ACCIDENT INVESTIGATION COMMISSION

FINAL REPORT

AIC 23 - 1001

North Coast Aviation (NCA)

P2-BJD

PAC 750XL

Controlled Flight into Terrain during take-off

Giramben Airstrip, Jiwaka Province

Papua New Guinea

9 February 2023

About the AIC

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

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

The AIC performs its functions in accordance with the provisions of the *PNG Civil Aviation Act 2000 (As Amended)*, 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 comment with the need to properly explain what happened, and why it happened, in a fair and unbiased manner.

About this report

On 9 February 2023 at 13:30 local time (03:30 UTC), the AIC became aware through social media of an accident involving a PAC 750XL aircraft, registered P2-BJD, owned and operated by North Coast Aviation at Giramben Airstrip, Jiwaka Province. The AIC immediately commenced an investigation, and a team was deployed to the accident site on 10 February 2023.

The accident investigation *Final Report* has been produced by the AIC, P O Box 1709, Boroko 111, NCD Papua New Guinea. It has been approved for public release by the Commission in accordance with *Para 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 (As Amended),* and *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 *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
12 March 2024

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GLOSSARY OF ABBREVIATION

AC	: Advisory Circular
AFM	: Aircraft flight manual
AIC	: Accident Investigation Commission
AMSL	: Above mean sea level
AOC	: Air operator certificate
CAR	: Civil aviation rules
CASA	: Civil aviation safety authority
CFIT	: Controlled flight into terrain
CLTC	: Christian Leaders Training Centre
CPL	: Commercial pilot license
CRM	: Crew resource management
DFR	: Daily flight record
ELT	: Emergency locator transmitter
ER	: Emergency room
ERP	: Emergency room patient
FOM	: Flight operations manager
ft	: Feet
HF	: High frequency
ICAO	: International civil aviation organisation
kg	: Kilogram (s)
km	: Kilometre (s)
kts	: Knot (s)
l	: Litre (s)
lbs	: Pounds
m	: Meter (s)
MEL	: Minimum equipment list
MLG	: Main landing gear
MOC	: Maintenance organisation certificate
NAC	: National Airports Corporation
NCA	: North Coast Aviation
NLG	: Nose landing gear
NSPL	: NiuSky Pacific Limited
NM	: Nautical miles
NWS	: National Weather Services
PAC	: Pacific Aerospace
psi	: Pounds per square inch
RAA	: Rural Airstrip Authority
SLA	: Service level agreement
SMS	: Safety management system
TAF	: Terminal aerodrome forecast
TNT	: Trans Niugini Tours
UTC	: Coordinated universal time
VHF	: Very high frequency
VFR	: Visual flight rules

INTRODUCTION

SYNOPSIS

On 9 February 2023, at 12:50 local time (02:50 UTC), a PAC 750XL aircraft, registered P2-BJD, owned and operated by North Coast Aviation (NCA), impacted terrain during take-off at Giramben Airtsrip, Jiwaka Province, Papua New Guinea. The VFR Charter flight was carrying cargo and passengers to Simbai Airstrip, Madang Province. The aircraft was destroyed by impact forces.

There were four persons onboard: one pilot and three passengers; a male adult, a female adult and a male infant. The pilot, the male adult passenger and the infant sustained serious injuries and were hospitalised and treated before getting discharged. The adult female passenger sustained minor injuries.

Maintenance records showed that all maintenance work were carried out as required and there no outstanding MEL items at the time of the accident.

The flight was planned to depart Giramben at 12:40, and track North for Simbai Airstrip, Madang Province at 9,000 ft AMSL.

According to the pilot, the aircraft was loaded by NCA ground handlers following his instructions. The manifest was completed by one of the ground handler, who stated that the aircraft was loaded by the other ground handlers while he was completing the manifest in the vehicle, due to no proper shed for him to work from.

The pilot also stated that at the time the loading was completed, and the passengers had boarded the aircraft, he observed that the winds were variable, blowing directly from the North and from the East as well.

Recorded data showed that the aircraft commenced taxiing at 12:44.

During the take-off roll, at the expected airborne point, about 500 m down the runway, as the aircraft accelerated with the airspeed approaching 60 knots, the right wheel hit a soft spot on the strip which dramatically reduced the momentum and speed of the aircraft, as described by the pilot. Eyewitnesses reported seeing the aircraft getting airborne briefly and got back on the ground again.

The pilot recalled that by the time the aircraft got back on the ground he realised that he had passed the nominated committal point, which was identified during onsite activities to be about 540 m from the threshold of runway 16. The pilot opted to continue with the take-off roll, with full power hoping that the aircraft would regain speed on the remaining part of the strip to get airborne again.

The pilot recalled reaching the end of the runway and getting airborne again with an airspeed of 50 kts airborne again, however, the right wheel got caught on the barbed wire of the perimeter fence that ran across to the runway, and subsequently impacted terrain. The pilot stated that he had lost consciousness at the time of the initial impact and therefore, had no recollection from thereon.

The investigation found that the aircraft got airborne about 19 m past the end of runway 16. However, the aircraft's main landing gears got caught on the perimeter fencing wire, subsequently impacting ground about 100 m from the end of the runway, then continued with the momentum and came to rest, in a local village garden about 160 m from the end of the runway.

The aircraft was destroyed by impact forces.

The pilot and passengers were rescued by the locals and taken to Nazarene General Hospital, Jiwaka Province, for treatment. The pilot, male adult and infant passengers sustained serious injuries, and the female passenger sustained minor injuries.

The investigation concluded that the wet grass with intermittently dug-up airstrip surface conditions and a potential weight and balance issue caused the aircraft to encounter take-off performance issues, which led to the accident. As a result of this investigation, there were two safety recommendations issued to the operator.

