flight for the day over the route in PK-NVC for this crew. The first flight departed Sentani at 0650 local time (2150 Coordinated Universal Time (UTC)<sup>2</sup>). The crew returned to Sentani at 0035. Prior to landing at Sentani, the Pilot in Command (PIC) contacted the company via very high frequency (VHF) radio and asked for a quick turn around, because of the weather on the route, and the possibility that cloud might block the gap into Oksibil.

The second flight departed Sentani at 0115, and was scheduled to arrive at Oksibil at 0205. The fuel on board was sufficient for 2 hours and 50 minutes flight time.



**Figure 1: A de Havilland DHC-6 Twin Otter similar to PK-NVC**

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<sup>1</sup> Sentani Airport, Jayapura - Papua, will be called Sentani in this report.

<sup>2</sup> The 24-hour clock in Coordinated Universal Time (UTC) is used in this report to describe the local time as specific events occurred. Local time in the area of the accident, East Indonesia standard Time (Waktu Indonesia Timur (WIT)) is UTC +9 hours.

The crew of the Twin Otter communicated with the crew of an Indonesian Air Force aircraft about the en route weather.<sup>3</sup> There were no other reports of radio transmissions from the Twin Otter, and it did not arrive at Oksibil.

A search was initiated at 0405 on 2 August 2009, the time the aircraft would have run out of fuel. On 4 August 2009, at about 2120, searchers located the wreckage of the Twin Otter at an elevation of about 9,300 feet. The location 04° 42'.25" S, 140° 36'.84" E was approximately 2.8 Nm from District Abmisibil<sup>4</sup>, the nearest district, or about 6 Nm from Oksibil.

The occupants were fatally injured.

## 1.2 INJURIES TO PERSONS

**Table 1: Injuries to persons**

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	2	13	15	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	-	-	-	Not applicable
TOTAL	2	13	15	-

The occupants were Indonesian citizens.

## 1.3 DAMAGE TO AIRCRAFT

The aircraft was destroyed by the impact forces.

## 1.4 OTHER DAMAGE

Trees in the forest were damaged during the impact.

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<sup>3</sup> See paragraph 1.7.

<sup>4</sup> District Abmisibil also known as Okbibab will be called as Abmisibil for the purpose of this flight.

## **1.5 PERSONNEL INFORMATION**

### **1.5.1 Pilot in command**

Gender	: Male
Date of birth	: 4 November 1972
Nationality	: Indonesia
License	: ATPL
Date of issue	: 10 May 2005
Valid to	: 23 December 2009
Aircraft type rating	: DHC 6 Twin Otter
Medical certificate	: First Class
Date of medical	: 1 July 2009
Valid to	: 1 January 2010
Last proficiency check	: 25 April 2009
Route and aerodrome recency	: 15 February 2009 (last Flight)
Total hours	: 8,387 hours 20 minutes
This make and model	: 8,387 hours 20 minutes
Last 90 days	: 181 hours
Last 7 days	: 16 hours 35 minutes
Last 24 hours	: 2 hours 50 minutes
This flight	: 55 minutes

### **1.5.2 Copilot**

Gender	: Male
Date of birth	: 11 December 1971
Nationality	: Indonesia
License	: CPL
Date of issue	: 30 January 1997
Valid to	: 11 November 2009
Aircraft type rating	: DHC 6 Twin Otter
Medical certificate	: First Class
Date of medical	: 11 May 2009
Valid to	: 11 November 2009

Last proficiency check	:	10 May 2009
Route and aerodrome recency	:	5 April 2009 (last flight)
Total hours	:	1,207 hours
This make and model	:	1,207 hours
Last 90 days	:	188 hours 20 minutes
Last 7 days	:	16 hours 35 minutes
Last 24 hours	:	2 hours 50 minutes
This flight	:	55 minutes

