



FINAL REPORT

AIC 11-1006

**PAPUA NEW GUINEA
ACCIDENT INVESTIGATION COMMISSION
SHORT SUMMARY REPORT**

Manalos Aviation Ltd

P2-LAE

Eurocopter BO-105B2

Uncontained Engine Failure and Collision with Terrain

Kuranda Village, Southern Highlands Province

PAPUA NEW GUINEA

7 July 2011

About the AIC

The Accident Investigation Commission (AIC) is an independent statutory agency within Papua New Guinea (PNG). The AIC is governed by a Commission and is entirely separate from the judiciary, transport regulators, policy makers and service providers. The AIC's function is to improve safety and public confidence in the aviation mode of transport through excellence in: independent investigation of aviation accidents and other safety occurrences within the aviation system; safety data recording and analysis; and fostering safety awareness, knowledge and action.

The AIC is responsible for investigating accidents and other transport safety matters involving civil aviation, in PNG, as well as participating in overseas investigations involving PNG registered aircraft. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The AIC performs its functions in accordance with the provisions of the PNG Civil Aviation Act 2000 (As Amended), Civil Aviation Rules 2004 (as amended), and the Commissions of Inquiry Act 1951 (as amended), and in accordance with Annex 13 to the Convention on International Civil Aviation.

The object of a safety investigation is to identify and reduce safety-related risk. AIC investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the AIC to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the AIC endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why it happened, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.

Uncontained Engine Failure and Collision with terrain involving a Eurocopter BO105, P2-LAE

Occurrence details

On July 2011, a Eurocopter BO-105 helicopter, registered P2- LAE, operated by Manalos Aviation Ltd, departed Kuranda village about 10nm North of Tari for Kopiago airstrip in the Southern Highlands Province of Papua New Guinea. There were three persons on board; one pilot and two passengers.

Due to low cloud to the South East of Kuranda village, the pilot commenced a cruise climb configuration, travelling in a south-easterly direction. About 1 km from the village, the pilot felt and heard a ‘thud’ through the airframe. That was accompanied by yawing of the helicopter left and right, over-riding the anti-torque pedal pressure input by the pilot. Shortly afterwards a low RPM warning horn sounded, and the pilot recognized that the helicopter’s engine had failed.

The pilot reported pulling torque to maintain height, while avoiding over torque and blade stall. The helicopter continued to descend. Due to the terrain, an immediate successful landing was impossible so the pilot decided to return to Kuranda village. While turning back he observed black smoke coming from the engine. The *Low RPM* warning horn was constantly sounding.

It became apparent to the pilot that he could not reach the village clearing so he opted for a small area at the bottom of a gully. The helicopter was descending in a semi-controlled auto rotation with rotor speed decaying. When the helicopter was about 40 ft above the ground it flipped inverted, impacted the ground, and slid down an embankment into trees. The helicopter was engulfed in flames, but the pilot and the two passengers were able to escape with minor injuries.

