ACCIDENT INVESTIGATION COMMISSION

FINAL REPORT

AIC 24-1001

North Coast Aviation Limited

P2-NCA

PAC 750XL

Runway Excursion

Bungawat Airstrip,

Morobe Province

PAPUA NEW GUINEA

8 January 2024

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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*, and the *Commissions of Inquiry Act 1951*, and in accordance with *Annex 13* to the *Convention on International Civil Aviation.*

The objective 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 relevant 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 comments with the need to properly explain what happened, and why it happened, in a fair and unbiased manner.

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About this Report

On 9 January 2024 at 08:30 local time (22:30 UTC), the AIC was notified by the Operator via email of an accident at Bungawat Airstrip, Morobe Province, that occurred on 8 January 2024 at 09:26 local, involving a PAC 750XL aircraft, registered P2-NCA, owned and operated by North Coast Aviation Limited (NCA). The AIC immediately commenced an investigation and deployed a team of investigators to perform on-site activities on 13 January 2024.

This Final Report has been produced by the AIC, P.O Box 1709, Boroko 121, NCD, Papua New Guinea. It has been approved for public release by the Commission in accordance with *Paragraph 6.5 of ICAO Annex 13*. The report is published on the AIC website www.aic.gov.pg.

The report is based on the investigation carried out by the AIC under the Papua New Guinea *Civil Aviation Act 2000*, and *ICAO Annex 13 to the Convention on International Civil Aviation*. It contains factual information, analysis of that information, findings and contributing (causal) factors, other factors, safety actions, and safety recommendations.

Although AIC investigations explore the areas surrounding an occurrence, only those facts that are relevant to understanding how and why the accident occurred are included in the report. The report may also contain other non-contributing factors which have been identified as safety deficiencies for the purpose of improving safety.

Readers are advised that in accordance with *ICAO Annex 13 to the Convention on International Civil Aviation*, it is not the purpose of an AIC aircraft accident investigation to apportion blame or liability. The sole objective of the investigation and the final report is the prevention of accidents and incidents (Reference: *ICAO Annex 13, Chapter 3, paragraph 3.1*). Consequently, AIC reports are confined to matters of safety significance and may be misleading if used for any other purpose.

Maryanne J. Wal
Chief Commissioner
11 December 2024

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GLOSSARY OF ABBREVIATION

AC	**:** Advisory Circular
AAR	: Aircraft Airworthiness Review
AIC	: Accident Investigation Commission
AMSL	: Above Mean Sea Level
AOC	: Air Operator Certificate
ATS	: Air Traffic Service
CAR	: Civil Aviation Rule
CASA	: Civil Aviation Safety Authority
CPL A	: Commercial Pilot License Aeroplane
CoA	: Certificate of Airworthiness
CoR	: Certificate of Registration
CVR	: Cockpit Voice Recorder
ETA	: Estimated time of arrival/Estimating arrival
FAA	: Federal Aviation Administration
FDR	: Flight Data Recorder
ft	: Foot (feet)
h	: Hour(s)
HF	: High frequency (3 000 to 30 000 kHz)
ICUS	: In Command Under Supervision
IOA	: Instrument of Authorization
IP	: Instructor Pilot
ICAO	: International Civil Aviation Organization
IP	: Instructor Pilot
kt	: Knot(s)
kHz	: Kilohertz
km	: Kilometre
kg	: Kilogram
m	: Metre(s)
MEL	: Minimum Equipment List
MHz	: Megahertz
MOC	: Maintenance Organisation Certificate
NCA	: North Coast Aviation
NM	: Nautical miles
NWS	: National Weather Service
AIP	: Aeronautical Information Publication
RAA	: Rural Airstrip Agency
SARWATCH	: Search and Rescue Watch
UTC	: Coordinated Universal Time
VFR	: Visual Flight Rules
VHF	: Very High Frequency (30 to 300 MHz)

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INTRODUCTION

SYNOPSIS

On 8 January 2024, at 09:26 local (23:26 UTC), a PAC 750XL aircraft registered P2-NCA, owned and operated by North Coast Aviation Limited (NCA) was conducting a VFR unscheduled passenger flight from Nadzab Tomodachi International Airport to Bungawat Airstrip, Morobe Province, Papua New Guinea, when during landing, the aircraft experienced a loss of directional control on touchdown and subsequent runway excursion.

There were 13 persons on board: 2 pilots and 11 passengers (8 adults and 3 children). None of the aircraft's occupants were injured. The pilot flying was occupying the left seat and was In Command Under Supervision (ICUS). The Pilot occupying the right seat was the Instructor Pilot (IP).

The aircraft departed Nadzab at 09:04, climbed to an altitude of not more than 8,800 ft AMSL and tracked North via Saidor Gap for Bungawat. There was no significant weather along the route to Bungawat. At 09:17, about 12.7 nautical miles (NM) from Bungawat Airstrip, the aircraft commenced descent from 8,800 ft AMSL. At 09:22, about 5,800 ft AMSL, the aircraft arrived in the circuit area and the crew cancelled SARWATCH at 09:23.

Upon arrival in the circuit, the crew observed clouds build up in the final approach path, so they tracked Northeast, overhead the strip for further aerial inspection and assessed it as being suitable for landing. The crew observed that the right side of the final approach path was clear of clouds, so they elected to continue approach for landing on Runway 32. The aircraft tracked for a right circuit from overhead and continued the approach. Due to clouds in the final approach path, the aircraft conducted an oblique pattern from the start of right base, straight to short finals and touch down to maintain visual clearance of the cloud build up on the final path to landing. The aircraft had to be flown further right of the normal track for finals, which was clear of clouds, before heading adjustments were made to the aircraft tracking to line up with runway heading for a safe touchdown.

The investigation concluded that the crew did not maintain a stabilised final approach, resulting in a left of centerline landing further up from the normal touchdown point on the runway. Sufficient heading adjustments were not made[1]on short final to line up with runway heading (centerline), leading to the aircraft drifting further left (overshot centerline tracking on approach). The aircraft was also not flared sufficiently[2] before touchdown, therefore, the aircraft landed flat from a lower than appropriate attitude for landing. Landing past the normal touchdown point, combined with the flat landing indicated a high approach angle (high profile) on approach leading to a steeper descent on short final, resulting in an unstable approach on short finals.

The aircraft had full right nose deflection and lowered right wing due to the pilot's attempt to correct its left drift before touchdown, causing it to veer right as the wheels contacted the ground. After landing, overcorrections resulted in a loss of directional control, and the wet runway conditions made recovery difficult. The aircraft continued to veer right, and the right wing contacted the shrubs at the edge of the runway. The right main wheel then dropped into the drainage ditch. Despite applying the left rudder to get the aircraft back onto centerline, the pilot could not regain control as the aircraft's belly had lowered closer to the ground resulting in the propellers striking the ground. The propeller continued to strike the ground as the aircraft tracked along the strip edge up to the parking bay, where the aircraft's right main wheel contacted the edge of the parking bay. Upon the right main wheel contacting the edge of the parking bay, the aircraft's nose wheel and right main wheel momentarily raised off the ground, resulting in the aircraft pivoting around the left main wheel as the aircraft spun to the left at about 130 degrees while continuing to drift into the parking bay, where it came to rest.

The report includes safety recommendations made by the AIC to the operator, with the intention of enhancing operational safety. According to *ICAO Annex 13 Standards*, identified safety deficiencies and concerns must be raised with the persons or organisations best placed to take safety action. Unless safety action is taken to address the identified safety deficiencies, death or injury might result in a future accident.

[1] An insufficient heading adjustment on landing refers to the failure to properly align the aircraft's heading with the runway centerline during the final approach and touchdown. This can result in the aircraft landing off-center or even veering off the runway.
[2] "Insufficient flare" refers to a situation during landing where the aircraft does not pitch up enough just before touchdown.

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1 FACTUAL INFORMATION

1.1 History of the flight

On 8 January 2024, at 09:26 local (23:26 UTC[3]), a PAC 750XL aircraft registered P2-NCA, owned and operated by North Coast Aviation Limited (NCA) was conducting a VFR[4] unscheduled passenger flight from Nadzab Tomodachi International Airport to Bungawat Airstrip, Morobe Province, Papua New Guinea, when during landing, the aircraft experienced a loss of directional control on touchdown and subsequent runway excursion.

Figure 1:Depiction of P2-NCA Accident Site

There were 13 persons on board: 2 pilots and 11 passengers (8 adults and 3 children).

The pilot flying was occupying the left seat and was In Command Under Supervision (ICUS). The Pilot occupying the right seat was the Instructor Pilot (IP).

On the day of the accident, the crew conducted a flight that morning from Goroka to Nadzab before the flight to Bungawat. V2-Track[5] recorded data showed that the aircraft departed Goroka Airport at 07:33 and landed at Nadzab Airport at 08:10. The IP stated that upon arrival at Nadzab, he was requested to conduct an unscheduled flight from Nadzab to Bungawat, then to Teptep Airstrip, before returning to Nadzab (Refer to Figure 2).

According to the recorded data, the aircraft departed Nadzab at 09:04, climbed to an altitude of not more than 8,800 feet (ft) AMSL[6] and tracked North via Saidor Gap for Bungawat. The crew stated that there was no significant weather along the route to Bungawat. At 09:17, about 12.7 nautical miles (NM) from Bungawat Airstrip, the aircraft commenced descent from 8,800 ft AMSL (Refer to Figure 3).

[3] 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.
[4] Visual Flight Rules.
[5] A satellite tracking device for aircraft. This enables the aircraft's position to be monitored from an internet connected device. It includes an 'SOS' button, which can be manually activated by the crew in an emergency.
[6] Above Mean Sea Level.

Figure 2:Depiction of P2-NCA Planned Destinations

At 09:22, the aircraft arrived in the circuit area, at an altitude of about 5,800 ft AMSL. Air Traffic Services (ATS) recorded data indicated that at 09:23, SARWATCH[7] was cancelled.

Figure 3:P2-NCA Flight Path from Nadzab to Bungawat Airstrip

The crew stated that while in the circuit area, they observed cloud buildup on the final approach. The IP briefed the pilot ICUS that they would proceed with the approach by executing a right-hand circuit from overhead, inspect the strip and assess to see if an approach and landing was possible.

The pilot ICUS handed over control to the IP and they tracked[8] towards the Northeast, overhead the airstrip to conduct further aerial inspection.

While positioned overhead, they visually assessed the airstrip and determined it to be suitable for landing; the area to the right of the final approach path was clear of clouds. Therefore, they decided to proceed with an oblique final approach for landing on Runway 32.

[7] Search and Rescue Watch; Monitoring of a flight to activate emergency services if not requested by the pilot to be cancelled by a specific time.
[8] Actual direction of the airplane tracking across the ground.

The IP initiated the approach by tracking for a right circuit from overhead and continued approach. Due to cloud buildup along the final approach path, the crew flew an oblique pattern from the start of right base, straight to short finals and touchdown. The aircraft had to be flown further right of the normal finals track, which was clear of clouds, before heading[9] adjustments were made to the aircraft tracking to line up with runway heading for touchdown.

The IP stated that the approach speed was maintained between 80 and 85 knots due to the aircraft being overweight, based on their calculations of the landing weight for Bungawat. He added that he configured the aircraft by fully extending the flaps and maintained an airspeed of 65-75 kts during the final approach and on short final and touchdown, he reduced the speed to 60 - 65 kts.

