



**FINAL REPORT**

**AIC 11-1008**

**Manalos Aviation Ltd**

**P2-RUH**

**Eurocopter Canada Bo 105LS A3**

**7.5 km south west of Timini, Morobe Province**

**PAPUA NEW GUINEA**

**8 August 2011**

The Papua New Guinea Accident Investigation Commission (AIC) was informed of the accident by the Civil Aviation Authority of PNG on 13 February 2011, and commenced an on-site investigation.

This Report, made publicly available on 3 August 2015 was produced by the AIC, PO Box 1709, Boroko 111, Papua New Guinea.

The report is based upon the investigation carried out by the AIC, in accordance with Annex 13 to the Convention on International Civil Aviation, Papua New Guinea (PNG) Act, and Civil Aviation Rules. New Guinea (PNG) Civil Aviation Act 2000 (As Amended), Civil Aviation Rules, and the Commissions of Inquiry Act 1951. It contains factual information, analysis of that information, findings and safety action taken to address identified deficiencies.

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**Nemo Yalo**  
**Chief Commissioner**  
**Accident Investigation Commission**

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# INTRODUCTION

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## SYNOPSIS

The Eurocopter-Canada Bo 105LS A3 helicopter, registered P2-RUH was being operated on a charter flight in support of mining operations around the Hidden Valley area of Papua New Guinea, PNG, about 90 km south west of Lae.

The pilot was unable to land at Hidden Valley due to low cloud and poor visibility and so diverted to Bulolo. About 90 minutes later he reported that he had departed Bulolo for Lae, tracking via Timimi, cruising not above 2,000 ft.

The last transmission from the helicopter heard by Air Traffic Services, was the pilot's Bulolo departure report. Wreckage of the helicopter was subsequently located about 7.5 km south west of Timini. The impact of the crash was not survivable.

There was significant low cloud and rain along the track flown. Witnesses along the flight route confirmed hearing a helicopter flying overhead, but they were unable to see the helicopter because of fog and mist on the ridges and in the valleys, and areas of rain. It is likely that in-flight visibility was marginal for visual flight.

The Papua New Guinea Accident Investigation Commission (AIC) conducted an investigation into this accident. The investigation found that the helicopter's attitude and speed, as indicated by the on-board satellite tracking device, showed the helicopter in a slight left bank angle and in excess of 100 kt, just prior to the impact.

It is possible that due to low cloud, rain, and reduced visibility, the pilot may have become disoriented, with no visual horizon for reference, and lost control of the helicopter at a height that was too low to effect recovery. It is likely that the pilot attempted to continue visual flight in marginal visual conditions or instrument meteorological conditions.

While not considered to be a contributing factor in this accident, the AIC found that the Civil Aviation Safety Authority of PNG (CASA) safety oversight of the operator's maintenance procedures did not detect that the operator's facilities in Rabaul and Lae were not CASA approved Part 145 facilities.

With this report, the AIC issued a recommendation to the CASA that it should conduct an audit of the Manalos Aviation maintenance program to ensure it meets its obligations under CASR Parts 119, 135, and 145.