## **1.6 AIRCRAFT INFORMATION**

### **1.6.1 Aircraft data**

Aircraft manufacturer	:	De Haviland Canada
Aircraft model/type	:	DHC 6 Twin Otter
Serial number	:	626
Year of manufacture	:	1977
Aircraft registration	:	PK- NVC
Certificate of registration	:	2334
Valid to	:	10 November 2011
Certificate of airworthiness	:	2512
Valid to	:	30 August 2009
Total hours since new	:	27,336 hours 45 minutes

### **1.6.2 Engines**

Engine type	:	Turbo Propeller
Manufacturer	:	Pratt & Whitney Canada
Model	:	PT6A-27

Engine data were not relevant in this occurrence.

The aircraft engines used aviation turbine-engine fuel. There was no evidence of any engine malfunctions that would have required fuel testing as part of the investigation.

The investigation determined that the aircraft had no recorded defects before the accident.

### **1.6.3 Propellers**

Propeller type : Variable Pitch Propeller  
Manufacturer : Hartzell  
Model : HC-B3TN-3DY

Propeller data were not relevant in this occurrence.

### **1.6.4 Weight and Balance (W&B)**

The aircraft was loaded within weight and balance limitations.

## **1.7 METEOROLOGICAL INFORMATION**

The weather in the area of the flight was reported by local villagers to have been mostly clear in the valleys, with cloud on the mountains and slopes.

About 25 minutes before the accident, the Twin Otter crew communicated with the crew of an Indonesian Air Force Hercules aircraft flying from Oksibil to Sentani, and said that they were 100 miles from Jayapura, en-route to Oksibil. The Hercules pilot informed the Twin Otter crew that over Oksibil the cloud base was low, with cloud tops between 6,000 and 7,000 feet. The Hercules pilot also informed them that the cloud tops in the gap area and towards Oksibil were up to 12,500 feet. The Hercules pilot told them that they had to detour via Kiwirok to avoid that cloud when they departed from Oksibil.

There was no meteorological information provided by Jayapura meteorological office<sup>5</sup> covering the area between Jayapura and Oksibil.

## **1.8 AIDS TO NAVIGATION**

There were no ground based navigation aids along the route and at Oksibil, however the aircraft was equipped with a Garmin 165 Global Positioning System receiver installed in the aircraft.

The operator supplied flight crews with the World Aeronautical Chart for the area. The scale of the chart was 1:1,000,000. The investigation was unable to confirm if the crew was using a chart for navigation.

## **1.9 COMMUNICATIONS**

Communications on VHF radio with Jayapura on frequency 119.1 Mhz

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<sup>5</sup> Meteorologi Klimatologi dan Geofisika (BMKG)

on departure from Jayapura until leaving the frequency at point MELAM, which is 100 NM from JPA VOR, were normal. Communications between the Twin Otter and an Indonesian Air Force Hercules aircraft about 35 minutes after departure from Sentani were also normal.

## 1.10 AERODROME INFORMATION

Not relevant to this accident.

## 1.11 FLIGHT RECORDERS

The aircraft was not equipped with flight data recorder (FDR). Indonesian regulations did not require a FDR to be fitted to the Twin Otter aircraft.<sup>6</sup> However, the aircraft was equipped with a Cockpit Voice Recorder (CVR). Indonesian Civil Aviation Regulations required that a serviceable CVR was required to be fitted to the Twin Otter aircraft. Search and Rescue personnel recovered the CVR from the wreckage and handed it over to NTSC investigators. The outer box had minor damage, but the contents were not damaged.



**Figure 2: Cockpit Voice Recorder from Twin Otter PK-NVC**

The 30-minute recording on the cockpit voice recorder contained good quality data.

