

Republic of the Philippines DEPARTMENT OF TRANSPORTATION CIVIL AVIATION AUTHORITY OF THE PHILIPPINES MIA Road, Pasay City 1300

AIRCRAFT ACCIDENT INVESTIGATION AND INQUIRY BOARD

FINAL REPORT

<u>RP-C189</u> ROBINSON HELICOPTER COMPANY R44 II

OPERATOR: PHILIPPINE ADVENTIST MEDICAL AVIATION SERVICES

TYPE OF OPERATION: GENERAL AVIATION

DATE OF OCCURRENCE: JULY 27, 2023

PLACE OF OCCURRENCE: SITIO BABAHAGON, LANTAPAN, BUKIDNON, PHILIPPINES

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FOREWORD

This report was produced by the Aircraft Accident Investigation and Inquiry Board (AAIIB), Civil Aviation Authority of the Philippines, MIA Road, Pasay City, Philippines.

The report is based upon the investigation carried out by the AAIIB in accordance with Annex 13 to the Convention on International Civil Aviation, Republic Act 9497 Section 42, and Philippine Civil Aviation Regulation Part 13.

Readers are advised that the AAIIB investigates for the sole purpose of enhancing aviation safety. Consequently, AAIIB reports are confined to matters of safety significance and may be misleading if used for any other purpose. It should be noted that the information in AAIIB reports and recommendations is provided to promote aviation safety, and in no case is it intended to imply blame or liability.

Furthermore, no part of the AAIIB report or reports relating to any accident or investigation shall be admitted as evidence or used in any suit or action for damages arising out of any matter mentioned in such report or reports.



Republic of the Philippines DEPARTMENT OF TRANSPORTATION CIVIL AVIATION AUTHORITY OF THE PHILIPPINES MIA Road, Pasay City 1300

www.caap.gov.ph

FINAL REPORT

TITLE: Accident involving a Robinson Helicopter Company R44 II type of aircraft with Registry Number RP-C189 owned and operated by Philippine Adventist Medical Aviation Services that had a forced landing incident at Sitio Babahagon, Lantapan, Bukidnon, Philippines, on July 27, 2023/0945H.

Notification of Occurrence to National Authority

The notification of accident to AAIIB-CAAP was relayed by the Operator of the aircraft to the OIC, AAIIB through to the Operation Center-CAAP at 1100H (LOCAL) on July 27, 2023.

Identification of the Investigation Authority

The Aircraft Accident Investigation and Inquiry Board (AAIIB), the mandated accident investigation organization within the Civil Aviation Authority of the Philippines (CAAP) as the state of Occurrence/Registry/ Operator conducted the investigation.

Organization of the Investigation

In accordance with provisions of Philippine Civil Aviation Regulation (PCAR) Part 13, an Investigator-In-Charge and Deputy Investigator-In Charge were appointed.

Authority Releasing the Report

The Final investigation report was released by Aircraft Accident Investigation and Inquiry Board (AAIIB) and published on the CAAP website on <u>31 May 2024.</u>

Synopsis:

On or about 0900H local time, July 27, 2023, a Philippine Adventist Medical Aviation Services (PAMAS) operated Robinson Helicopter R44 II type of aircraft with Registry Number RP-C189 experienced low engine power after take-off. The pilot and three (3) passengers safely evacuated the helicopter, while one (1) passenger sustained a minor injury. The Aircraft Accident Investigation and Inquiry Board determined that the cause factors of this accident were attributed to the loss of rotor rpm resulting to engine power loss and the pilot's application of an inappropriate amount of collective during climb that developed into blade stall resulting to the decrease of main rotor rpm.

LIST OF ACRONYMS AND ABBREVIATIONS

AAIIB	:	Aircraft Accident Investigation and Inquiry Board
CAAP	:	Civil Aviation Authority of the Philippines
CoA	:	Certificate of Airworthiness
CoR	:	Certificate of Registration
FAA	:	Federal Aviation Administration
FSIS	:	Flight Standards Inspectorate Service
MVC	:	Mountain View College
OFSAM	:	Office of the Flight Surgeon and Aviation Medicine
PAMAS	:	Philippine Adventist Medical Aviation Services
PCAR	:	Philippine Civil Aviation Regulation
RPM	:	Revolution Per Minute
VFR	:	Visual Flight Rules
VMC	:	Visual Meteorological Condition