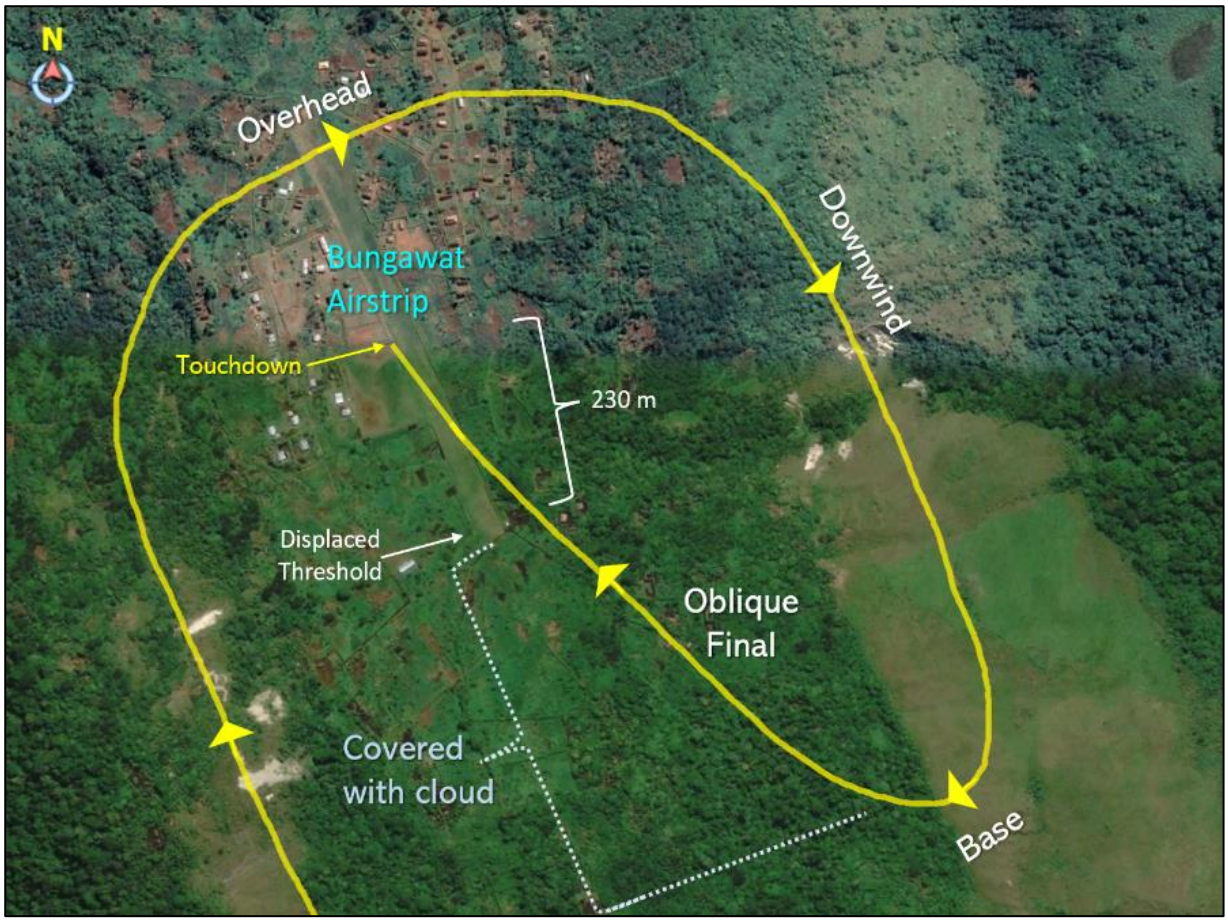

Figure 4:P2-NCA Circuit flown at Bungawat Airstrip (Source:V2 Track recorded data and pilot interview)

The aircraft touched down about 230 m beyond the Runway 32 threshold, left of centerline and experienced a bounce. The IP stated that on touchdown, full right rudder was applied to get the aircraft tracking to the right onto centerline. When the aircraft got back onto the ground after being in the air momentarily, it immediately turned right and overshot the centerline and veered further right towards the runway edge. The IP attempted to turn the aircraft back to the left by applying left rudder to get it back onto centreline, however, the aircraft continued to track further towards the right edge of Runway 32.

As the aircraft's right wing contacted the shrubs on the right edge of the strip, the IP continued to apply the left rudder pedal. However, the aircraft continued to track along the drainage ditch at the edge of the runway, towards the parking bay. The right main wheel dropped into a drainage ditch and continued to track towards the parking bay as the propellers struck the ground.

Upon the right wheel contacting the edge of the parking bay, the aircraft's nose wheel and right main wheel momentarily raised off the ground, resulting in the aircraft pivoting around the left main wheel as the aircraft spun to the left for about 130 degrees while continuing to drift into the parking bay, where it came to rest. The IP shut down the engine while the pilot ICUS evacuated the passengers through the main door.

[9] Heading is the direction the airplane is pointed.

1.2 Injuries to persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	2	11	13	Not applicable
TOTAL	2	11	13	-

Table 1: Injuries to persons.

1.3 Damage to aircraft

The aircraft sustained substantial damage. Refer to *Section 1.12* for a detailed description of damage to the aircraft.

1.4 Other damage

There was no other damage to property and the environment.

1.5 Personnel information

1.5.1 Instructor Pilot (IP)

Age	: 33
Gender	: Male
Nationality	: Papua New Guinean
Position	: Check and Training Captain
Type of license	: PNG CPL (A)[10]
Valid to	: Perpetual
Type rating	: SEAL[11]; PAC-750
Total flying time	: 3, 564.3 hours
Total hours in command	: 2, 917.4 hours
Total hours on type	: 3, 217.4 hours
Total hours last 90 days on type	: 91.8 hours
Total hours last 7 days on type	: 16.7 hours
Total hours last 24 hours on type	: 5.4 hours
Total rest period(s) last 48 hours	: 2 Rest Period[12]
Last recurrent base and line check	: 3 October 2023
Last proficiency check	: 3 October 2023
Medical class	: One (1)
Valid to	: 23 August 2024
Medical limitation	: Nil

[10] Commercial Pilot License (Aeroplane)
[11] Single Engine Aeroplane (Land)
[12] Rest period as required by PNG CAR Part 122.105 (a)(e).

Records provided to the AIC showed that the IP joined North Coast Aviation Limited (NCA) on 20 August 2022 and commenced Line Pilot duties on 30 August 2022. His competency checks were conducted on 3 October 2023 in accordance with *PNG CAR Part 135.607 Flight Crew Competency Checks.*

The pilot was issued an Instrument of Authorisation (IOA) by the Civil Aviation Safety Authority (CASA) of PNG on 25 January 2023 to carry out functions of a *Category D Flight Instructor* in accordance with *PNG CAR Part 61.305(d).*

Records reviewed showed that the IP was familiar with the route and operations into and out of Bungawat Airstrip. He had conducted six landings into Bungawat Airstrip within the past three months prior to the accident flight.

1.5.2 Pilot In Command Under Supervision (ICUS)

Age	: 24
Gender	: Male
Nationality	: Papua New Guinean
Position	: Line Pilot
Type of license	: PNG CPL (A)
Valid to	: Perpetual
Type rating	: SEAL; PAC-750
Total flying time	: 243.9 hours
Total hours in command	: 70.6 hours
Total hours on type	: 31.9 hours
Total hours last 90 days on type	: 22.7 hours
Medical class	: One (1)
Valid to	: 12 May 2024
Medical limitation	: Nil

Records provided to the AIC showed that the pilot ICUS joined NCA on 4 October 2023 and commenced Initial Training on the PAC 750XL in accordance with *PNG CAR Part 135.557 Initial Training for Crew members.*

On 6 January 2024, the pilot ICUS was issued a PNG CPL(A). According to the pilot ICUS's logbook records, he had not conducted any flights to Bungawat Airstrip prior to the accident flight.

1.6 Aircraft Information

According to the aircraft manufacturer, the PAC 750XL aircraft is a turboprop driven, all metal, low wing monoplane with a fixed tricycle undercarriage. Its robust construction, wide section, and low-pressure tyres enable operations from unpaved strips to be flown as a matter of routine.

The power plant, a Pratt & Whitney PT6A-34 turbine engine is enclosed in a 2-piece composites cowl, and drives a three or four blade, constant speed feathering and reversible pitch Hartzell propeller.

1.6.1 Aircraft data

Aircraft Manufacturer	: Pacific Aerospace Corporation Limited
Model	: PAC 750XL
Serial Number	: 134
Year of Manufacture	: 2007
Total Airframe Hours	: 9, 304.6 hours
Total Airframe Cycles	: 13, 875
Registration	: P2-NCA
Name of the Owner	: North Coast Aviation Limited
Name of the Operator	: North Coast Aviation Limited
Certificate of Registration number	: 134
Certificate of Registration issued	: 4 February 2014
Certificate of Registration valid to	: Non-Terminating
Certificate of Airworthiness number	: 134
Certificate of Airworthiness issued	: 4 February 2014
Certificate of Airworthiness valid to	: Non-Terminating

1.6.1.1 Engine data

Engine Type	: Turbo propeller
Manufacturer	: Pratt and Whitney Canada
Model	: PT6A-34
Serial Number	: PCE-RB0240
Year of Manufacture	: 2005
Total Time Since New	: 9,579.6 hours
Cycles Since New	: 13,875
Time Since Overhaul	: 1,881.7 hours
Cycles Since Overhaul	: 2,875

Evidence reviewed indicated that the engine was operating within the required parameters.

1.6.1.2 Propeller data

Propeller Type	: Variable Pitch Propeller
Manufacturer	: Hartzell Propeller Inc
Model	: HC-B3TN-3D
Serial Number	: BUA30860
Total Time Since New	: 2,720.5 hours
Time Since Overhaul	: 2,720.5 hours

Evidence reviewed indicated that the propellers were operating within the required parameters.

1.6.1.3 Fuel information

According to documents reviewed, the aircraft departed Nadzab for Bungawat with 450 kg of Jet A1 fuel. During the interview, the crew stated that there were no aircraft performance issues experienced during the accident flight.

Therefore, the investigation determined that the fuel in terms of quantity and quality were not contributing factors to this accident.

1.6.2 Weight and Balance

The *Pilot Operating Handbook and Civil Aviation Authority of New Zealand Approved Flight Manual Air 2825* for the PAC 750XL *Section 1,* shows that the maximum certified landing weight for the aircraft is 7125 lbs. (3,232 kg) and the maximum certified take-off weight is 7500 lbs. (3,402 kg).

According to the operator's *Daily Flight Record (DFR) (*Refer to Section 5.1, Appendix A*),* the aircraft departed Nadzab with a take-off weight of 3,345 kg and landed at Bungawat Airstrip with a total landing weight of 3,285 kg which was found to have exceeded the Maximum allowable weight by 53 kg.

Weight and Balance Report, dated 22 December 2020 (Refer to Section 5.3, Appendix C), shows that the aircraft, P2-NCA, was reweighed and the Basic Empty Weight was found to be 1733.25 kg and the centre of gravity of the aircraft was 110.99 inch[13].

Therefore, the investigation found that since the Basic empty weight of the aircraft was 1733.25 kg, the take-off weight out of Nadzab Airport was 3,259.25 kg and the Landing Weight at Bungawat was 3,199.25 kg, which is below the maximum certified take-off and landing weight and within the trim for landing.

The investigation determined that the aircraft's takeoff and landing weights at the time of the accident were within the permissible limitation. However, the investigation could not determine the centre of gravity due to the unavailability of relevant information. The Weight and Balance sheet provided by the operator was dated 11 January 2024, which was three days after the accident.

1.6.3 Maximum Seat Capacity in the Passenger Cabin (PAC 750XL)

According to Pacific Aerospace Limited PAC 750XL *Pilot Operating Handbook* and Civil Aviation Authority of New Zealand approved *PAC 750XL Flight Manual AIR 2825, Section 9,Supplement 36 'Installation of Aero Twin Seats'*;

> *The front right seat immediately to the right of the pilot's seat may be occupied by a passenger and a maximum seat capacity in the cabin of eight.*

The investigation found that eight (8) adult passengers were seated in their assigned seats in the cabin and three (3) children, ages six (6), seven (7) and twelve (12) were each secured to three (3) adult passengers in Rows one (1) and two (2). Refer to Section 1.17 4 for operator's procedure on the carriage of minors.

The operator's passenger *Manifest Number 206347* (Refer to Section 5.2, Appendix B) confirmed that there were 13 persons on the flight; 2 pilots and 11 passengers.

Pacific Aerospace Limited PAC 750XL *Pilot Operating Handbook and* Civil Aviation Authority of New Zealand approved *PAC 750XL Flight Manual AIR 2825,Section 2.12 states that the minimum crew is one pilot, seated in the left seat.*

Operator's *Standard Operating Manual PAC 750XL, section 2.12 Flight Crew Limits,* also states that the minimum crew is one pilot seated in the left seat.

The front left seat was occupied by the pilot ICUS, and the front right seat was occupied by the Instructor Pilot (IP). On the day of the occurrence, the IP was monitoring the pilot ICUS.

1.6.4 Passenger Seating Layout and Cabin Dimensions (PAC 750XL)

The investigation found from the manufacturer's PAC 750XL *Pilot Operating Handbook* and approved *Flight Manual 2825* that the maximum seat capacity in the cabin is eight (8) ; two (2) seats in each row. There are two (2) seats infront; left seat for the pilot and right seat adjacent to the pilot's seat, may be occupied by a passenger (Refer to Figure 5).

[13] Distance of Empty Weight C of G.