About 20 minutes before the impact, the pilots were discussing the area they were flying over, and they made comments about the local inhabitants. Fifteen minutes before impact, the PIC said to the copilot “lets

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<sup>6</sup> A Flight Data Recorder was not required to be fitted for aircraft with a Maximum Take-off Weight of less than 5,700 kgs. The Twin Otter had a MTOW of 12,500 pounds (5,669.9 Kgs).



fly direct Oksibil". The copilot confirmed "direct brother?" The PIC replied "direct, the sky is blue over there and the layer of the cloud is 10,000 feet". One minute later the copilot gave a position report to ATC stating:

One two three zero traffic, Merpati nine seven six zero delay, Sentani to Oksibil, position approaching Melam maintain nine thousand five hundred, estimate Abmisibil zero two zero one, arrival zero two zero eight.

This transmission was blocked by other transmissions and there was no evidence on recorded communications that the position report was acknowledged by ATC.

During the 20 minutes before the impact there was no discussion about aircraft problems or navigation difficulties.

However;

10 minutes before impact: The PIC discussed climbing to 10,000 feet and tracking straight ahead. He said that the left side was clear and the right side was cloudy. "If we cannot go visual I will turn left". The PIC described his strategy to the copilot, that if they lost visual contact they would turn to the left and circle and climb above the cloud because the aircraft's performance was good to do that.

Shortly after exchanging his strategy to the copilot, the PIC said that the cloud in front of the aircraft's track was starting to disperse (break up). The copilot responded "blue weather". The PIC replied saying "yap, but just enough to see"... "just go through this part". A few seconds later the PIC added "let's go underneath it brother, because we are just on top, we keep descending underneath, keep..."

This was followed by a comment by the copilot, but the recording was unintelligible. The PIC responded, affirming the statement by the copilot by saying "yes". The PIC then said "look the visual is good".

7 minutes before impact: The PIC said that the flight path was as he had expected, and he saw the gap. This was

agreed by the copilot. However, the PIC asked the copilot to “standby” as he intended to ascertain that if the right of their present track was clear. The copilot immediately responded “right clear”. The PIC then said "visually still good. It is only the edge of the cloud". The copilot immediately replied, that it was clear and the cloud had moved away. This was affirmed by the PIC.

6 minutes before impact      The PIC said to the copilot that he intended to look at the gap “that direction”. He then said "later turn to the left, right?" A few seconds later, the copilot called Jayapura Approach to make a position report. The recording showed that there was no reply from Jayapura Approach so the position report was repeated.

5 minutes before impact      The copilot said to the PIC "through that path brother?" The PIC affirmed the copilot’s question. The CVR revealed that a few seconds after that exchange, somebody in the cockpit mentioned the name of the place as "Abmisibil"

4 minutes and 40 seconds before impact:

The PIC murmured (seemingly to himself) "the gap, the gap, emmm". That was followed by the PIC saying to the copilot that he intended to fly close to the right of the valley in order to make it easier when turning. The copilot commented "disebelah" [alongside]. A few seconds after this, exchange the PIC was humming a tune. The copilot made asked "is that Kiwirok?" The PIC replied to the copilot that it was Kiwirok, clearly visible and free from cloud.

4 minutes before impact      The copilot said to the PIC that he had Ambisibil in sight in front of them. That was confirmed by the PIC when he said "OK, take from that direction.”

Seventeen seconds later, the PIC remarked that Admisibil was below and to the left of

the aircraft, and he said that he intended to fly as close as possible to the wall of the valley. The copilot responded "closer to the right?". The PIC immediately replied "this would make the turning to the left easier". The PIC then added "this is the last gap, will pass through from the right".

2 minutes before impact: the PIC made a statement confirming the altitude "Ten thousand, right".

1 minute 46 seconds before impact:

the PIC said "If we cannot go we turn left".

90 seconds before impact: the co-pilot said "haze, can you see?" The PIC responded "yes".

50 seconds before impact: the co-pilot expressed concern and asked about the PIC's intentions, and the PIC said "climb, to the left".

42 seconds before impact: the co-pilot called "speed, speed", and the PIC responded "standby, standby". The co-pilot immediately reiterated "speed". The PIC said "no, no, no", and the co-pilot asked "is it safe on the left?"