1. FACTUAL INFORMATION

Aircraft Registration No.	:	RP- C189
Aircraft Type/Model	:	Robinson Helicopter Company R44 II
Operator	:	Philippine Adventist Medical Aviation Services Inc.
Address of Operator	:	PAMAS Airstrip, Mountain View College, Valencia City, Philippines
Place of Occurrence	:	Sitio Babahagon, Lantapan, Bukidnon, Philippines
Date/Time of Occurrence	:	July 27, 2023/0945H
Type of Operation	:	General Aviation
Phase of Flight	:	Cruise
Type of Occurrence	:	Take-off - overweight

1.1 History of Flight

On or about 0900H local time, July 27, 2023, a Philippine Adventist Medical Aviation Services (PAMAS) operated Robinson Helicopter R44 II type of aircraft with Registry Number RP-C189 departed PAMAS Airstrip located at MVC Complex, Valencia City, Bukidnon to pick up passengers at Barangay Bantuanon, Lantapan, Bukidnon, Philippines. The said passengers will be performing skydiving activities in the said barangay, which is celebrating its fiesta. The flight proceeded at the pick-up point without incident.

After reaching the pick-up station, the aircraft took off again with four (4) skydivers as passengers, ascending to its planned altitude of 8,000 ft. However, upon reaching 3,000 feet., the aircraft experienced low engine power. Subsequently, the pilot decided to discontinue the flight and return to the PAMAS base station. While en route toward the PAMAS airstrip, the aircraft continued to lose power and encountered difficulty maintaining altitude. The pilot made the decision to search for a suitable area to perform an emergency landing. Eventually, the aircraft had to make a forced landing at a nearby banana plantation situated at Sitio Babahagon, Lantapan, Bukidnon, Philippines. The pilot and three (3) passengers safely evacuated the helicopter, while one (1) passenger seated at the back sustained a minor injury and was transported to a nearby hospital. The aircraft sustained substantial damage due to collision with bananas and an impact with the ground.

1.2 Injuries to Person (s)

Injuries	Crew	Passengers	Others	TOTAL
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	1	0	1
None	1	3	0	4

1.3 Damage to Aircraft

The aircraft incurred substantial damage.

1.4 Other Damages

Damage to at least twenty (20) or more banana crops were noted at the accident site.



Figure 1 - Damaged banana crops at the accident site.

1.5 Personnel Information

1.5.1 Pilot

Male			
: September 21, 1978			
American			
US FAA Commercial Pilot 2798912 (Rotorcraft- Helicopter) issued on September 01, 2022 and with CAAP Certificate of Validation issued on June 02, 2023, valid up to June 01, 2024.			
R44 - Private Pilot license (helicopter) privileges only.			
Class 2 valid up to May 15, 2024			
May 15, 2023			
220 + 00 Hours			
50 + 00 Hours			

1.6 Aircraft Information

The Robinson R44 is a four (4) seater light helicopter produced by Robinson Helicopter Company since 1992. Based on the company's two-seat Robinson R22, the R44 features hydraulically assisted flight controls. It was first flown on 31 March 1990 and received FAA certification in December 1992, with the first delivery in February 1993.

1.6.1 Aircraft Data

Registration Mark	: RP-C189
Manufacturer	: Robinson Helicopter Company
Country of Manufacturer	: United States of America
Type/Model	: R44 II
Operator	: Philippine Adventist Medical Aviation Services Inc.
Serial No.	: 11037
Year of Manufacture	: 2006
Certificate of Airworthiness	: Valid until December 28, 2023
Certificate of Registration	: Valid until November 17, 2027
Category	: Normal
Gross Weight	: 1,133 Kgs.
Number of Flight Crew	: 1
Number of Passenger	: 3
Airframe total time	: $2,200 + 00$ Hours since last C of A

1.6.2 Engine Data

Manufacturer	:	Lycoming
Туре	:	Reciprocating
Model	:	IO-540-AE1A5

Engine Serial No.	:	L-30769-48A
Engine TSO	:	1,825 + 02 Hours
Engine Total Time	:	2,863 + 06 Hours

1.6.3 Propeller Data

Manufacturer	:	Robinson
Model	:	C005-12
Propeller Serial No.	:	14082 and 14083

1.7 Meteorological Information

Visual Meteorological Conditions (VMC) prevailed at the time of the occurrence.

1.8 Aids to Navigation

The flight departed under VFR (Visual Flight Rules), wherein the pilot must operate the aircraft using visual references to the ground and visually avoid obstructions and other aircraft.