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# 1 FACTUAL INFORMATION

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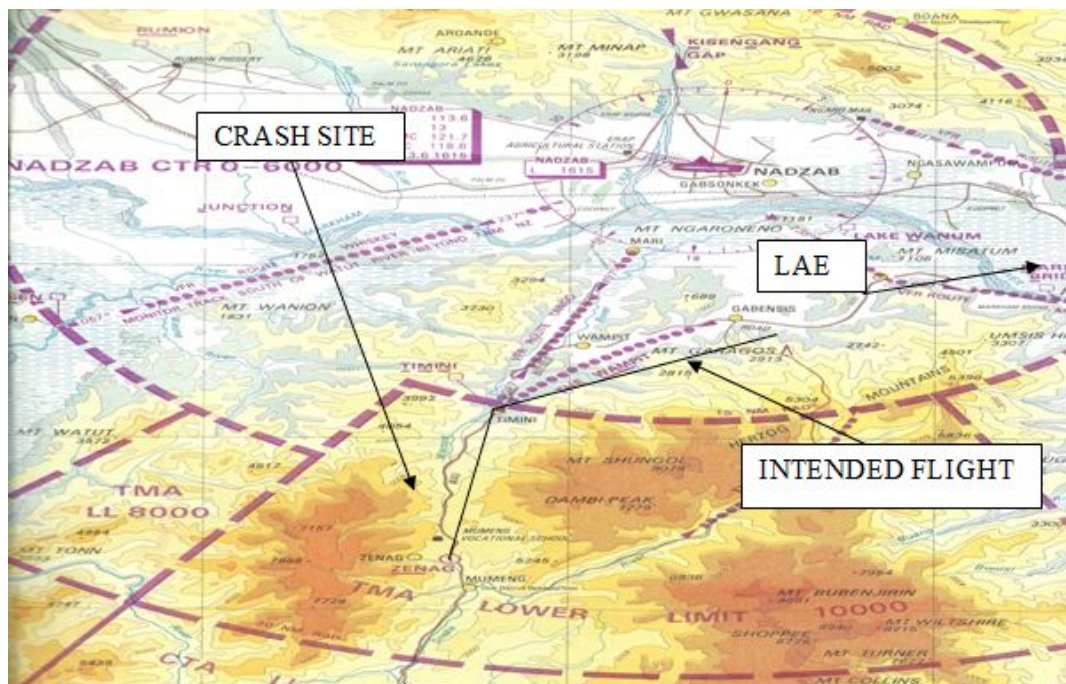
## 1.1 History of the flight

On 8 August 2011, a Eurocopter-Canada Bo 105LS A3 helicopter, registered P2-RUH was being operated on a charter flight in support of mining operations around the Hidden Valley area of Papua New Guinea, PNG

The helicopter departed Nadzab at 2218 UTC<sup>1</sup> (08:18 local time) with 3 passengers on board (POB), bound for Hidden Valley (about 90 km south west of Lae). The pilot reported tracking via the Timini<sup>2</sup> reporting point, not above 7,000ft (VFR<sup>3</sup>), estimating Hidden Valley at 2243. The pilot reported being unable to land at Hidden Valley, due to low cloud and poor visibility, and subsequently revised his destination to Bulolo (43 km south of Lae), estimating Bulolo at 2248.

At 2255 the pilot reported his arrival at Bulolo to Nadzab Flight Service<sup>4</sup>, and cancelled “SAR” (Search and Rescue).

The helicopter remained on the ground at Bulolo, and while there the pilot contacted a friend to advise that he would be departing Bulolo and returning to Lae, and not Nadzab as indicated on the flight plan. The pilot reported departure at 0020, tracking via Timini, estimating Lae at 0050, cruising not above 2,000 ft.



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1 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, Papua New Guinea Time (Pacific/Port Moresby Time) is UTC + 10 hours.

2 Timini is a reporting point located on the Nadzab Air Traffic Control zone boundary west of Lae.

3 VHF: Very High Frequency

4 Nadzab Flight Service provided flight information services to en-route aircraft.

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## Figure 1: Map showing the intended track

The pilot did not report at Timini, and the helicopter did not arrive at Lae. No MAYDAY<sup>5</sup> transmission was reported by ATS<sup>6</sup> or other aircrew.

At 0152 a DISTRESFA<sup>7</sup> was declared, indicating the degree of apprehension held for the safety of the aircraft and its occupants.

The aircraft was equipped with an emergency locator beacon (ELB), but it did not activate on impact.

Another aircraft operating in the area subsequently located smoke rising from a steep, densely-timbered mountain side, about 7.5 km south west of Timini, which was later identified as the accident site.



## Figure 2: P2-RUH accident site

The wreckage was spread through jungle vegetation with some components 80 m from the main wreckage. The occupants had not survived the impact.

The operator had equipped the aircraft with an independent tracking device that sent satellite signals at about three-minute intervals, or when there was an aircraft heading change. A review of the information obtained by the satellite tracking service provider, revealed that the helicopter had been tracking in a north-westerly direction towards Timini, at 4,300 ft. The recorded airspeed was 110 kt. From the recorded data, the investigation determined that the accident occurred at about 0033.

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5 MAYDAY: International call for urgent assistance, from French “m’aidez!