24 seconds before impact: the co-pilot again asked "is it clear on the left?" The PIC responded "yes".

13 seconds before the end of the recording:

engine power was heard increasing to a high power setting. Engine sound was normal, and the power increase was even, with no sound of asymmetric power.

## 1.12 WRECKAGE AND IMPACT INFORMATION



**Figure 3: Wreckage of Twin Otter PK-NVC**

The aircraft struck trees, in a left banking turn, before it impacted the ground. The wings separated from the fuselage as it struck the trees. The aircraft was severely disrupted and fragmented by the impact forces.

## 1.13 MEDICAL AND PATHOLOGICAL INFORMATION

The investigation team requested medical and pathological information, but despite a number of requests it was not provided.

## 1.14 FIRE

There was no pre- or post-impact fire.

## 1.15 SURVIVAL ASPECTS

The aircraft was fitted with an Emergency Locator Transmitter, part number CA98H6DMELT8, Serial Number 3902E, in the empennage. The ELT was designed to emit a signal on radio frequencies 243 Mhz and 121.5 Mhz.

Crews of search aircraft reported that no signals were heard from the aircraft's. The ELT was not damaged in the accident.

During the afternoon of 3 August, local villagers from Abmisibil informed search personnel that they had seen the aircraft fly over them. This assisted the searchers, and the wreckage was located at about 0620 LT on 4 August.

The ELT was found in the wreckage by search personnel, who gave it to the NTSC investigators. The investigation found that the ELT was last serviced/inspected in June 2008. The subsequent inspection was required by June 2009. The ELT was not serviceable.

The accident was not survivable.

## **1.16 TESTS AND RESEARCH**

Not relevant to this accident.

## **1.17 ORGANISATIONAL AND MANAGEMENT INFORMATION**

Aircraft Owner : PT. Merpati Nusantara Airlines  
Aircraft Operator : PT. Merpati Nusantara Airlines  
Jalan Angkasa Blok B 15, Kavling 2-3  
Kemayoran  
Jakarta 172  
Republic Indonesia

Air Operator Certificate Number: AOC/121-002

PT. Merpati Nusantara Airline commenced operating in Papua in 1962 and pioneered airline services within Papua. The airline operates six de Havilland DHC-6 Twin Otter aircraft. Flights within Papua are considered to be special operations, due to the topographical/mountainous terrain and weather conditions.

Prior to serving as a pilot of a Twin Otter with Merpati, a type rating training program, consisting of an aircraft type ground course and flight training (minimum of six sessions), must be completed. There was no Twin Otter simulator training program. After completing the type endorsement flight training, the pilot will undergo line training to all airports served by Merpati; at least 100 hours. Before acting as a Pilot in Command, a pilot should have experience as a copilot on the Twin Otter for at least 1 year. This requirement is also applicable to any pilot transitioning to the Twin Otter from any other aircraft type within the company.

After a Twin Otter copilot has completed the required 1 year of flight experience, that pilot may be considered for promotion to PIC. There is then a requirement to complete at least five sessions of left seat flight training. That is followed by a minimum of 75 hours of line flying training.

A newly qualified Twin Otter PIC will be restricted to several specific routes. Periodically, the PICs ability will be evaluated and additional routes may be added.

A Twin Otter pilot must have flown over a specific route and into all significant airports within the preceding 12 months, or a route and airport qualification check will be required. Within the preceding 12 months, a pilot must have served to all significant airport, otherwise it require a route qualification check. However, there was no requirement to do more than one flight over a particular route.

Oksibil is classified as a significant airport in the Merpati network.

PT. Merpati Nusantara Airlines has established a Safety Management System (SMS), and the SMS manual was approved by the DGCA in February 2008. The SMS includes a system of reporting through text message from a mobile phone. All Merpati employees are encouraged to send reports through the server number.