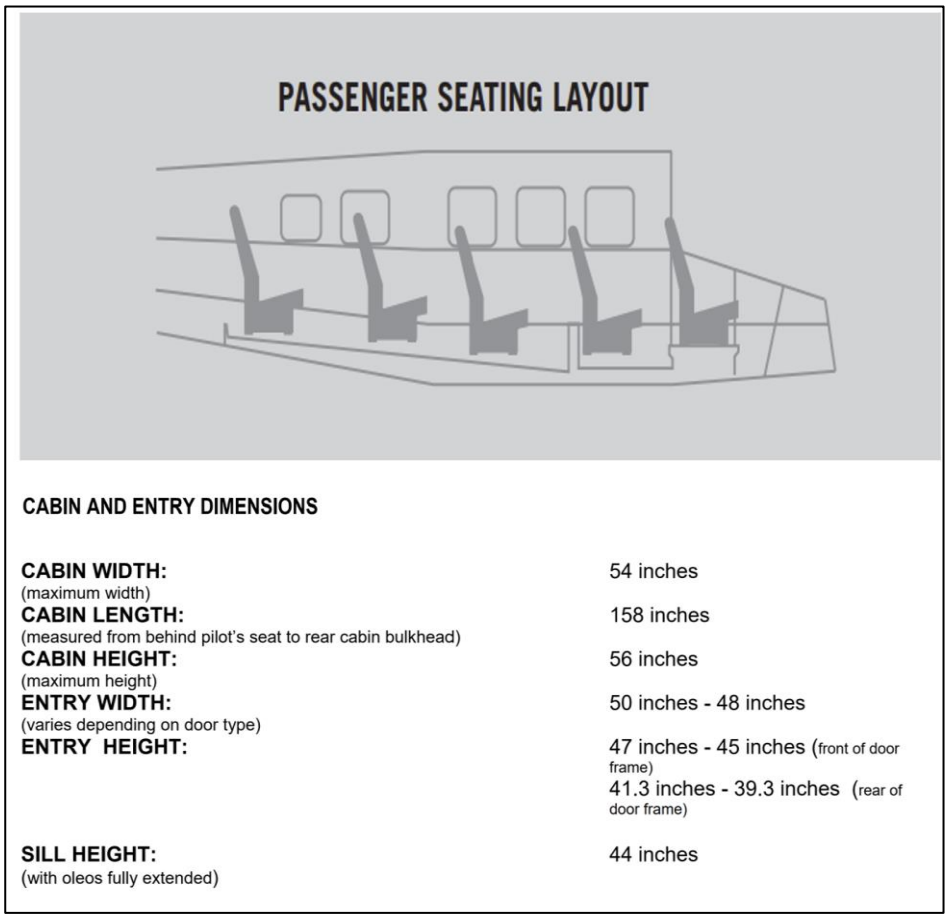

Figure 5:Seating Layout and Cabin and Entry Dimensions PAC 750XL (*Source: Utility Aircraft Corporation and PAC 750XL Pilot Operating Handbook and approved Flight Manual 2825*)

1.6.5 Aircraft Airworthiness and Maintenance

At the time of the accident, the aircraft had a current Certificate of Airworthiness (CoA), Certificate of Annual Airworthiness Review (AAR), Certificate of Registration (CoR), and was certified as being airworthy.

The maintenance records were reviewed during the investigation and identified that there were no outstanding scheduled maintenance, defects, and outstanding Minimum Equipment List (MEL) item at the time of the accident. Therefore, the aircraft was serviceable at the time of the accident.

1.6.6 Collision Avoidance Systems

The aircraft was equipped with a Mode C transponder and its serviceability was not a factor in this occurrence.

1.7 Meteorological information

1.7.1 PNG National Weather Service Forecast Data

The Area Forecast issued by PNG National Weather Service (NWS) for 8 January 2024 was valid from 07.00 to 02:00 local.

The information is as follows:

Overview: Scattered showers and thunderstorms with rain areas

Winds:	**2,000 ft Variable at 5kts 5000ft 320 degrees at 10kts**
Upper Winds:	7,000 ft 340 degrees at 10kts 10000ft Variable at 5kts 14,000 ft 060 degrees at 10kts
Cloud below 20,000 ft:	Scattered cumulonimbus at 1,800 ft Broken Stratus at 500 ft Broken Stratus at 3,000 ft in precipitation Scattered cumulous at 1,500 ft. Broken cumulus at 10, 000 ft in showers of rain. Scattered Stratocumulus at 3,000 ft. Broken Stratocumulus at 8 000 ft with rain and drizzle. Overcast altocumulus at 1,0000 ft and 18,000 ft.
Visibility:	500m in fog 3,000m in thunderstorm and 4,000m in showers of rain and rain drizzle
Weather:	Fog, Thunderstorms, Showers of rain, Rain and Drizzle

Table 2:NWS Forecast Data

1.7.2 Bungawat Local Weather reports

The weather updates for Bungawat is provided to the operator by an agent in Bungawat by phone. On the day of the accident, the IP stated that the agent reported clear skies and calm winds. A local eyewitness also informed the AIC that there were no clouds in the morning.

1.8 Aids to navigation

Navigational aids and their serviceability were not a factor in this accident.

1.9 Communication

The aircraft was equipped with a High Frequency (HF) and Very High Frequency (VHF) two-way communication radio. Both communication systems were determined to have been serviceable and not a contributing factor to the accident.

1.10 Aerodrome information

1.10.1 General Information

Bungawat Airstrip is located in Bungawat Village, Kabwum District, Morobe Province, and it is approximately 34 NM North of Nadzab Tomodachi International Airport. The Airstrip is a one-way landing and take-off and is situated on a mountain range at an elevation of about 5,695 ft (1,736 m).

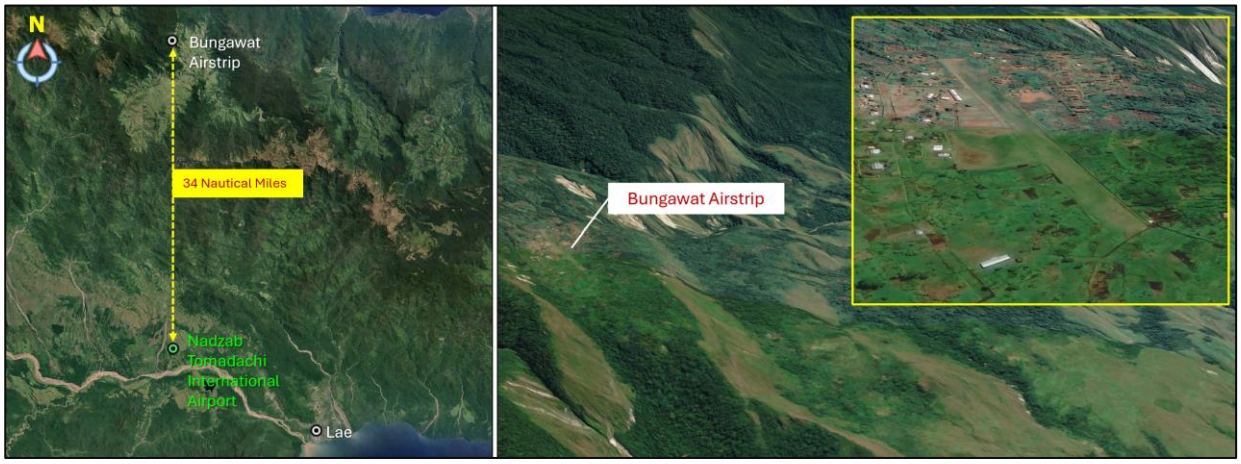

Figure 6:Bungawat Airstrip Location in reference to Nadzab Tomodachi International Airport

1.10.2 Airstrip Data

The Rural Airstrip Agency (RAA) records of the last survey conducted at Bungawat Airstrip on 22 January 2021 were provided to the AIC. See Table 3, the airstrip data:

Airstrip	**RAA Survey Data**
Airstrip Type	One-way
Take off direction	146 °
Co-ordinates (at parking bay)	S 06° 00.136'
	E 146° 43.185'
Elevation (at parking bay)	5,459 ft
Elevation (at threshold)	5,385 ft
Runway Direction	14/32
Length	1,804 ft (550 m)
Width	82 ft (25 m)
Slope	6 % upslope

Table 3:Bungawat Airstrip data from RAA

RAA also provided records for a Subsurface Strength Assessment conducted at Bungawat Airstrip on October 4, 2022 (Refer to Section 5.4, Appendix D). The assessment indicated that the subsurface strength on both sides of the runway was deemed inadequate at that time.

1.10.3 Topography Data

According to the topography data, Bungawat Airstrip is surrounded by hills, cliffs, ridges and mountain ranges with the tallest peak reaching about 6,200 ft. A river flows from the Northwestern end to the Southeastern end of the strip through a large canyon.

The region is heavily covered in tropical rainforests and features notable topographic relief, which can impact visibility and weather conditions. Winds are usually light to moderate but may strengthen during storms or tropical cyclones.

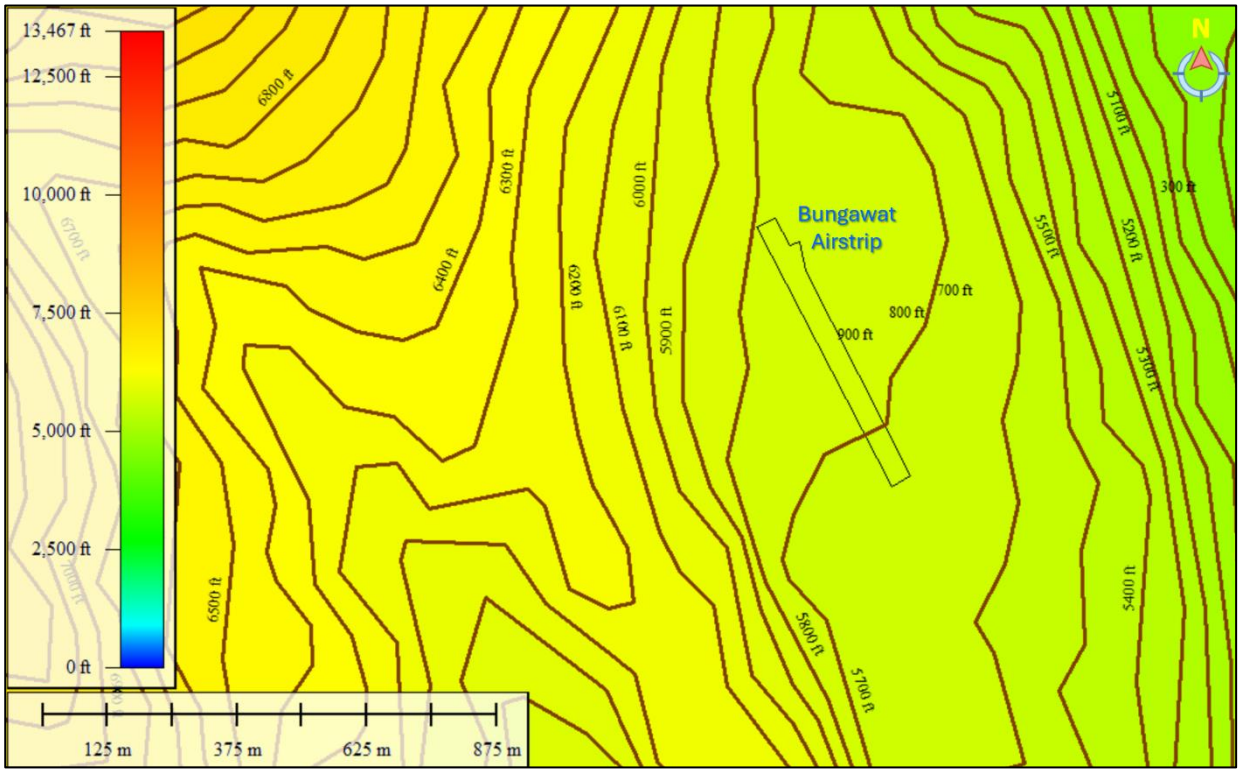

Figure 7:Bungawat Area Topography

This topographical setting results in a challenging environment for aviation, with the need for precise navigation during take-offs and landings.

1.10.4 On-site team observation of Bungawat Airstrip

During the onsite investigation, it was observed that the runway surface was covered with light overgrowth of grass. The runway centreline had a hard surface, however, the left and right sides of the runway centerline had soft surfaces.

The team also observed that the windsock was unserviceable and the cone markers at the threshold and along the edge of the strip on each side of the runway were not in a good condition nor were they clearly visible.

Figure 8:Bungawat Airstrip with indications of the on-site team observation

1.11 Flight recorders

The aircraft was not equipped with a Flight Data Recorder or a Cockpit Voice Recorder, neither were they required by *PNG Civil Aviation Rules*.

1.12 Wreckage and impact information

During the on-onsite investigation, it was observed from tyre markings that the aircraft initially touched down about 237 m past the Runway 32 threshold and to the left of the centerline.