6 ATS: Air Traffic Services, which included the Nadzab Flight Service.

7 DISTRESFA: Distress phase of a search/and rescue operation

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## 1.2 Injuries to persons

**Table 1: Injuries to persons**

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	1	2	3	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	-	-	-	Not applicable
<b>TOTAL</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>-</b>

The pilot was an Australian citizen. The two passengers were citizens of Papua New Guinea.

The recovery of the fatally injured occupants was not able to be carried out until two days after the accident due to the prevailing weather conditions.

## 1.3 Damage to aircraft

The helicopter was destroyed by the impact forces and a post-impact fire,



**Figure 3: Part of the burnt Fuselage and tail boom**



**Figure 4: Damaged tail boom**

## **1.4 Other damage**

The only other damage was to trees.

## **1.5 Personnel information**

### **1.5.1 Pilot in Command**

Age	: 73 years
Gender	: Male
Type of licence	: Commercial (Helicopter)
Valid to	: Perpetual based on medical validity.
Rating	: Bo 105 (and various other helicopters)
Total flying time	: 17,500 hours
Total on this type	: 40 hours
Medical class	: One
Valid to	: 10 September 2011
Medical limitation	: Nil

The pilot was qualified to fly various single- and multi-engine helicopter types. These included the HU50; AS315; AS350; BH206; & BH212. He had flown helicopters for many years throughout Papua New Guinea, including the highlands region, accumulating approximately 17,500 hours of flight time. He had recently been trained by an overseas operator, to fly the Bo 105 helicopter type. At the time of the accident he had accumulated approximately 40 hours of total flight time on Bo 105 type.

The AIC was informed that “some decades” prior to the accident, the pilot had been treated for a minor heart condition. However, his peers reported that he was very active and fit for his age.

## 1.6 Aircraft information

### 1.6.1 Aircraft Data

Aircraft manufacturer	: Eurocopter-Canada
Model	: Bo 105LS A3
Serial number	: 2050
Date of manufacture	: 1994
Nationality and registration mark	: Papua New Guinea. P2-RUH
Name of the owner	: Manalos Aviation Ltd
Name of the operator	: Manalos Aviation Ltd
Certificate of Airworthiness issued	: 19 May 2008
Valid to	: Non terminating
Certificate of Registration issued	: 14 May 2008
Valid to	: Non terminating
Total Hours Since New	: 4,432.2 hours
Cycles since new	: 6,724 cycles

### 1.6.2 Engine Data

Engine Type	: Turbo-shaft
Manufacturer	: Rolls Royce
Type	: A250-C28C
<i>Engine number one (Left)</i>	
Serial Number	: CAE 280128
Total Time Since New	: 4,414.2 hours

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Total Time Since Overhaul	: 634.8 hours (at 24 July 2011)
Cycles since new	: 3,636 cycles
<i>Engine number two (Right)</i>	
Serial Number	: CAE 280130
Total Time Since New	: 4,406.2 hours
Total Time Since Overhaul	: 1,522.2 hours
Cycles since new	: 3,527 cycles (at 6 August 2011)

## 1.7 Meteorological information

The general weather (to the west and south west of Lae, at the time of the accident, was reported to be overcast with low cloud around the ridges and mountains, with a light south-easterly wind prevailing. Associated with the significant cloud development were rain and rain showers, with visibility reduced to zero in precipitation. These conditions were reported to be widespread throughout the area, including the Bulolo, Timini, Lae tracks.

The Nadzab Air traffic Control Tower recorded the Nadzab Airport weather conditions at 0942 as:

Wind	light easterly
QNH	1013
Cloud	fog 1,000 ft, scattered cumulus 3,000 ft, overcast above
Visibility	CAVOK <sup>8</sup>

The area forecast at the time of the accident, issued by the Bureau of Meteorology, indicated that the general area around the Hidden Valley mine site was being adversely affected by significant low cloud and rain showers, making it very difficult for VFR flight. Witnesses at another company situated along the flight route, confirmed hearing a helicopter flying overhead its site, but they were unable to see it because of fog and mist on the ridges and in the valleys, and areas of rain.

## 1.8 Aids to navigation

The aircraft was fitted with a Garmin GPS-695 Global Positioning System (GPS) unit for satellite navigation. The serviceability of the GPS could not be determined.

Ground-based navigation aids and their serviceability were not a factor in this occurrence.