1.9 Communications

The aircraft is equipped with a standard radio transceiver.

1.10 Flight Recorders

The aircraft is not equipped with any flight recorders, and existing Philippine Civil Aviation Regulation (PCAR) does not require it to be installed for that type of aircraft.

1.11 Wreckage and Impact Information

The aircraft wreckage (Figure 2 and 3) was found inside a banana plantation specifically at coordinates 7° 59' 48.8" N, 125° 03' 5.8" E and with a general heading of 321° NW. The site was approximately 2.51 kilometers from the PAMAS airstrip.

Inspection of the crash site revealed that the aircraft incurred substantial damage to its structures and flight controls (Figure 4) upon impact with the vegetation (banana trees) and the ground.



Figure 2 and 3 – The aircraft wreckage.



Figure 4 – Damages incurred by RP-C189.

1.12 Medical and Pathological Information

The pilot completed the mandatory drug and alcohol testing at the local hospital, which was later endorsed to CAAP OFSAM for the required post-accident medical examination. The subject pilot was later issued a medical clearance by the mentioned CAAP office.

One (1) out of the four (4) passengers on the aircraft reported experiencing back pain, prompting a medical check-up at a local hospital. The hospital advised him to stay for further observation, but later cleared him and released him.

1.13 Fire

There was no post-crash fire observed during on-site investigation.

1.14 Search and Survival Aspects

The accident was survivable because, following the forced landing, both the cockpit and cabin of the aircraft remained almost intact, allowing the occupants to vacate the aircraft without any restrictions. Further, local plantation workers and PAMAS personnel were able to respond immediately to the accident site and provide assistance to the aircraft occupants.

1.15 Organizational and Management Information

PAMAS is a faith-based, volunteer-driven organization that supports the Seventh-day Adventist Church in its mission through aviation and medical ministry. It was established in 2007 by a helicopter and fixed-wing pilot/mechanic who was inspired and encouraged by Gospel Ministries International to initiate a much-needed aviation ministry in the Philippines. Over time, the organization has expanded its operations to cover three main areas of the Philippines, providing air support in Palawan, Luzon, and Mindanao.

2. ANALYSIS

2.1 Pilot

The pilot involved holds a valid FAA-issued Commercial Pilot License for helicopters. When he was still in the US, he gained experience flying Robinson R22, R44, and Schweizer S300 helicopters. Upon arriving in the Philippines, he applied to convert his FAA license to a CAAPissued license to fly Philippine-registered aircraft. During the application, he was informed by the CAAP that instead of a direct conversion, he would be issued a Certificate of Validation with limited privileges equivalent to a Private Pilot License, as he would not be involved in commercial operations while in the Philippines.

During the investigation, it was learned that this was the concerned pilot's first solo flight since arriving in the Philippines. Prior to this, he had flown several times with another senior PAMAS pilot, who oversaw his familiarization with flight operations in the area as well as with this involved aircraft. Furthermore, it had been more than two (2) weeks since he had performed any flying duties, so his physical condition has been found to not be an issue for him to safely conduct this scheduled flight. During the past few days, he has solely been attending to some routine tasks within their ministry.

2.2 Aircraft Status

In the interview with the pilot, he stated that he performed the required pre-flight inspection prior to his departure from the PAMAS airstrip and that there have been no issues with the aircraft. In addition, routine maintenance inspections had been done by their Head Mechanic more than a week ago before the latter departed for the US. Further review of the aircraft maintenance documentation also revealed no issues regarding the subject aircraft's airworthiness.

Furthermore, a witness revealed that they had refuelled the helicopter two (2) weeks prior to the accident. He also stated that he assisted in refuelling the helicopter to a full tank. With this, fuel testing was done on the remaining fuel inside the tank. This revealed that the fuel was clear and free of any visible solid matter. Additionally, it met the relevant specifications for Avgas 100 and showed no evidence of any particulate that might have potentially caused the accident.

2.3 Flight Operations

On the day of the accident, the pilot departed from the PAMAS airstrip to pick up four (4) skydivers scheduled for a skydiving activity in a barangay celebrating their fiesta. Once all the skydivers were onboard, the aircraft took off and began ascending to its planned altitude of 8,000 feet, which is the altitude for releasing the skydivers. During its ascent to its planned altitude, the helicopter experienced low rotor RPM upon reaching 3,000 feet. With this, the pilot decided to discontinue the flight and return to the PAMAS airstrip. While en route to the airstrip, the helicopter started to lose more power and had difficulty maintaining its altitude. The pilot then decided to look for an area to perform an emergency landing, ultimately landing at a nearby banana plantation approximately three (3) miles from the PAMAS airstrip.