Airport information for aerodromes such as Oksibil normally are not available in the public NOTAMs<sup>7</sup>. Merpati's safety department publishes internal information related to an airport, based on employee reports and observations. This publication contains any information that may not available in the public NOTAMs.

At the time of issuing the Final Aircraft Accident Investigation Report, PT. Merpati Nusantara Airlines had not provided the investigation with details of any line checks and crew resource management training undertaken by the pilots involved in this accident.

## **1.18 ADDITIONAL INFORMATION**

Not relevant to this accident investigation.

## **1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUE**

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

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<sup>7</sup> Notice to Airmen

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## 2 ANALYSIS

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There were no witnesses to the accident.

The pilots were operating under visual flight rules procedures for the flight from Jayapura Airport to Oksibil. This required them to remain clear of cloud. From the cockpit voice recording and the impact signature, the investigation determined that the aircraft had been flown into cloud while tracking towards the gap. The accident was consistent with controlled flight into terrain while manoeuvring in the vicinity of the gap. The location of the accident was to the north east of the route normally flown through the gap to Oksibil.

About 20 minutes before the accident, the crew of the Twin Otter discussed the weather in the Oksibil area and the gap with the crew of an Indonesian Airforce Hercules aircraft. The Hercules crew also advised them of the most suitable route for their return to Jayapura.

Ten minutes before impact the pilot in command (PIC) mentioned climbing to 10,000 feet, and stated “if we cannot go visual I will turn left”. The cockpit conversations did not exhibit any signs of stress or concern until 2 minutes before the impact, when the copilot mentioned haze and asked the PIC if he could see. Fifty seconds before impact, the copilot expressed further concern and asked about the PIC’s intentions, and the PIC said “climb, to the left”. Forty-two seconds before impact the copilot asked if it was safe on the left.

The copilot became increasingly uncertain about the safety of the flight, specifically mentioning visibility and speed. From the recorded sounds, it is apparent that 13 seconds before impact, engine power was increased symmetrically to a high power setting. From the pilots’ comments and the wreckage trail, the investigation determined that the aircraft was banking left at the time of impact.

The investigation was unable to determine if the aircraft reached 10,000 feet. The impact was at 9,300 feet.

The Cockpit Voice Recorder information indicated that there was cloud in the area of the gap and that marginal visual meteorological conditions for flight may have existed. It is likely that the gap itself was obscured by cloud.

There was no meteorological information provided by Jayapura meteorological office (Meteorologi Klimatologi dan Geofisika (BMKG)) covering the area between Jayapura and Oksibil.

The investigation determined that the pilots did not conduct the flight in accordance with the visual flight rules, and flew the aircraft into cloud in the vicinity of the gap north west of Oksibil.

The fitment of a serviceable CVR provided the investigators with vital information about the flight and the operation of the aircraft that greatly assisted the investigators determining the factors that contributed to this accident.



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## **3 CONCLUSIONS**

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### **3.1 FINDINGS**

1. The aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures.
2. The aircraft was certified as being airworthy when dispatched for the flight.
3. There was no evidence of any defect or malfunction in the aircraft that could have contributed to the accident.
4. The Emergency Locator Transmitter did not emit a signal. It was not serviceable. It was last serviced/inspected in June 2008. The subsequent inspection was required by June 2009.
5. The aircraft was loaded within the prescribed weight and balance limitations.
6. The pilots were licensed and qualified for the flight in accordance with existing regulations.
7. There was cloud along the mountain range necessitating tracking via a gap to the north west of Oksibil.
8. There was no meteorological information provided by Jayapura meteorological office (Meteorologi Klimatologi dan Geofisika (BMKG)) covering the area between Jayapura and Oksibil.
9. The Cockpit Voice Recorder information indicated that there was cloud in the area of the gap and that marginal visual meteorological conditions for flight may have existed. It is likely that the gap itself was obscured by cloud.
10. The location of the accident was to the north east of the route normally flown to the gap.
11. The impact was consistent with controlled flight into terrain.