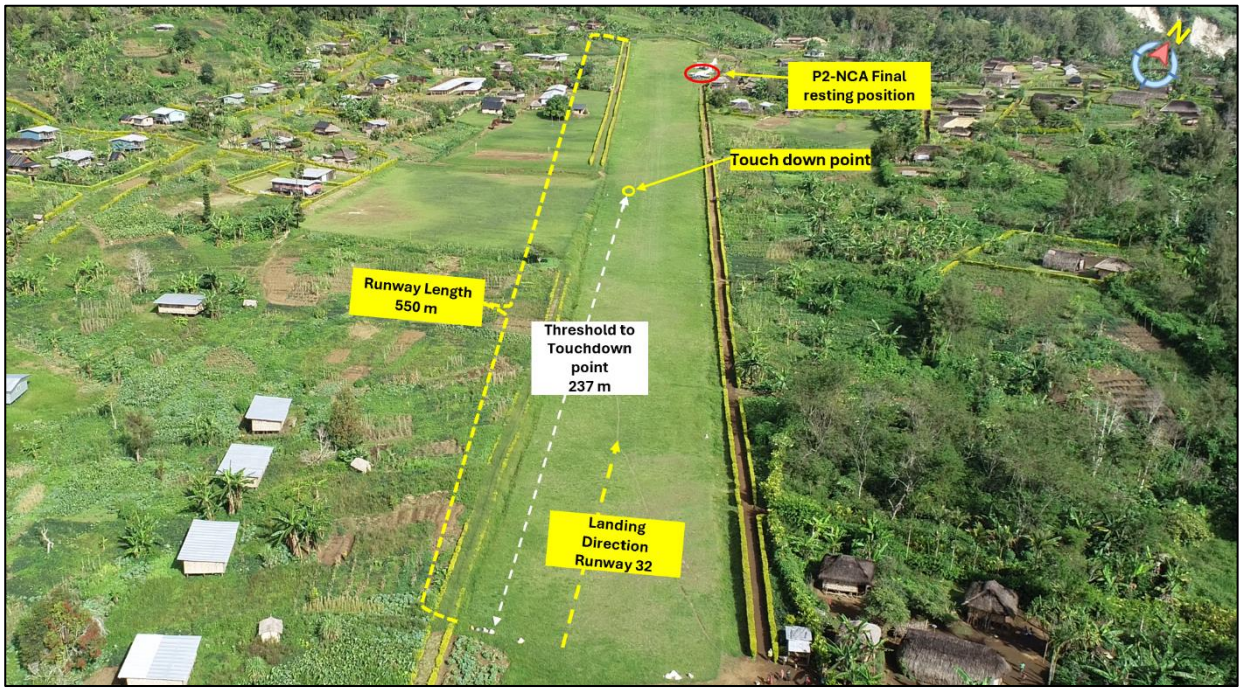

Figure 9:Accident Site Overview

The right main wheel was the first to contact the runway upon touchdown.

The nose wheel and the left main wheel, touched down simultaneously shortly after about 24 meters after the right main wheel. The tyre markings also indicated that the nose wheel was significantly closer to the right main wheel when it contacted the strip surface.

The tyre markings indicated that the left main wheel remained on the runway for approximately 8 meters, while the nose wheel and right main wheel lifted off simultaneously. Shortly thereafter, the left main wheel also became airborne, resulting in all three wheels being off the ground momentarily.

The right main wheel subsequently contacted the runway again, followed by the nose wheel, which was airborne for about 19 meters. The nose wheel remained closer to the right wheel as they continued forward and began to veer to the right. The left main wheel stayed in the air for about 28 meters before getting back on to the runway and began to veer to the right.

As the aircraft neared the centreline, the right main wheel and nose wheel started to separate, resulting in a noticeable gap between them. The tyre markings prior to the aircraft's final position indicated that the nose wheel and left main wheel were moving closer together.

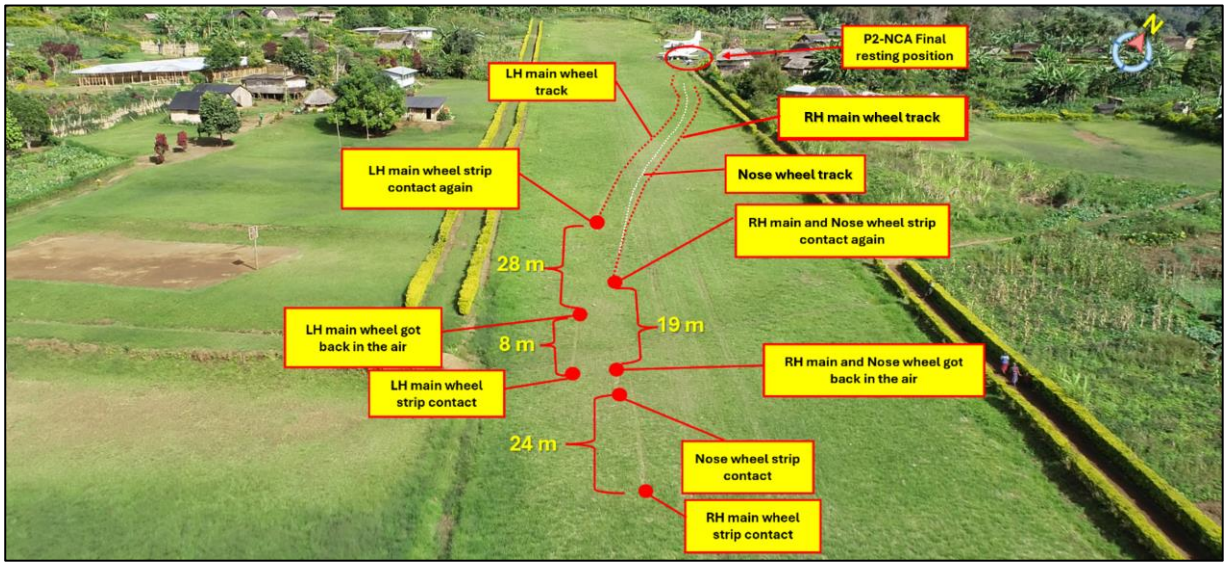

Figure 10:Tyre markings and indications from touchdown

The tyre markings showed that the aircraft continued to veer right past the centreline and towards the right edge of the runway and the right wing contacted the shrubs on the runway edge. The tyre markings also indicated that the right main wheel dropped into the drainage ditch, and this resulted in the aircraft's belly lowering closer to the ground, causing the propellers to strike the ground .The propellers continued to strike the ground as the aircraft tracked along the strip edge up to the parking bay, where the aircraft's right main wheel contacted the edge of the parking bay.

Upon the right wheel contacting the edge of the parking bay, the aircraft's nosewheel and right main wheel momentarily raised off the ground, resulting in the aircraft pivoting around on the left main wheel as it spun about 130 degrees to the left while continuing to drift into the parking bay, where it came to rest.

The onsite team also observed mud deposits on the aircraft's tyres and underbelly, indicating that the strip surface was wet and damp at the time of the accident.

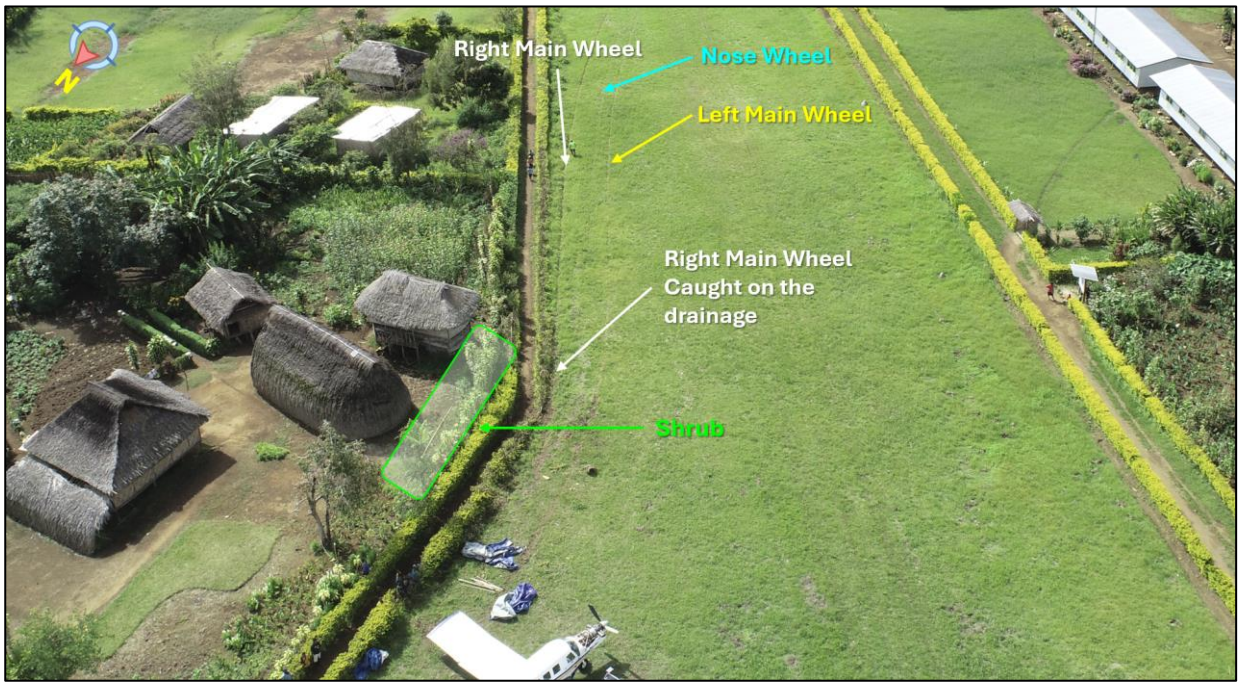

Figure 11:Final Resting Position of P2-NCA

During the onsite investigations, it was observed that the aircraft sustained substantial damage to its structure and certain components. The right-wing tip and the leading edge sustained substantial damage. The flap hinge was detached from the aircraft wing structure and the tips of all the propeller blades were also damaged.

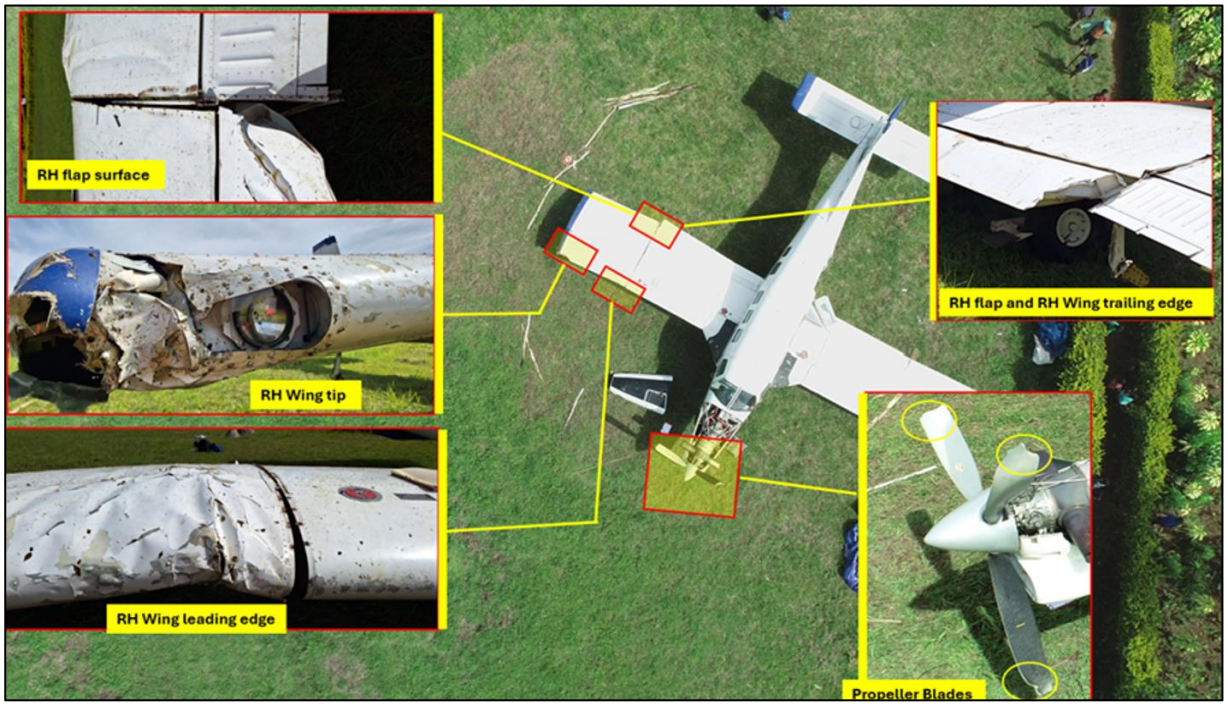

Figure 12:Overview of Damage Sustained by the Aircraft

1.13 Medical and pathological information

No medical or pathological investigations were conducted as a result of this occurrence, nor were they required.

1.14 Fire

There was no evidence of pre- or post-impact fire.

1.15 Survival aspects

1.15.1 Search and Rescue

According to recordings from Air Traffic Services, at 09:23, the crew cancelled SARWATCH with Moresby Flight Information Services on HF 5565 kHz upon arrival in the Bungawat circuit area.

The IP stated that after shutting down the aircraft, the pilot ICUS evacuated the passengers through the main door as instructed, while he conducted inspections on the aircraft.

Within half an hour of the accident, the IP contacted the operations base at Nadzab by phone to report the accident. The operator then attempted to send another company aircraft to Bungawat with an engineer on board, however, poor weather conditions prevented any rescue operations that day. The crew spent the night with locals at Bungawat and were rescued the following day.

1.16 Tests and Research

There was no test and research conducted as a result of this occurrence.

1.17 Organisational and Management Information

1.17.1 North Coast Aviation Limited (NCA)

North Coast Aviation (NCA) is privately owned with fixed-wing aircraft operations. Their regular operations span within Nadzab, Wau and Kerema. The certificate holder is authorised to operate non-schedule passenger and cargo flights in commercial air operations (charters) under *PNG Civil Aviation Rule Part 135* for the purposes of carriage of passengers and cargo to aerodromes where approval has been granted.