In consideration of the above, it appears that this occurrence involves a helicopter that was operated at a gross weight exceeding the maximum take-off weight specified in the R44 pilot's operating handbook. For this flight, the helicopter took off with five (5) personnel on board, compared to the maximum number of four (4), which already includes the pilot. This overweight condition likely played a role in the difficulties encountered during the ascent.

For a helicopter to maintain a steady climb, it requires increased main rotor thrust to act as a lift when carrying additional weight. This, in turn, necessitates more engine power. Moreover, if the same level of rotor thrust is required, the rotor blades must be set at a higher angle of attack. This results in increased drag, requiring even more engine power. Furthermore, the higher angle of attack can lead to overpitching of the main rotors. Once overpitching occurs, the reduced main rotor RPM leads to coning and a condition known as blade stall. In the event of overpitching, if the pilot compensates by increasing the collective, the situation worsens, causing further reduction in rotor RPM, increased coning, reduced lift, and ultimately, descent. Failure to take corrective action promptly can lead to further reductions in rotor RPM, causing the blades to stall. Once the blades are stalled, recovery becomes nearly impossible. Recovering from overpitching necessitates the simultaneous application of more throttle and the lowering of collective control. This action decreases the blade pitch angle, reducing blade drag while maximizing engine power to increase rotor RPM.

In the case of complete engine power loss, the pilot is required to immediately enter autorotation by lowering the collective to reduce the drag generated by the main rotor blades. A freewheeling unit in the clutch assembly automatically disengages the engine from the main rotor, allowing the main rotor to rotate freely. As the helicopter descends, an upward flow of air through the rotor system is produced, providing an autorotative force to create rotor thrust. If properly managed, this will maintain the rotor's RPM throughout the descent and provide a steady rate of descent. This process is known as autorotation. When landing from an autorotation, most of the rotational energy stored in the main rotor is used by the pilot to progressively reduce the helicopter's rate of descent and ground speed. At a low height above

the ground, the collective is raised to utilize the remaining energy in the main rotor blades to cushion the touchdown.

Under the R44 helicopter standard operating specifications, this aircraft is equipped with an aural warning horn and light that activate at 97% main rotor RPM to alert the pilot of a low main rotor RPM condition. During the interview, one of the passengers seated at the back stated that he noticed a warning light illuminating as the aircraft descended. This statement corroborates the presence of such safety features on this helicopter and further confirms that the aircraft encountered low main rotor RPM.

There are numerous factors crucial for efficient and safe helicopter operation, and among these factors is proper weight and balance control. The weight and balance system commonly used in helicopters comprises three equally vital elements: the weighing of the rotorcraft, maintaining the weight and balance records, and the correct loading of the rotorcraft. Any inaccuracy in one of these elements undermines the effectiveness of the entire system.

3. CONCLUSIONS

3.1 Findings

- **3.1.1** The involved pilot is holder of a valid Certificate of Validation and medical certificate issued by the CAAP.
- **3.1.2** The pilot is rated to perform his functions for that specific type of aircraft.
- **3.1.3** The aircraft has valid Certificates of Airworthiness and Registration.
- **3.1.4** There were no recorded aircraft discrepancies prior to its flight on July 27, 2023.
- **3.1.5** The aircraft is operated beyond its operating maximum take-off weight.

3.2 Probable Cause

3.2.1 Primary Cause Factors

- **a.** Loss of rotor rpm resulting to engine power loss.
- **b.** The pilot's application of an inappropriate amount of collective during climb that developed into blade stall resulting to decrease of main rotor rpm.

3.2.2 Contributory Cause Factor

- **a.** The pilot's decision to operate the aircraft exceeding the maximum take-off weight specified in the R44 pilot's operating handbook.
- **b.** Pilot's lack of situational awareness.

4. SAFETY RECOMMENDATIONS

- **4.1** The AAIIB provides the following recommendation to the **CAAP-FSIS** in view of the investigation conducted:
 - **a.** To ensure that the operator makes certain that pilots operating the R44 are familiar with the take-off weight limitation specified in the pilot's operating handbook.
 - b. To ensure that the operator makes sure that pilots operating the R44 are knowledgeable of the emergency procedures specified in the pilot's operating handbook.
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