### **3.2 CAUSES**

The pilots did not maintain visual flight procedures when flying below lowest safe altitude, and the aircraft was flown into cloud in the vicinity of gap north west of Oksibil.

The accident was consistent with controlled flight into terrain.

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## **4 SAFETY ACTIONS AND RECOMMENDATIONS**

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### **4.1 SAFETY ACTIONS**

At the time of issuing this Final Accident Investigation Report, the National Transportation Safety Committee had not been informed of any safety actions resulting from this accident.

### **4.2 RECOMMENDATIONS**

*As a result of this investigation, the National Transportation Safety Committee re-issues the following recommendations to address safety issues identified in this report. (Previously issued on 23 December 2009 in relation to the Pilatus PC-6/B2-H4 Turbo Porter aircraft, registered PK-LTJ, that crashed on Mt Gergaji, Papua, on 17 April 2008).*

#### **4.2.1 Recommendation to Directorate General of Civil Aviation (DGCA)**

The National Transportation Safety Committee recommends that the Directorate General of Civil Aviation review the training and checking requirements for pilots operating in remote and mountainous regions such as Papua.

- Particular attention should be given to visual flight operations in mountainous and unpredictable weather conditions. This should include intensive route and aerodrome familiarization in locations, and over routes, where aids such as EGPWS<sup>8</sup>, TAWS<sup>9</sup>, GPS<sup>10</sup>, and Radio Altimeter<sup>11</sup> are not effective, are not practical, or are not available.

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The following definitions were taken from The Cambridge Aerospace Dictionary.

<sup>8</sup> EGPWS – Enhanced ground proximity warning system. Provides predictive terrain-hazard warnings. Uses aircraft flight data to calculate envelope along projected flight path and compare this with internal terrain data base. Potential conflict gives aural warning and also displays terrain map showing clearance ahead.

<sup>9</sup> TAWS – Terrain awareness and warning system. Provides predictive terrain-hazard warnings. See EGPWS.

<sup>10</sup> GPS – Global positioning system. Worldwide system in which users derive their location by interrogating four satellites from a total net of 24.

<sup>11</sup> Radio altimeter – Instrument giving a readout of height above ground level by time varying frequency and measuring the difference in frequency of received waves, this being proportional to time and hence to height.



**Figure 4: Typical of lightly clouded mountain valleys in Papua**



**Figure 5: Short, high altitude airstrip in cloud filled mountain valley**



**Figure 6: Typical high altitude, valley system with steep sloping airstrip**



**Figure 7: Typical jungle airstrip wedged in between mountains**

#### **4.2.2 Recommendation to Directorate General of Civil Aviation (DGCA)**

The National Transportation Safety Committee recommends that the Directorate General of Civil Aviation issue an urgent notice to airmen (NOTAM) to remind pilots that flight below lowest safe altitude, in particular in mountainous regions, must be conducted in accordance with the visual flight rules (VFR).

#### **4.2.3 New Recommendation with this report issued to PT. Merpati Nusantara Airline**

The National Transportation Safety Committee recommends that PT. Merpati Nusantara Airline review its maintenance procedures and maintenance inspection programs, to ensure that Emergency Locator Transmitters are serviceable.

#### **4.2.4 New Recommendation with this report issued to the Directorate General of Civil Aviation (DGCA)**

The National Transportation Safety Committee recommends that the Directorate General of Civil Aviation liaise with the Meteorologi Klimatologi dan Geofisika (BMKG) to establish an aviation weather information service for all areas covered by civilian aircraft operators.

- This service could be enhanced by a network of government and mission out stations providing scheduled weather reports that the (Meteorologi Klimatologi dan Geofisika (BMKG)) could promulgate to aircraft operators through the briefing offices and air traffic services.

- This service could be further enhanced by the same network of government and mission out stations providing updated weather reports when there is a significant change of weather between scheduled reports.