NCA has an Air Operator Certificate (AOC) 119/009. The certificate is issued pursuant to *section 47 (3)* and *49* of the *Civil Aviation Act 2000* and *CAR Part 119*. This certificate authorises North Coast Aviation to perform commercial air operations, as defined in the approved operations specifications and exposition. The AOC was effective from 1 November 2023 and expires on 1 May 2024.

The operator also holds a Maintenance Organisation Certificate (MOC) 145/009. This certificate is issued pursuant to *section 4 (3)* and *49* of the *Civil Aviation Act 2000* and *PNG CAR Part 145*. This certificate authorizes NCA to perform maintenance activities, as defined in the approved operations specifications and exposition. The MOC was effective on 1 November 2023 and expires on 31 October 2024.

1.17.2 Route and Aerodrome Guide

The operator's *Operations Manual (OM), Section 4.14.1 (b)* states:

> *Where an NCA aeroplane uses an aerodrome not promulgated in the PNGAIP[14], maintain an airstrip guide containing—the aerodrome data and procedures for ensuring that the condition of the aerodrome is safe for that operation; and procedures for ensuring that the condition of any required equipment, including safety equipment, is safe for that operation; and any limitations on the use of the aerodrome.*

According to *PNG CAR 135.77 Use of aerodromes.*

> *(c)The certificate holder shall, where its aeroplanes use an aerodrome not promulgated in the PNGAIP[15], maintain a register containing—*
>
> *(1) the aerodrome data; and*
>
> *(2) procedures for ensuring that the condition of the aerodrome is safe for that operation; and*
>
> *(3) procedures for ensuring that the condition of any required equipment, including safety equipment, is safe for that operation; and*
>
> *(4) any limitations on the use of the aerodrome.*

A review of the operator's Route and Aerodrome Guide showed that it did not comply with *PNG CAR Part 135.77(C)(2) (3) and (4)* for all aerodromes used, which included Bungawat Airstrip.

1.17.3 Operator's recommended operational times into Bungawat Airstrip

According to the crew, it is normal practice for the operator to schedule flights into Bungawat earlier in the morning between 07:30 to 09:00 when the area is most likely to be clear of cloud build ups. However, the aircraft arrived in Bungawat Airstrip past the operational time recommended by the operator.

The investigation also found that this practice of operating earlier in the morning to Bungawat is not documented in the operator's Route and Aerodrome Guide.

[14] PNG Aeronautical Information Publication.

1.17.4 Carriage of Minors

According to the operators *Operations Manual, Section 2.13 (1) (2) (3)* '*Carriage of Minors'*.

1. Two children may occupy one seat, other than a control seat or a seat adjacent to an emergency exit, if seated side by side provided their combined weight does not exceed 77 kg. The seat belt will be adjusted to secure both children at all times when seat belts are required to be worn.

NOTE: A person who has reached 14 years of age may not occupy the same seat with another person except as provided for in 2.

2. An infant or child less than 4 years old may be carried in the arms or on the lap of an adult passenger whilst the seat belt will be fastened around the person, the child must be secured by a safety belt attached to the adult's safety belt.
3. An infant or child less than 4 years old may be carried in an approved child restraint system which will conform to the following:

   A. Be secured to the aircraft seat or berth by a safety belt meeting the requirements of TSQ C22

   B. Not be fitted with a tether strap that secures the top of the infant or child seat

   C. Does not exceed the specified weight limits of the restraint system

   D. The child is accompanied by a parent or guardian, appointed by the parent, to care for the safety of the child during flight

   E. Meet the requirements of one of the following:

   1. TSOCIOO; or
   2. Australian Standard 1754; or
   3. United States Standard FMVSS 213
   4. European Standard ECE 44

The investigation found that three (3) children, ages six (6), seven (7) and twelve (12) were each strapped to three (3) adult passengers in Rows one (1) and two (2) in the passenger cabin with the same harness fastened around the child and adult passenger.

According to the Pacific Aerospace Limited *PAC 750XL Pilot Operating Handbook* and Civil Aviation Authority of New Zealand approved *PAC 750 XL Flight Manual AIR 2825, Section 9,Supplement 36 'Installation of Aero Twin Seats*, seat rows one , two and three are equipped with four-point harness [16], a seat bottom cushion and cover and a seat back and cover. Seat row four are equipped with a 3-point harness[17], a seat bottom cushion and cover and a seat back cushion and cover.

The seating arrangement for the minors/children on the day of the accident did not conform with the operator's procedure in the *Operations Manual, Section 2.13*, which does not have allowance for minors between 4 and 14 years old to be carried in the arms or on the lap of an adult passenger.

1.17.5 Regulatory Requirements for occupation of seats and wearing of restraints.

The seating arrangement for the minors/children on the day of the accident was non-compliant with *PNG Civil Aviation Rule 91.207* (Refer to Section 5.5, Appendix E). *PNG Civil Aviation Rule 91.207* has no allowance for minors/children between 4 and 14 years old to be seated on the lap of an adult and secured by a safety belt attached to the adult's safety belt.

Civil Aviation Safety Authority of PNG confirmed that there is no Advisory Circular/guidance material that provides methods for showing compliance with the requirements of *PNG CAR Part 91.207 'Occupation of seats and wearing of restraints'* .

[16] A four-point harness has two waist belts plus two shoulder straps that come down over the wearer's chest to attach at the center.
[17] A three-point shoulder harness fastens at the waist and provides additional protection for the head and torso with a strap across the chest.

Therefore, the investigation could not determine what Advisory circular/guidance material the operator had referenced to develop the procedure regarding the seating of two (2) children on one (1) seat provided their combined weight is 77 kg that is documented in the operator's *Operations Manual, Section 2.13 (1)*

1.17.6 Passenger Manifest Record from January 2023 to January 2024

Due to the number of passengers in the cabin exceeding the manufacturer's requirement of maximum 8 for the PAC 750XL on the day of the accident, the operator's passenger manifests for the period, 1 January 2023 to 8 January 2024 was reviewed to identify any trends or safety concerns. The investigation found that between that period, the passenger manifest showed that the total number of passengers was within the manufacturer's permissible limit.

1.18 Additional Information

1.18.1 Cloud Formation

Clouds form through a process involving water vapor, temperature changes, and tiny particles in the air.

According to *Federal Aviation Administration Aviation Weather Handbook (FAA-H-8083-28*), section *12.5* and 12.6;

> There are four basic cloud forms (appearances) observed in the Earth's atmosphere. By convention, the part of the atmosphere in which clouds are usually present has been divided into three levels: high, middle, and low . Each level is defined by the range of heights at which the cloud of a certain type occurs most frequently. The levels overlap, and their limits vary with latitude.
>
> Stratus clouds are Low-level clouds composed of thin layers of clouds covering a large area of the sky. Stratus clouds are simply called mist or fog when they form close to the ground. You can easily distinguish a stratus cloud by the long horizontal layers which have a fog-like appearance.
> The clouds form from large air masses that rise to the atmosphere and later condense. These are benign in terms of rainfall producing light showers if the temperatures fall below freezing.
> However, if enough moisture is retained at the ground level, the cloud can transform into a nimbostratus. Stratus clouds are very common in the coastal and mountainous regions. Stratus clouds generally signify overcast conditions with the potential for light precipitation or drizzle. They often form as a result of stable atmospheric conditions, such as a cool air mass settling near the ground or the lifting of moist air over a colder surface. The weather associated with stratus clouds is typically characterized by gray and dull skies, reduced visibility, and a misty or drizzly precipitation. The intensity of the precipitation is usually light, and the clouds can persist for hours or even days, creating a dreary and damp atmosphere.
>
> Cumulus clouds are also Low-level clouds, fluffy, white clouds that resemble cotton balls and are often associated with sunny days. They form due to convective processes, typically triggered by warm air rising from the surface.
>
> These 'piles of cotton' form a large mass with a well-defined rounded edge, which explains the name 'cumulus' which is Latin for 'heap'.
> You can find them virtually everywhere in the world except for the polar regions. When cumulus clouds are observed in the sky, it usually indicates fair and stable weather conditions. The weather under cumulus clouds is often characterized by bright, sunny skies, mild temperatures, and little to no precipitation. However, it's important to note that cumulus clouds can grow and develop into cumulonimbus clouds, which are associated with thunderstorms. Monitoring the changes in cumulus cloud development is essential to assess potential weather shifts accurately.

 **Cirri-form**	High-level clouds that form above 20,000 ft (6,000 m) and are usually composed of ice crystals. High-level clouds are typically thin and white in appearance, but can create an array of colors when the Sun is low on the horizon. Cirrus generally occur in fair weather and point in the direction of air movement at their elevation.
 **Nimbo-form**	Nimbus comes from the Latin word meaning "rain." These clouds typically form between 7,000 and 15,000 ft (2,100 to 4,600 m) and bring steady precipitation. As the clouds thicken and precipitation begins to fall, the bases of the clouds tend to lower toward the ground.
 **Cumuli-form**	Clouds that look like white, fluffy cotton balls or heaps and show the vertical motion or thermal uplift of air taking place in the atmosphere. The level at which condensation and cloud formation begins is indicated by a flat cloud base, and its height will depend upon the humidity of the rising air. The more humid the air, the lower the cloud base. The tops of these clouds can reach over 60,000 ft (18,000 m).
 **Strati-form**	Stratus is Latin for "layer" or "blanket." The clouds consist of a featureless low layer that can cover the entire sky like a blanket, bringing generally gray and dull weather. The cloud bases are usually only a few hundred feet above the ground. Over hills and mountains, they can reach ground level when they may be called fog. Also, as fog lifts off the ground due to daytime heating, the fog forms a layer of low stratus clouds.
Source: NWS JetStream – Online School for Weather	

Table 4:Cloud Types

Level	Polar Regions	Temperate Regions	Tropical Regions
High Clouds	10,000–25,000 ft (3–8 km)	16,500–40,000 ft (5–13 km)	20,000–60,000 ft (6–18 km)
Middle Clouds	6,500–13,000 ft (2–4 km)	6,500–23,000 ft (2–7 km)	6,500–25,000 ft (2–8 km)
Low Clouds	Surface–6,500 ft (0–2 km)	Surface–6,500 ft (0–2 km)	Surface–6,500 ft (0–2 km)

Table 5:Approximate Height of Cloud Bases Above the surface

Federal Aviation Administration *Aviation Weather Handbook (FAA-H-8083-28), Section 18.1.1.1.1.1* states;

> Mountain/Valley Fog Mountain tops jutting skyward out of the fog can be a beautiful sight, but it can also be dangerous. There are two ingredients that add to the formation of mountain/valley fog in areas of variable terrain. First, overnight, the ground cools as the heat that was gathered from the Sun's rays during the day is released back into the air near the ground level. The denser, cooler air on mountaintops sinks into valleys and collects there. Second, over the course of the night, the valley begins to fill from the bottom with cold layers of air. This phenomenon is known as "cold air drainage." This cooler air lowers the surrounding air temperatures closer to the dewpoint and subsequently saturation. If there is sufficient moisture in the air, fog will begin to form in these valleys as the night progresses.

1.18.2 Stabilized Approach Concept

According to the *Federal Aviation Administration Airplane Flying Handbook (FAA-H-8083)*;

A stabilized approach is one in which the pilot establishes and maintains a constant-angle glide path toward a predetermined point on the landing runway. It is based on the pilot's judgment of certain visual clues and depends on maintaining a constant final descent airspeed and configuration.

An airplane descending on final approach at a constant rate and airspeed travels in a straight line toward a spot on the ground ahead, commonly called the aiming point.

During instruction in landings, one of the important skills a pilot acquires is how to use visual cues to discern the true aiming point from any distance out on final approach. From this, the pilot determines if the current glide path will result in either an under or overshoot. Note that the aiming point is not where the airplane actually touches down. Since the pilot reduces the rate of descent during the round out (flare), the actual touchdown occurs farther down the runway. Considering float during round out, the pilot is also able to predict the point of touchdown with some accuracy.

Immediately after rolling out on final approach, the pilot adjusts the pitch attitude, power, and trim so that the airplane is descending directly toward the aiming point at the appropriate airspeed in the landing configuration. If it appears that the airplane is going to overshoot the desired landing spot, a steeper approach results by reducing power and lowering the pitch attitude to maintain airspeed. If available and not fully extended, the pilot may further extend the flaps. If the desired landing spot is being undershot and a shallower approach is needed, the pilot increases both power and pitch attitude to reduce the descent angle. Once the approach is set up and control pressures removed with trim, the pilot is free to devote significant attention toward outside references and use the available visual cues to fine tune the approach. The pilot should not stare at any one place, but rather scan from one point to another, such as from the aiming point to the horizon, to any objects along the runway, to an area well short of the runway, and back to the aiming point. This makes it easier to perceive any deviation from the desired glide path and determine if the airplane is proceeding directly toward the aiming point. The pilot should also glance at the airspeed indicator periodically and correct for any airspeed deviation.