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<sup>8</sup> CAVOK: Ceiling and visibility OK (for VFR), or better than predicted.

## **1.9 Communications**

The helicopter was fitted with the following communication equipment:

- Two Very High Frequency (VHF) transceivers
- One High Frequency (HF) transceiver
- One Emergency Locator Transmitter (ELT)

There was no evidence that the pilot was having difficulty communicating with Nadzab Flight Service, or other aircraft during the time leading up to the accident.

The Emergency Locator Transmitter (ELT) did not activate.

## **1.10 Aerodrome information**

Aerodrome information was not relevant to this investigation.

## **1.11 Flight recorders**

The aircraft was not fitted with a flight data recorder or cockpit voice recorder. Neither recorder was required by Papua New Guinea Civil Aviation Rules current at the time of the accident.

## **1.12 Wreckage and Impact Information**

### **1.12.1 General Description of the Wreckage**

The accident was a high velocity event in adverse weather conditions. The impact forces were such that the helicopter was totally destroyed by the impact with trees and the steep terrain. A post-impact fire further damaged sections of the fuselage. Aircraft wreckage was dispersed through thick jungle vegetation, with some components up to 80 metres from the main wreckage.



**Figure 5: Both engines**



**Figure 6: Part of a main rotor blade**



**Figure 7: Shows destruction to panels and cowls**



**Figure 8: Tail rotor components**

The AIC investigators retrieved the GPS and part of the instrument panel containing instrument gauges, including the airspeed indicator (ASI), Engine torque (TQ) and the helicopter main-rotor RPM (Nr). They were sent to Australian Transport Safety Bureau (ATSB) in Canberra for further investigation, testing, and analysis.

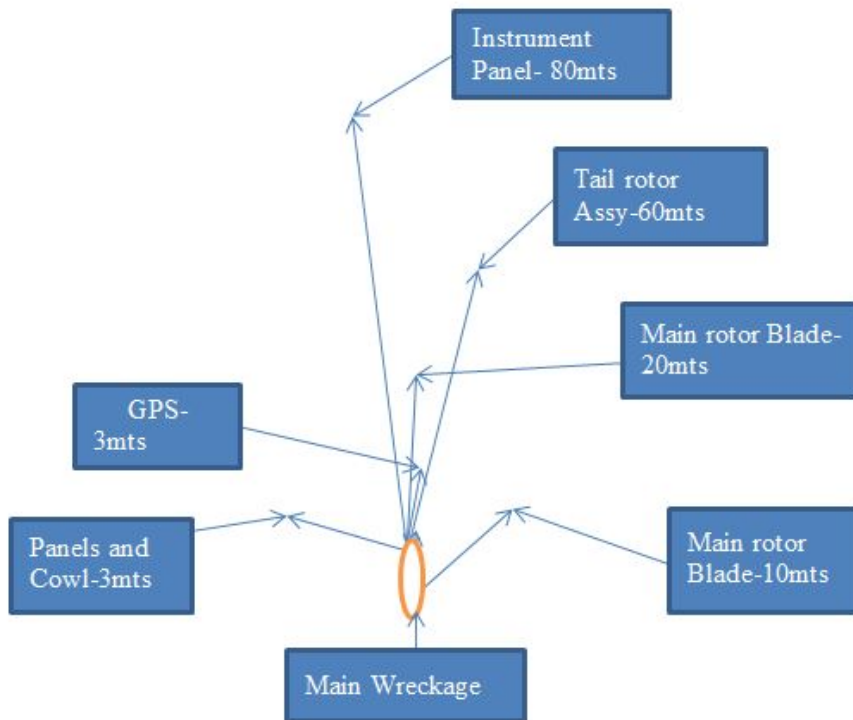
The accident occurred on steep, mountainous, heavily-timbered terrain, with dense vegetation, at approximately 4,200ft above mean sea level (AMSL). The trajectory of the descent through tall mature trees was at an angle of approximately 20 to 25 degrees.





**Figure 9: A main rotor blade**

The final impact was into soft muddy ground on the mountain side. The airspeed indicator needle showed an impact speed in excess of 100 kt.



**Figure 10: Wreckage sketch**

Both engines remained attached to the airframe. Power-train components, including the main rotor gear-box were partially burnt during the post-impact fire.