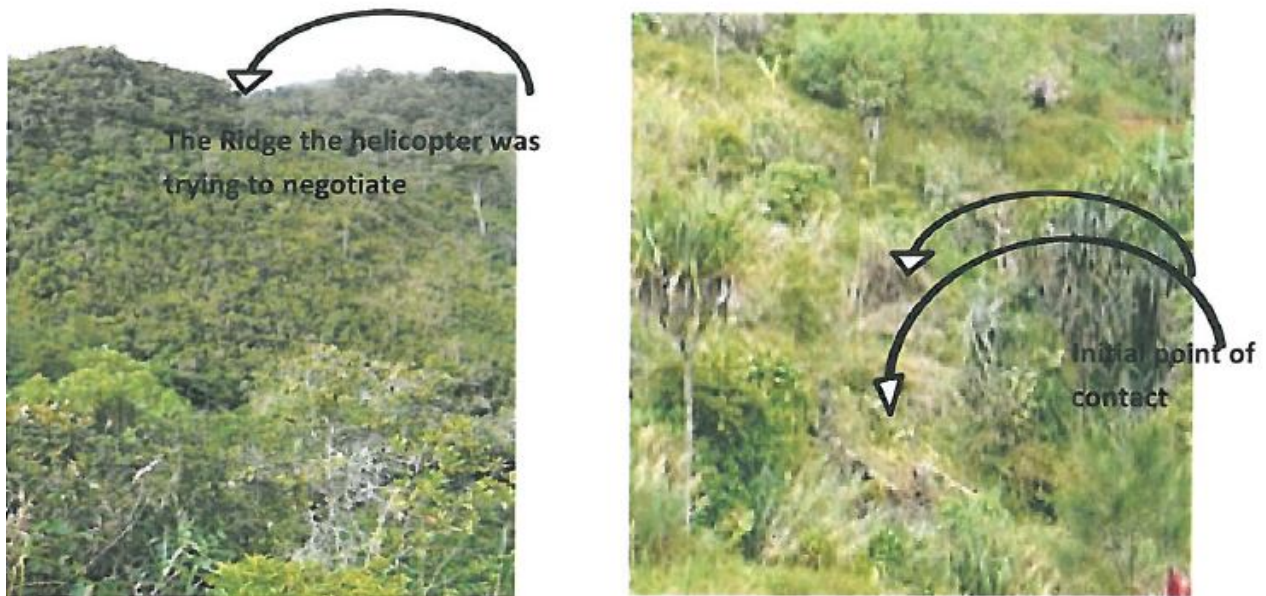


Figure 1: Impact location

The investigation found that the impact marks left by the main rotor indicated that rotor speed was very low, and possible rotor stall may have caused the sudden roll inverted. Local villagers recalled hearing the engine ‘crying’ (still operating) followed by an explosion, evidence of the number-2 engine, self-destructing. An on-board fire extinguisher was used with the help of the local villagers in an unsuccessful attempt to extinguish the fire.

The intense post-impact fuel-fed fire destroyed the helicopter.



Figure 2: Cockpit and engine destroyed by the fire

The helicopter was being operated within the prescribed weight and balance limitations. It was not fitted with a flight data recorder or cockpit voice recorder. Neither recorder was required by the PNG Civil Aviation Act and Civil Aviation Rules current at the time of the accident.

Engine examination

The engine components were examined at the Australian Transport Safety Bureau's Engineering laboratory in Canberra, Australia and subsequently further detailed examination was carried out at the Rolls Royce Corporation facility in Indiana USA. The Rolls Royce examination report made the following findings:

1. All the 2nd through 5th stage aerofoils were fractured and liberated near the root. The fracture surfaces were heavily damaged, and no obvious fatigue fractures were identified.
2. Twelve (12) of the 6th stage compressor aerofoils were fractured and liberated near the root. The fracture surfaces exhibited evidence of progressive crack growth. The remaining thirteen (13) 6th stage compressor airfoils were intact and severely deflected opposite the direction of engine rotation.
3. Evidence of corrosion was noted on the 1st stage compressor rotor inner diameter and aft rim face, on the 2nd stage compressor rotor hub and blade leading edge root fillets, on the 3rd stage blade leading edge root fillets and pressure side surfaces, and on the 5th stage leading edge aerofoil to hub fillets.
4. Punctures through the compressor case halves, damage and liberation of the blade track lining on the inner surfaces, and damage to the 3rd through 6th stage compressor vanes was evident on both case halves.

The ATSB opinion

In the absence of any other identified failure mechanism, it is probable that the engine power loss was related to a progressive failure and release of a number of stage-6 compressor blades. The induced damage from those blade failures led to significant upstream hard-body damage to the stage 2, 3, 4 and 5 blades.

The conclusion that can be drawn is that the blade release and subsequent compressor damage led to an immediate loss in engine power.

AIC comment

During the investigation of another helicopter accident involving P2-RUH operated by Manalos Aviation Ltd a month later (AIC 11-1008 refers), the AIC investigation found that, while not a causal factor in the accident, the facility where the helicopter was assembled did not meet the requirements of the CAR's Part 145. The same facility carried out the Certificate of Airworthiness inspections of P2-LAE. A review of the operator's documentation revealed that at that time it was not a CAR's Part 145 approved maintenance organisation. A recommendation was issued to Civil Aviation Safety Authority (CASA) of PNG (Recommendation number AIC 15-R09/11-1008) with the accident investigation report into P2-RUH (AIC 11-1008) aimed at addressing the irregularity.

On 4 June 2011, the CASA issued Manalos Aviation Ltd with a Certificate of Airworthiness for P2-LAE; a month before the accident.

General Details

Date and time:	7 Jul 2011	
Occurrence category:	Accident	
Primary occurrence type:	Uncontained engine failure	
Location:	Kuranda village, Southern Highlands Province (6,300' AMSL)	
	Latitude: 05 39'S	Longitude: 142 45'E

Crew details

Nationality	Australian
Licence type	PNG CPL
Licence number	P0688
Total hours	10,000 hours
Total hours on type	500 hours
Total hours last 90 days	139 hours
Total hours last 30 days	75.4 hours

Aircraft Details

Aircraft manufacturer and model:	Eurocopter BO-105	
Registration:	P2-LAE	
Serial number	S-777	
TTIS	9,931.4hrs	
Engine number one (Left)		
Engine manufacturer and model	Rolls Royce 250-C20B	
Engine serial number	CAE-835390	
Engine number two (Right)		
Engine manufacturer and model	Rolls Royce 250-C20B	
Engine serial number	CAE835391	
Type of operation:	Charter	
Persons on board:	Crew: 1	Passengers:2
Injuries:	Crew: 1 Minor	Passengers:2 Minor
Damage	Destroyed	

Approved

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