Pilots normally establish a stabilized approach before short final. The round out, touchdown, and landing roll are much easier to accomplish when preceded by a stabilized final approach, which reduces the chance of a landing mishap. Therefore, deviations from the desired glide path should be detected and corrected early so that the magnitude of corrections during the later portion of the approach is small.

If the approach is very high or very low, it may not be possible to establish a stabilized approach, and the pilot normally executes a go-around.

If the airplane is initially low and undershooting the aiming point, the pilot may intercept the desired glide path by increasing pitch attitude and adding power to level off while maintaining the correct airspeed. This may necessitate a substantial increase in power if the aircraft is operating on the backside of the power curve.

As the airplane intercepts the desired glide path, the pilot reduces power and pitches down to remain on the glide path. Retracting the flaps to correct for an undershoot creates an unnecessary risk. It may cause a sudden decrease in lift, an excessive sink rate, and an aggravated unstable condition.

1.18.3 Standard Passenger weight

PNG *Civil Aviation Rule Part 135.303 (b) (3)(i) (ii) (iii)*[18] states ;

(b) The total weight of passengers, (excluding their carry-on-baggage) must be established by using one of the following:

(3) the following applicable standard weight for every passenger:

(i) 15 kg for a child under 2 years of age;
(ii) 46 kg for a child of the age of 2 years and under the age of 13 years;
(iii) 86 kg for a person of over the age of 13 years.

[18] PNG CAR Part 135 applicable 08 November 2021.

However, the Operator's *Operations Manual ,section 2.5 (B) 'Standard Passenger Weights'* states;

> B. At out ports where calibrated scales are not available the Company passenger standard weights established will be used. Until the standard company weights have been established the weights as defined by Part 135.303 will be used. They are:
>
> 1. 84 kg for an adult male or female
> 2. 46 kg for a child aged 4 to 14 years
> 3. 15 kg for a child under 4 years

The investigation identified that the operator's provisions on Standard Passenger Weight is non-compliant with *PNG CAR Part 135.303 (b) (3)(i) (ii) (iii).*

1.19 Useful or effective investigation techniques

The investigation was conducted in accordance with the *Papua New Guinea Civil Aviation Act 2000*, and the Accident Investigation Commission's approved policies and procedures, and in accordance with the Standards and Recommended Practices of *ICAO Annex 13* to the *Chicago Convention on International Civil Aviation.*

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2 ANALYSIS

2.1 General

The analysis of this report will discuss the relevant issues and circumstances resulting in P2-NCA aircraft experiencing a loss of control immediately after touchdown and subsequent runway excursion at Bungawat Airstrip, Morobe Province.

The investigation determined that there were no issues with the aircraft and all systems were generally operating normally. The analysis will therefore focus on weather, airstrip conditions, geographical location and topography of the airstrip and pilot technique but not necessarily under separate headings.

2.1.1 Flight Operation

On the day of the accident, upon arrival in the Bungawat area and following an assessment of the circuit area, the crew tracked Northeast, overhead the strip to conduct further assessment of the circuit area. Following the assessment, the crew tracked for a right circuit from overhead and continued approach for landing on Runway 32. The investigation found that due to clouds in the final approach path, the crew elected to conduct an oblique pattern from the start of right base, straight to short finals and touchdown to maintain visual clearance of the cloud build up on the final path to landing. Therefore, the crew flew the aircraft further right of the normal finals track, before heading adjustments were made to the aircraft tracking to line up with runway heading for a safe touchdown.

Tyre markings showed that the aircraft touched down left of centerline. Taking into consideration the position at which the aircraft had touched down, it is the view of the AIC that the aircraft had drifted beyond centerline tracking when heading adjustments were made on short finals. On correction of the oblique finals flight path, prior to touchdown, it is highly likely that the crew did not adjust the heading sufficiently to prevent overshooting the centerline tracking and also to cater for the drift resulting from such a track adjustment. The aircraft, therefore drifted further left of centerline tracking, prior to touchdown.

Furthermore, the right main wheel was the first to contact the ground upon touchdown, as the left main wheel and the nose wheel touched down almost simultaneously shortly after the right main wheel, which is an indication that the aircraft was not flared sufficiently on touchdown, resulting in a flat landing from a lower than appropriate attitude for landing. The nose wheel marking also showed that the aircraft touched down left of centerline with a full right nose wheel deflection and a heading to the right.

The sequence of the tyre markings of the nose wheel and the left and right main wheels also indicated that the aircraft touched down with a lowered right wing. It is likely that as the aircraft touched down, the IP was still in the process of correcting the aircrafts tracking from left of centerline, and the aircraft was turning to the right as the wheels contacted the ground. This resulted in the aircraft veering to the right immediately on touchdown.

The investigation also established that following touchdown, the IP overcorrected the aircraft's tracking from left of centerline to the right. This resulted in the aircraft overshooting centerline and veering further right towards the runway edge. It was also established that following touchdown, as the aircraft tracked past the centerline towards the right, the aircraft heading was changed from right to left to maintain centerline tracking.

It is the view of the AIC that this was a result of pilot input to arrest the overcorrection initially made on touchdown. However, due to the airstrip surface condition, coupled with the aircraft's momentum, the aircraft tracked past centerline and drifted towards the right edge of Runway 32.

Considering the strip surface condition being wet and damp at the time of the accident, it is highly likely that the condition of the strip surface on the day of the occurrence would have made it challenging to maintain directional control on the ground following touchdown, and the excessive control input by the IP directly resulted in an over correction that led to the loss of directional control.

As the aircraft's right wing contacted the shrubs on the runway edge, the IP continued to apply the left rudder pedal, while the aircraft continued to track along the runway edge towards the parking bay.

The investigation established that the aircraft continued to track along the drainage ditch at the edge of the runway despite the IP's input to correct the aircraft's tracking due to the aircraft's right main wheel being restricted since it had dropped into the drainage ditch. Additionally, when the right main wheel dropped into the drainage ditch, the aircraft's belly lowered closer to the ground, and this resulted in the propeller striking the ground. The propeller continued to strike the ground as the aircraft tracked along the strip edge up to the parking bay, where the aircraft's right main wheel contacted the edge of the parking bay.

Upon the right wheel contacting the edge of the parking bay, the aircraft's nosewheel and right main wheel momentarily raised off the ground, resulting in the aircraft pivoting around the left main wheel as it spun to the left while continuing to drift into the parking bay, where it came to rest. The left spin was noted to be a change of heading of about 130 degrees to the left, and this in the view of the AIC was a result of the IP continuing to apply left rudder pedal input as the aircraft tracked along the runway edge.

2.1.2 Airstrip Condition

The condition of Bungawat airstrip had challenges posed by its geographical location and topography. Situated atop a ridge and surrounded by hills and cliffs, the airstrip experiences unique weather patterns that lead to cloud formation during the day as the surface begins to heat up. Water from the river and other sources evaporate due to heat from the sun, turning into water vapor; an invisible gas. This water vapor rises into the atmosphere and as it ascends, the air pressure decreases and the temperature drops. When the air cools to its dew point, the water vapor condenses onto tiny particles like dust, salt, or pollen, forming tiny water droplets. This process is called condensation. These droplets or ice crystals cluster together to form clouds. The cloud buildup on the final approach path would be strati -form clouds which are low levels clouds or fog.

It is a normal practice for the operator to schedule flights into Bungawat earlier in the morning when the area is more likely to be clear of cloud build ups. The aircraft arrived in Bungawat Airstrip outside the operational time recommended by the operator, which according to the operator is between 07:30 to 09:00.

Furthermore, the soft surface at the edges of the airstrip resulted in a loss of directional control and ineffectiveness of the rudder input.

The airstrip's condition, geographical location, topography, weather and time of arrival into Bungawat, also contributed to the accident.

2.1.3 Occupation of Seats and wearing of Restraints

The investigation also found that the number of passengers in the cabin exceeded the manufacturer’s maximum allowable, which is eight (8). Since the minimum crew for the PAC 750XL is one pilot who occupies the left seat in front, the right front seat, adjacent to the pilot’s seat may be occupied by a passenger. The right seat in the front, adjacent to the left seat was occupied by the IP who was monitoring the pilot ICUS.

The investigation found that the seating arrangement in the passenger cabin on the day of the accident was also non-compliant with regulatory requirements and non-conformant with the operator’s procedure which only allows for infants below 4 years to be carried or seated on the lap of an adult and secured by a safety belt attached to the adult’s safety belt. Although this non-conformance and non-compliance did not directly contribute to the accident, it is a safety risk if left unresolved.

The investigation could not determine what guidance material the operator had referenced to develop their procedure regarding the seating of two (2) children on one seat provided their combined weight did not exceed 77 kg.

The investigation also determined that although the number of passengers had exceeded the permissible limit, the investigation determined that the aircraft’s takeoff and landing weights during the accident were within the limit. The investigation could not determine the centre of gravity due to the unavailability of relevant information. The operator provided a Weight and Balance Sheet three (3) days after the accident occurred. However, the investigation could not determine the veracity of this Weight and Balance Sheet.

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3 CONCLUSIONS

3.1 Findings

3.1.1 Aircraft

a) The aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures.

b) The aircraft had a valid Certificate of Airworthiness and had been maintained in compliance with the regulations.

c) The aircraft was within the required weight limits for take-off and landing.

d) The investigation could not determine the centre of gravity due to the unavailability of relevant information.

e) There was no evidence of any defect or malfunction prior to the accident.

f) There was no evidence of airframe failure or system malfunction prior to the accident.

g) The aircraft was structurally intact prior to impact.

h) All damage sustained to the aircraft's right wing and propellers was due to the aircraft contacting the shrubs on the right side of the runway edge.

i) The engine was operating within the required parameters.

3.1.2 Pilots

a) The crew were properly licensed and qualified for the flight in accordance with existing regulations.

b) The crew were medically fit to operate the flight.

c) The IP had conducted six landings into Bungawat Airstrip within the past three months prior to the accident flight.

d) The Pilot ICUS had not conducted any flights to Bungawat Airstrip prior to the accident flight.

e) Crew flight and duty times were within the limit.

3.1.3 Flight operations

a) The crew carried out normal radio communications with the relevant ATS units.

b) The flight was conducted outside of the recommended operational times for Bungawat.

c) The crew conducted an oblique final due to the clouds along the final approach path.

d) The aircraft conducted a high approach angle on approach leading to a steeper descent on short final.

e) The aircraft touched down flat, left of centerline.

f) The aircraft touched down further up the runway from the normal touchdown point beyond Runway 32 threshold

g) The tyre markings also indicated that the aircraft was not flared sufficiently on touchdown, resulting in a flat landing from a lower than appropriate attitude for landing.

3.1.4 Operator

a) The Operator's Route and Aerodrome Guide did not comply with *PNG CAR Part 135.77(C)(2), (3)* and *(4)* requirements for all airstrips used, which includes Bungawat Airstrip.

b) The operator did not conform with company procedures on the carriage of minors.

c) The operator did not comply with regulatory requirements regarding the occupation of seats and wearing of restraints.

d) The operator did not comply with the manufacturer's requirement of maximum eight (8) passengers in the cabin on the PAC 750XL aircraft.

3.1.5 Airstrip

a) Bungawat Airstrip is a one-way landing and taking off strip.

b) Bungawat Airstrip surface is mainly grass.

c) At the time of the accident, the left and right sides of the strip was wet and damp.

d) The airstrip's windsock was damaged.

e) The cone markers at the threshold and runway edge were not visible.

3.1.6 Air Traffic services and airport facilities

a) There was a two-way radio communication maintained between the flight crew and the ATC unit.

3.1.7 Flight Recorders

a) The aircraft was not equipped with a FDR or a CVR; neither was it required by the current PNG Civil Aviation Rules.

3.1.8 Medical

a) There was no evidence that the crew suffered any sudden illness or incapacitation which might have affected his ability to control the aircraft.

3.1.9 Survivability

a) The accident was survivable.

b) The crew and the passengers egressed the aircraft without injuries and external assistance.

c) The crew cancelled the SARWATCH before landing at Bungawat Airstrip.

3.2 Causes [Contributing factors]

The investigation identified factors related to operational, weather, airstrip condition, geographical location, topography of the airstrip and aircraft handling/manoeuvring techniques by the pilot from final approach to touchdown.

The aircraft had arrived in Bungawat Airstrip outside the operational time recommended by the operator, which according to the operator is a normal practice for the operator to schedule flights into Bungawat earlier in the morning (between 07.30 to 09:00) when the area is more likely to be clear of cloud build ups. Weather patterns associated with the geographical location of the airstrip include cloud formation during the day as the surface begins to heat up. Prior to departing from Nadzab, the crew obtained a weather update from the operator's local agent based in Bungawat, and the weather was reported to be fine, calm wind and clear skies.

Upon arrival in the Bungawat circuit area, the crew observed clouds build up in the final approach path. The crew then maneuvered the aircraft Northeast, overhead the strip for further aerial inspection and assessed it as being suitable for landing. The crew observed that the right side of the final approach path was clear of clouds, so they elected to continue approach for landing on Runway 32. The crew tracked for a right circuit from overhead and continued the approach. Due to clouds in the final approach path, the crew conducted an oblique pattern from the start of right base, straight to short finals and touchdown to maintain visual clearance of the cloud build ups on the final path to landing. Therefore, the crew flew the aircraft further right of the normal track for finals, before heading adjustments were made to the aircraft tracking, to line up with runway heading for a safe touchdown.