## 1.13 Medical and Pathological Information

No medical or pathological or Toxicological investigations were able to be conducted as a result of this occurrence.

## 1.14 Fire

The helicopter sustained post-impact fire damage, from the fuselage mid-section to the cockpit and cabin area.



**Figure 11: The burnt engine area of the fuselage**

## 1.15 Survival Aspects

The accident was not survivable

## 1.16 Tests and Research

The AIC requested the ATSB to assist in recovering/retrieving data from the GPS. Data could not be recovered from the GPS because the memory integrated circuit was substantially damaged. The results of the examination of the recovered instruments (see 1.12.1) were inconclusive.

No other tests or research were required to be conducted as a result of this occurrence.

## 1.17 ORGANISATIONAL AND MANAGEMENT INFORMATION

Owner/Operator: Manalos Aviation  
P.O.Box 80  
Rabaul,  
East New Britain Province

The operator, Manalos Aviation, had a Civil Aviation Safety Authority of PNG (CASA) approved Air Operator's Certificate (AOC). It had a full complement of relevant senior staff, having operated since 2008. The Company's Head Office was in Rabaul, PNG, with another base operating out of Lae, Morobe Province, PNG.

Manalos Aviation held a Maintenance Organisation Certificate (MOC) approval Part 145 from CASA-PNG. The maintenance was contracted to a third party contractor whose base was in Cairns, Australia. The operator's facilities in Rabaul and Lae were not PNG CASA approved Part 145 facilities

The maintenance documents (engine log books, airframe/aircraft log books, AD's, Mod's and Special Inspections) for RUH covering the six months prior to the accident were examined in relation to scheduled and unscheduled maintenance. The records did not reveal anything of significance that could have contributed to this accident.

However a comment by the pilot to his long term partner indicated that he saw equipment and components laying around the work place with no proper identification tags'. The partner indicated that the pilot had concerns in regard to the safety culture of the company.

## **1.18 Additional Information**

The helicopter's attitude as indicated by the on-board satellite tracking device, showed the helicopter in a slight left bank angle and in excess of 100 kt, just prior to the impact.

There was no other factual information that was relevant to the circumstances leading up to the occurrence.

## **1.19 Useful or Effective Investigation Techniques**

The investigation was conducted in accordance with Papua New Guinea Legislation and Civil Aviation Regulations, and the PNG Accident Investigation Commission's approved policies and procedures, and in accordance with the Standards and Recommended practices of Annex 13 to the Chicago Convention.

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## 2 ANALYSIS

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The Eurocopter-Canada Bo 105LS A3 helicopter, registered P2-RUH was being operated on a charter flight in support of mining operations around the Hidden Valley area of Papua New Guinea, PNG

The pilot was unable to land at Hidden Valley due to low cloud and poor visibility and so diverted to Bulolo. About 90 minutes later he reported that he had departed Bulolo for Lae, tracking via Timimi, cruising not above 2,000 ft.

The last transmission from the helicopter heard by Air Traffic Services, was the pilot's Bulolo departure report. Wreckage of the helicopter was subsequently located about 7.5 km south west of Timini. The impact of the crash was not survivable.

There was significant low cloud and rain along the track flown. Witnesses along the flight route confirmed hearing a helicopter flying overhead, but they were unable to see the helicopter because of fog and mist on the ridges and in the valleys, and areas of rain. It is likely that in-flight visibility was marginal for visual flight.

The Papua New Guinea Accident Investigation Commission (AIC) conducted an investigation into this accident. The investigation found that the helicopter's attitude and speed, as indicated by the on-board satellite tracking device, showed the helicopter in a slight left bank angle and in excess of 100 kt, just prior to the impact.

It is likely that due to low cloud, rain, and reduced visibility, the pilot may have become disoriented, with no visual horizon for reference, and lost control of the helicopter at a height that was too low to effect recovery. It is likely that the pilot attempted to continue visual flight in marginal visual conditions or instrument meteorological conditions.