The investigation found that as a result of the aircraft overshooting centerline on short finals, the IP applied control inputs to correct the overshoot prior to touchdown. The overshoot on short finals appeared to be the outcome of an insufficient heading change when the aircraft intercepted the extended centerline from the oblique finals flight path. Therefore, the aircraft drifted further left of centerline on touchdown.

The investigation also found that the loss of control immediately after touchdown left of centerline was initiated by the incorrect landing technique, with an offset heading to the right and insufficient flare on touchdown, resulting in a flat landing from a lower than required attitude for landing. The incorrect landing technique on touchdown, combined with a wet and damp strip surface, created a controllability situation that the IP was not able to recover from. The investigation further noted that the aircraft touched down further up the runway in relation to the normal touchdown point, and this, combined with the flat landing indicated a high approach angle (high profile) on approach leading to a steeper descent on short final, resulting in an unstable approach on short finals.

The aircraft touched down with a full right nose deflection and a heading to the right and a lowered right wing. This is because as the aircraft touched down, the pilot was still in the process of correcting the aircrafts tracking from left of centerline and the aircraft was turning to the right as the wheels contacted the ground. However, following touchdown, the pilot overcorrected the aircrafts tracking from left of centerline to the right, resulting in the aircraft overshooting centerline and a loss of directional control as the aircraft veered further to the right towards the runway edge. As the aircraft tracked past the centerline towards the right, the pilot changed the aircraft heading from right to left to maintain centerline tracking. However, due to the sides of the airstrip surface being wet and damp, coupled with the aircraft's momentum, it was difficult to maintain directional control and the aircraft tracked past centerline and drifted towards the right edge of Runway 32 where the right wing contacted the shrubs as the right main wheel dropped into the drainage ditch on the runway edge.

When the right main wheel dropped into the drainage ditch, the aircraft's belly lowered closer to the ground, and this resulted in the propeller striking the ground. The propeller continued to strike the ground as the aircraft tracked along the strip edge up to the parking bay, where the aircraft's right main wheel contacted the edge of the parking bay.

Upon the right wheel contacting the edge of the parking bay, the aircraft's nosewheel and right main wheel momentarily raised off the ground, resulting in the aircraft pivoting around the left main wheel as it spun to the left at about 130 degrees while continuing to drift into the parking bay, where it came to rest.

3.3 Other factors

The investigation identified safety deficiencies or concerns during the investigation that while not causal to the accident, nevertheless, should be addressed with the aim of accident prevention. The investigation identified the following safety deficiencies or concerns:

- The Operator's Route and Aerodrome Guide does not comply with PNG *CAR Part 135.77(C)(2), (3)* and *(4)* requirements for all airstrips used, which includes Bungawat Airstrip.
- The operator did not conform to company provisions relating to the carriage of minors.
- The operator did not comply with the regulatory requirements on the occupation of seats and wearing of restraints.
- The operator did not comply with the manufacturer's requirement of maximum eight (8) passengers in the cabin on the PAC 750XL aircraft.
- The investigation identified that the operator's provisions on Standard Passenger Weight is non-compliant with *PNG CAR Part 135.303 (b) (3)(i)(ii)(iii).*

4 SAFETY RECOMMENDATIONS

4.1 Recommendation number AIC 24-R10/24-1001 to North Coast Aviation Limited (NCA)

The PNG Accident Investigation Commission (AIC) recommends that North Coast Aviation Limited should update the Route and Aerodrome Guide to include the following for all aerodromes used, which includes Bungawat Airstrip, to comply with *CAR Part 135.77 (c) (2) (3)* and *(4)*;

a) procedures for ensuring that the condition of the aerodrome is safe for that operation;

b) procedures for ensuring that the condition of any required equipment, including safety equipment is safe for that operation; and

c) any limitations on the use of the aerodrome.

Action requested

The AIC requests that North Coast Aviation Limited (NCA) note recommendation AIC 24-R10/24-1001 and provide a response to the AIC within 90 days of the issue date, but no later than 31 December 2024 and explain (including with evidence) how NCA has addressed the safety deficiency identified in the safety recommendation.

4.2 Recommendation number AIC 24-R11/24-1001 to North Coast Aviation Limited (NCA)

The PNG Accident Investigation Commission (AIC) recommends that North Coast Aviation Limited should;

a) establish and document Approach Criteria and Requirements;

b) ensure that its pilots are aware of the Approach Criteria and Requirements to prevent unstable approaches that may lead to an unsafe landing.

Action requested

The AIC requests that North Coast Aviation Limited (NCA) note recommendation AIC 24-R11/24-1001 and provide a response to the AIC within 90 days of the issue date, but no later than 31 December 2024 and explain (including with evidence) how NCA has addressed the safety deficiency identified in the safety recommendation.

4.3 Recommendation number AIC 24-R12/24-1001 to North Coast Aviation Limited (NCAL)

The PNG Accident Investigation Commission (AIC) recommends that North Coast Aviation Limited (NCAL) should ensure that appropriate provisions are in place to ensure that its pilots and ground personnel strictly conform to NCAL's policies and procedures, the Aircraft Manufacturer's specification, and PNG regulatory requirements relating to aircraft seat occupation and use of restraints.

Action requested

The AIC requests that North Coast Aviation Limited (NCAL) note recommendation AIC 24-R12/24-1001 and provide a response to the AIC within 90 days of the issue date, but no later than 24 February 2025 and explain (including with evidence) how NCAL has addressed the safety deficiency identified in the safety recommendation.

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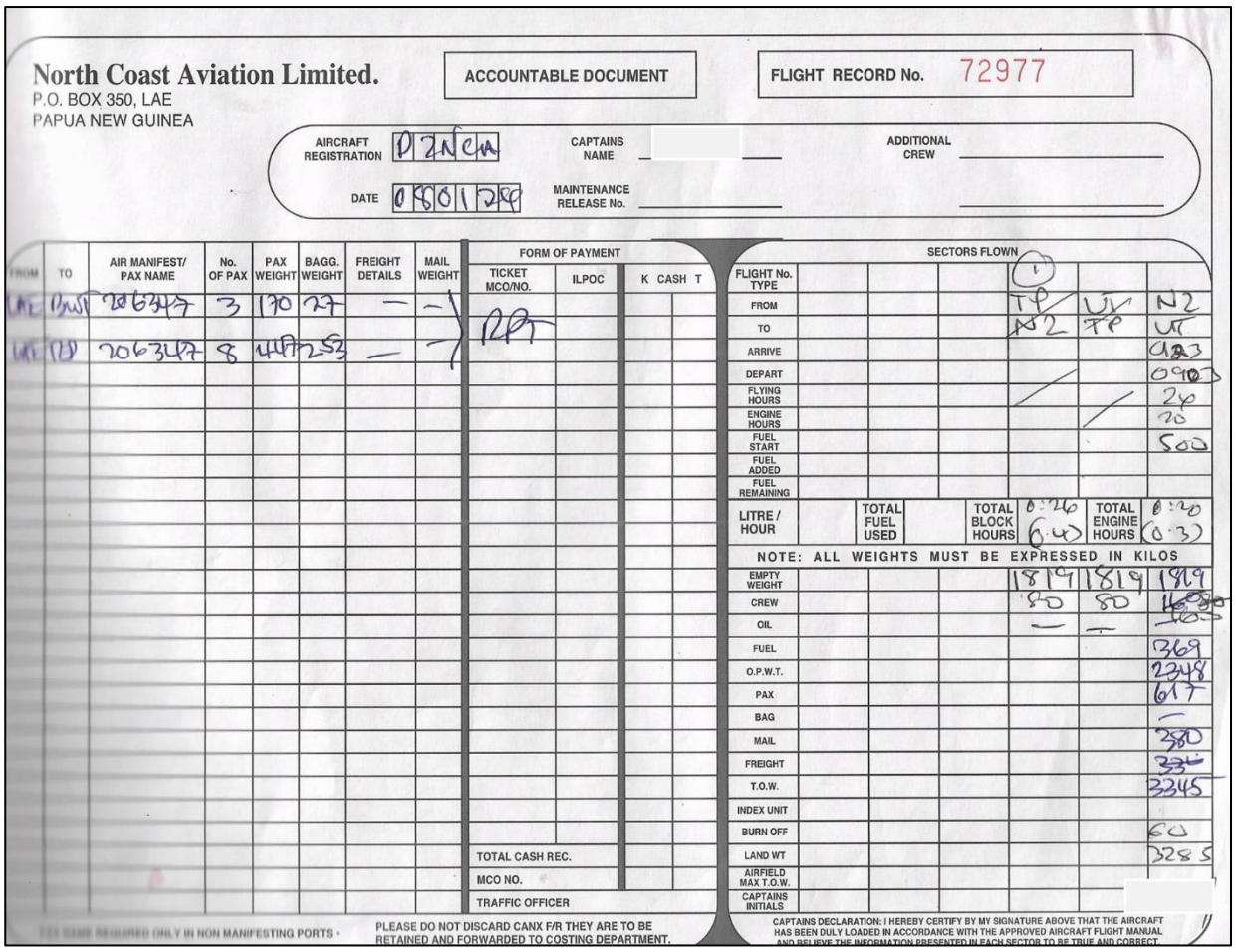
5 APPENDICES

5.1 Appendix A: Daily Flight Record



North Coast Aviation Limited.
P.O. BOX 350, LAE
PAPUA NEW GUINEA

ACCOUNTABLE DOCUMENT

FLIGHT RECORD No. 72977

AIRCRAFT REGISTRATION P2NCA
CAPTAINS NAME
ADDITIONAL CREW
DATE 08/01/2019
MAINTENANCE RELEASE No.

FROM	TO	AIR MANIFEST/ PAX NAME	No. OF PAX	PAX WEIGHT	BAGG. WEIGHT	FREIGHT DETAILS	MAIL WEIGHT
LAE	BUS	206347	3	170	27	—	—
LAE	TB	206347	8	447	253	—	—

FORM OF PAYMENT

TICKET MCO/NO.	ILPOC	K CASH T
RPT		

TOTAL CASH REC.
MCO NO.
TRAFFIC OFFICER

SECTORS FLOWN

	1		
FLIGHT No. TYPE			
FROM	TP	UK	N2
TO	N2	TP	UK
ARRIVE			0923
DEPART			0900
FLYING HOURS			2+0
ENGINE HOURS			20
FUEL START			500
FUEL ADDED			
FUEL REMAINING			

LITRE / HOUR | TOTAL FUEL USED | TOTAL BLOCK HOURS 0:26 6:43 | TOTAL ENGINE HOURS 0:20 6:33

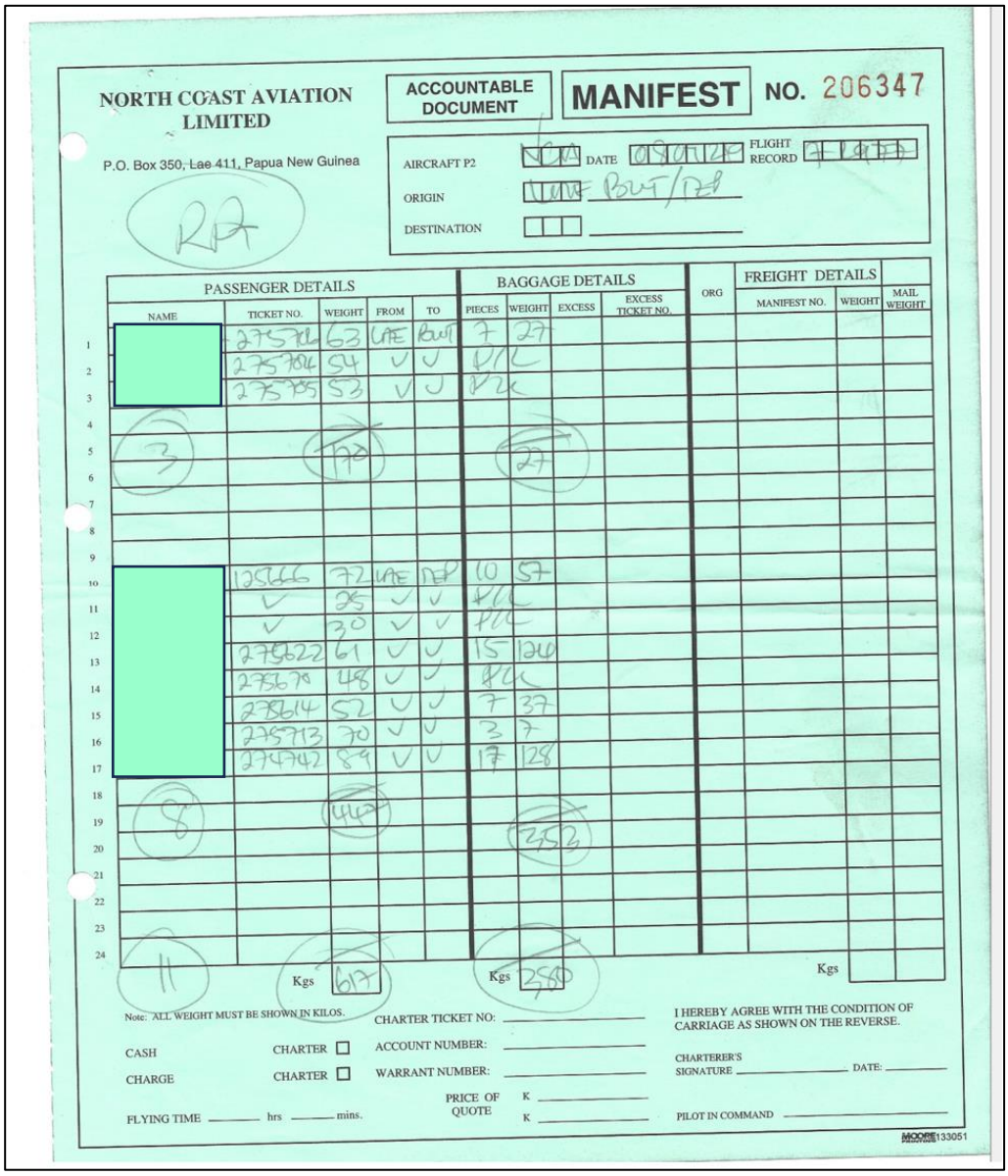
NOTE: ALL WEIGHTS MUST BE EXPRESSED IN KILOS

EMPTY WEIGHT	1819	1819	1819
CREW	80	80	160
OIL	—	—	—
FUEL			369
O.P.W.T.			2348
PAX			617
BAG			—
MAIL			380
FREIGHT			33
T.O.W.			3345
INDEX UNIT			
BURN OFF			60
LAND WT			3285
AIRFIELD MAX T.O.W.			
CAPTAINS INITIALS			

PLEASE DO NOT DISCARD CANX F/R THEY ARE TO BE RETAINED AND FORWARDED TO COSTING DEPARTMENT.

CAPTAINS DECLARATION: I HEREBY CERTIFY BY MY SIGNATURE ABOVE THAT THE AIRCRAFT HAS BEEN DULY LOADED IN ACCORDANCE WITH THE APPROVED AIRCRAFT FLIGHT MANUAL AND BELIEVE THE INFORMATION PRESENTED IN EACH SECTOR TO BE TRUE AND CORRECT.

5.2 Appendix B: Passenger Manifest No. 206347



NORTH COAST AVIATION LIMITED

P.O. Box 350, Lae 411, Papua New Guinea

ACCOUNTABLE DOCUMENT

MANIFEST NO. 206347

AIRCRAFT P2 [N][C][A] DATE [0][5][0][7][1][2] FLIGHT RECORD

ORIGIN LAE BUT/DAU

DESTINATION

	PASSENGER DETAILS					BAGGAGE DETAILS				ORG	FREIGHT DETAILS		
	NAME	TICKET NO.	WEIGHT	FROM	TO	PIECES	WEIGHT	EXCESS	EXCESS TICKET NO.		MANIFEST NO.	WEIGHT	MAIL WEIGHT
1		275706	63	LAE	BUT	7	27						
2		275704	54	V	V	PAL							
3		275705	53	V	V	PAL							
4													
5	3		170				27						
6													
7													
8													
9													
10		125666	72	LAE	DAU	10	57						
11		V	25	V	V	PAL							
12		V	30	V	V	PAL							
13		275622	61	V	V	15	126						
14		275678	48	V	V	PAL							
15		275614	52	V	V	7	37						
16		275713	70	V	V	3	7						
17		274742	89	V	V	17	128						
18													
19	8		444				235						
20													
21													
22													
23													
24	11		617				750						
			Kgs				Kgs					Kgs	

Note: ALL WEIGHT MUST BE SHOWN IN KILOS.

CHARTER TICKET NO: _____

CASH

CHARGE

CHARTER ☐

CHARTER ☐

ACCOUNT NUMBER: _____

WARRANT NUMBER: _____

I HEREBY AGREE WITH THE CONDITION OF CARRIAGE AS SHOWN ON THE REVERSE.

CHARTERER'S SIGNATURE _____ DATE: _____

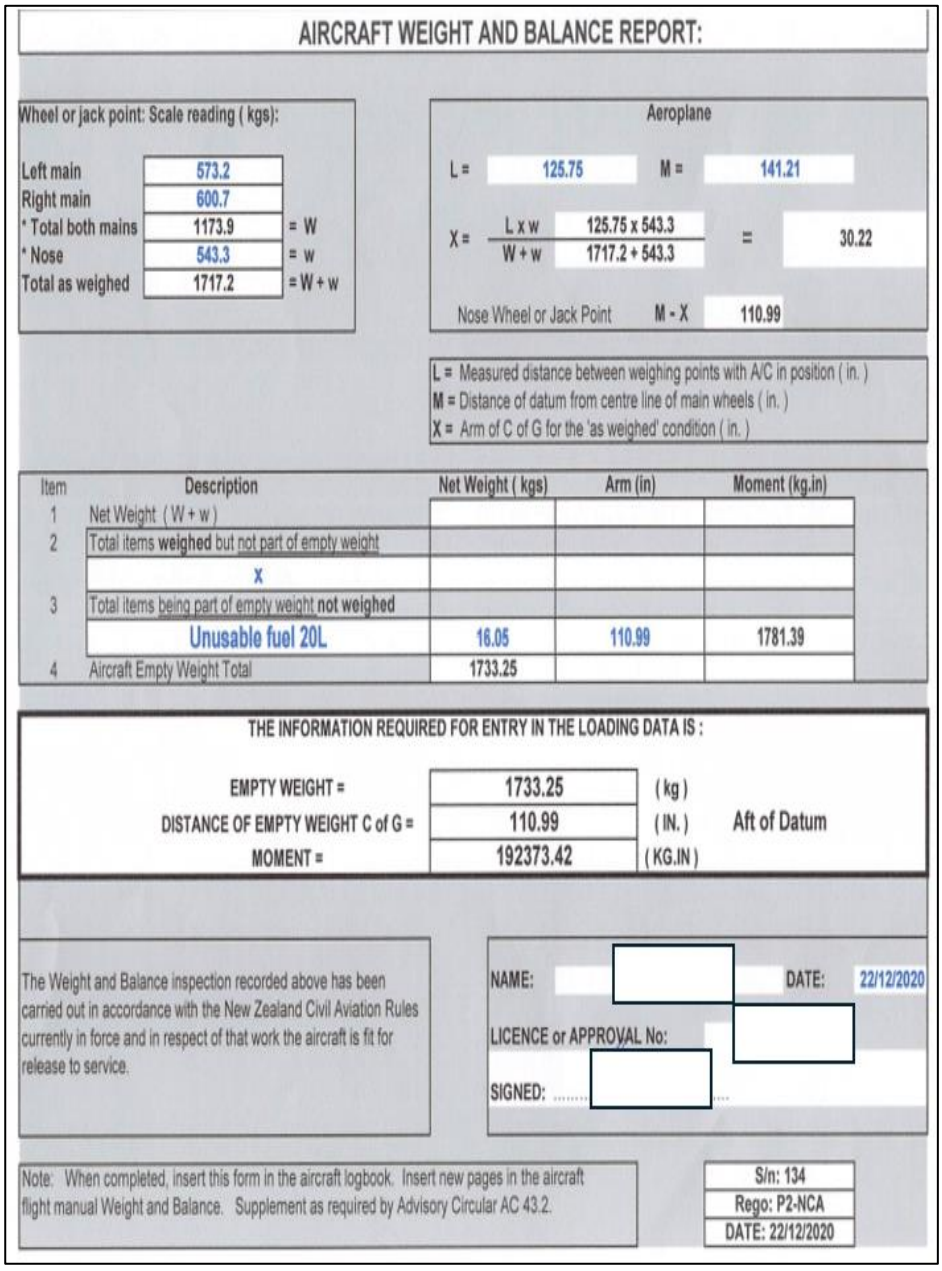
FLYING TIME _____ hrs _____ mins.

PRICE OF QUOTE K _____ K _____

PILOT IN COMMAND _____

MOORE 133051

5.3 Appendix C: Aircraft Weight and Balance Report



AIRCRAFT WEIGHT AND BALANCE REPORT:

Wheel or jack point: Scale reading (kgs):

Left main	573.2	
Right main	600.7	
* Total both mains	1173.9	= W
* Nose	543.3	= w
Total as weighed	1717.2	= W + w

Aeroplane

L = 125.75 M = 141.21

$X = \frac{L \times w}{W + w} = \frac{125.75 \times 543.3}{1717.2 + 543.3} = 30.22$

Nose Wheel or Jack Point M - X 110.99

L = Measured distance between weighing points with A/C in position (in.)
M = Distance of datum from centre line of main wheels (in.)
X = Arm of C of G for the 'as weighed' condition (in.)

Item	Description	Net Weight (kgs)	Arm (in)	Moment (kg.in)
1	Net Weight (W + w)			
2	Total items **weighed** but not part of empty weight			
	X			
3	Total items being part of empty weight **not weighed**			
	Unusable fuel 20L	16.05	110.99	1781.39
4	Aircraft Empty Weight Total	1733.25		

THE INFORMATION REQUIRED FOR ENTRY IN THE LOADING DATA IS :

EMPTY WEIGHT =	1733.25	(kg)	
DISTANCE OF EMPTY WEIGHT C of G =	110.99	(IN.)	Aft of Datum
MOMENT =	192373.42	(KG.IN)	

The Weight and Balance inspection recorded above has been carried out in accordance with the New Zealand Civil Aviation Rules currently in force and in respect of that work the aircraft is fit for release to service.

NAME: DATE: 22/12/2020

LICENCE or APPROVAL No:

SIGNED: .....

Note: When completed, insert this form in the aircraft logbook. Insert new pages in the aircraft flight manual Weight and Balance. Supplement as required by Advisory Circular AC 43.2.

S/n: 134
Rego: P2-NCA
DATE: 22/12/2020

5.4 Appendix D: Rural Airstrip Agency Bungawat Airstrip Subsurface Strength Assessment

Subsurface Strength Assessment

Recommendations from the Jan 2021 report:

In order to improve the sub-surface strength of the airstrip, we recommend that:

- *Perimeter drains must be constructed on both sides, about 1m wide and 1m deep*
- *Cut subsoil drains across the airstrip (trench cut and backfilled with wrapped gravel).*
- *Always remove dead grass after being cut because it will affect the surface strength and,*
- *Patch repair the soft section at 505m with gravel.*

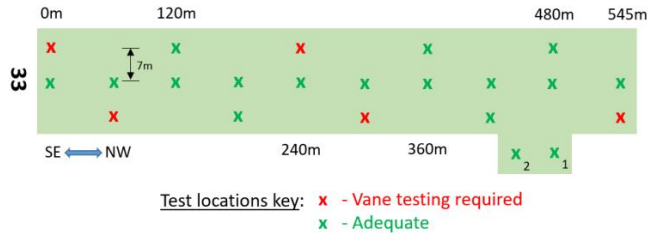


Figure 1: Showing DCP test locations at 60m interval. Diagram not drawn to scale.

Figure 2: Showing DCP test location and results from Jan 2021.

5.5 Appendix E: PNG Civil Aviation Rule Part 91.207

91.207 Occupation of seats and wearing of restraints

(a) A pilot-in-command of an aircraft must require each passenger to occupy a seat or berth and to fasten their safety belt, or restraining belt, or, if equipped, safety harness or safety belt with single diagonal shoulder strap—

(1) during each take-off and landing; and

(2) when the aircraft is flying at a height of less than 1000 feet above the surface; and

(3) during aerobatic flight; and

(4) at all times in an open cockpit aircraft; and

(5) at other times when the pilot-in-command considers it necessary for their safety.

(b) A pilot-in-command of an aircraft may permit a passenger to unfasten a safety harness or safety belt with single diagonal shoulder strap -

(1) during take-off and landing; and

(2) when the aircraft is flying at a height of less than 1000 feet above the surface-if the pilot-in-command is satisfied that such action is necessary for the passenger's performance of an essential function associated with the purpose of the flight.

(c) A pilot-in-command of an aircraft must require each passenger to place their seat in the take-off and landing configuration during take-off and landing.

(d) Paragraphs (a)(1), (2), and (5) do not apply to a child under 4 years of age if the child—

(1) is held by an adult who is occupying a seat or berth, and the child is secured by a safety belt attached to the adult's safety belt; or

(2) occupies a seat equipped with a child restraint system, if the child does not exceed the specified weight limit for that system and is accompanied by a parent, guardian, or by an attendant designated by the child's parent or guardian to attend to the safety of the child

during the flight.

(e) Paragraph (d)(1) and (2) do not apply to the carriage of children under 4 years of age on domestic flights operated within PNG.

(f) Paragraph (a) shall not apply to persons carried in balloons or engaged in parachute operations.