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## **3 CONCLUSIONS**

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### **3.1 FINDINGS**

#### **3.1.1 Aircraft**

1. The helicopter was certified, equipped and maintained in accordance with existing regulations and approved Civil Aviation Safety Authority of PNG procedures.
2. The helicopter was certified as being airworthy when dispatched for the flight.
3. There was no evidence of any defect or malfunction in the helicopter that could have contributed to the accident.
4. There was no evidence of airframe failure or airframe system malfunction prior to the accident.
5. The helicopter was structurally intact prior to impact.
6. All control surfaces were accounted for, and all damage to the helicopter was attributable to the severe impact forces.
7. The helicopter was destroyed by impact forces and a post-impact fire.
8. The destruction of the helicopter by impact and fire precluded determination of meaningful findings from the examination of the Global Positioning System (GPS) unit and other instrument.
9. The helicopter was in a slight left bank angle with power, just prior to the impact.
10. The accident occurred at about 1033.

#### **3.1.2 Pilot**

1. The pilot was licensed and qualified for the flight in accordance with existing Papua New Guinea regulations.
2. The pilot's peers reported that he was very active and fit for his age

#### **3.1.3 Flight operations**

1. The pilot carried out normal radio communications with the relevant ATC units.
2. The pilot attempted to continue visual flight in marginal visual conditions, or instrument meteorological conditions.
3. The pilot may have become disoriented, lost situational awareness, and lost control of the helicopter at a height that was insufficient to effect recovery.

### **3.1.4 Operator**

1. The operator had an approved Air Operator's Certificate (AOC).
2. The operator's helicopter maintenance was carried out by an overseas third-party contractor with its base in Cairns, Australia.
3. The operator's facilities in Rabaul and Lae were not Civil Aviation safety Authority of PNG (CASA) approved Part 145 facilities.

### **3.1.5 Air Traffic Services**

1. Nadzab Flight Service Unit received the pilot's Bulolo departure transmission.
2. No MAYDAY transmission was reported by ATS or other flight crew.
3. A DISTRESFA Search and Rescue Phase was declared at 1152.

### **3.1.6 Flight recorders**

1. The helicopter was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR); neither was required by Papua New Guinea Civil Aviation Rules current at the time of the accident.

### **3.1.7 Medical**

1. There was no evidence that incapacitation or physiological factors affected the pilot's performance.
2. There was no evidence that the pilot suffered any sudden illness or incapacity which might have affected his/her ability to control the aircraft.
3. No medical or pathological or Toxicological investigations were able to be conducted as a result of this occurrence.

### **3.1.8 Survivability**

The accident was not survivable due to the impact forces and post-impact fire.

### **3.1.9 Safety oversight**

1. The Civil Aviation Safety Authority's safety oversight of the operator's maintenance procedures did not detect that the operator's facilities in Rabaul and Lae were not Civil Aviation safety Authority of PNG (CASA) approved Part 145 facilities.

## **3.2 Contributing factors**

The reason the aircraft impacted terrain could not be determined. However, it is likely that the pilot continued flight into marginal visual, or instrument flight conditions. The pilot may have become disoriented, lost situational awareness, and lost control of the helicopter at a height that was insufficient to effect recovery.

### **3.3 Other factors**

The following concern was identified during the course of the investigation. While not causal to the accident, it is addressed with the aim of safety improvement.

The Civil Aviation Safety Authority of PNG (CASA) safety oversight of the operator's maintenance procedures did not detect that the operator's facilities in Rabaul and Lae were not CASA approved Part 145 facilities.

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## **4 SAFETY ACTIONS AND RECOMMENDATIONS**

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### **4.1 Recommendations**

As a result of the investigation into the accident involving Eurocopter-Canada Bo 105LS A3 helicopter, registered P2-RUH, on 8 August 2011, about 7.5 km south west of Timini, the Papua New Guinea Accident Investigation Commission issues the following recommendation to address safety concerns identified in this report.

The Civil Aviation Safety Authority of PNG (CASA) safety oversight of the operator's maintenance procedures did not detect that the operator's facilities in Rabaul and Lae were not CASA approved Part-145 facilities. The last CASA audit was conducted in 2008.

#### **4.1.1 Recommendation number AIC 15-R09/11-1008 to the Civil Aviation Safety Authority of PNG.**

The Accident Investigation Commission recommends that the Civil Aviation Safety Authority of PNG (CASA) conduct an audit of the Manalos Aviation maintenance program to ensure it meets its obligations under CASR Parts 119, 135, and 145.