1 FACTUAL INFORMATION

1.1 History of the flight

On 9 February 2023, at 12:50 local time (02:50 UTC[1]), a PAC 750XL aircraft, registered P2-BJD (BJD), owned and operated by North Coast Aviation (NCA), was conducting a VFR[2] Charter flight from Giramben Airstrip, Jiwaka Province to Simbai Airstrip, Madang Province, when during take-off, the aircraft impacted terrain South of Giramben Airstrip.

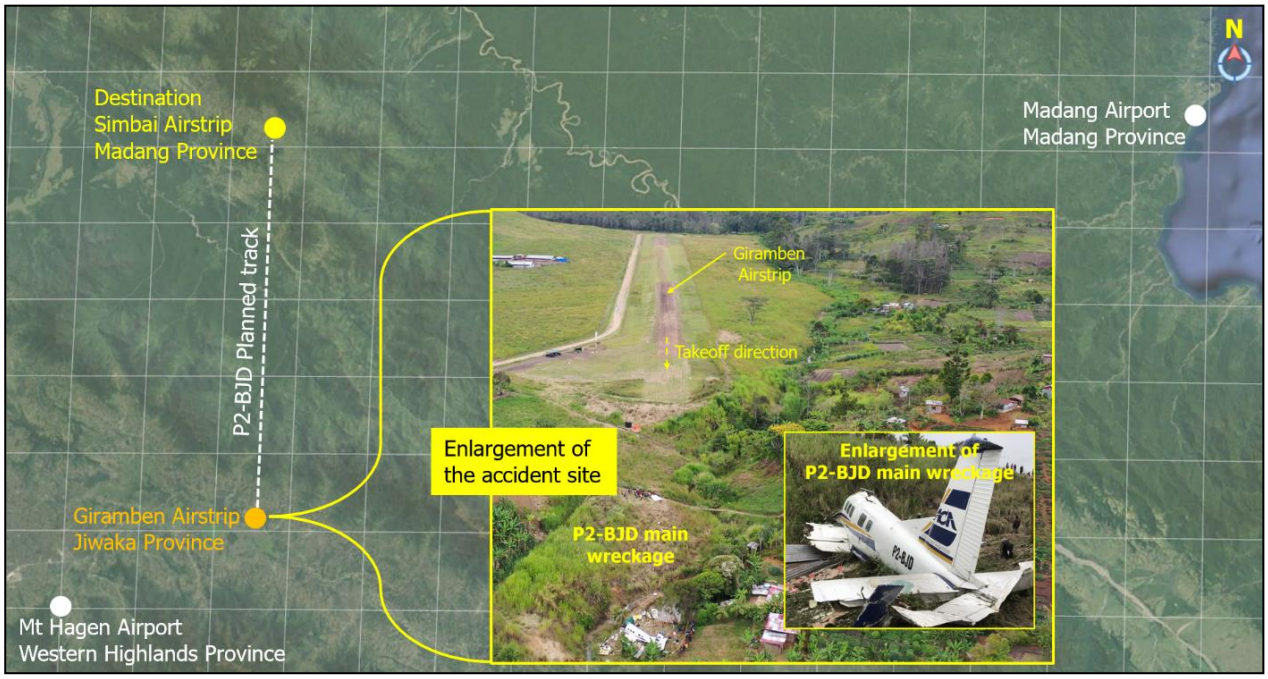

Figure 1: Overview of BJD's planned departure and destination points and the accident site

There were four persons on board the aircraft: one pilot and three passengers; an adult male, an adult female and an infant. The pilot occupied the left seat in the cockpit. The two adult passengers occupied the only two seats[3] in the cabin and the infant was nursed by the female passenger.

The pilot had conducted a repositioning flight from Nadzab Airport, Lae, Morobe Province to Giramben Airstrip, earlier that day. The pilot recalled that the landing into Giramben was uneventful.

According to the Flight Plan, the pilot had planned to depart Giramben Airstrip at 12:40 and track North for Simbai, Madang Province, at 9,000 ft above mean sea level (AMSL).

The pilot stated that at the time the loading was completed, and the passengers had boarded the aircraft, he observed that the winds were variable, blowing directly from the North and from the East as well.

The pilot stated during interview that he had configured the aircraft for 'before take-off' prior to taxiing to line up for take-off. The pilot recalled configuring the aircraft at the parking bay by setting the trims and flaps for take-off, setting the propeller for pitch, and pushing the fuel condition lever forward. Refer to *Appendix 5.1.1*.

1 The 24-hour clock, in Coordinated Universal Time (UTC), is used in this report to describe the local time as specific events occurred. Local time in the area of the accident, Papua New Guinea Time (Pacific/Port Moresby) is UTC + 10 hours.

2 Visual Flight Rules: Those rules as prescribed by national authority for visual flight, with corresponding relaxed requirements for flight instruments (Source: The Cambridge Aerospace Dictionary)

3 Standard number of seats in the cabin is nine, however seven seats in the cabin were removed to accommodate cargo.

According to Spidertracks[4] recorded data, the aircraft commended taxiing at 12:44.

Recorded showed that at 12:47, the aircraft had lined up at the departure end[5]. According to the pilot, after lining up for take-off, he advanced the power lever to achieve take-off power, which he recalled to be 53 psi at that time and subsequently commenced the take-off roll. He also ensured that the wind was blowing from the East prior to commencing the take-off roll.

The pilot stated during interview that during the take-off roll, at the expected airborne point, with an airspeed approaching 60 knots (kts), he felt the right wheel hit what he thought was a soft spot[6] on the strip that dramatically reduced the momentum and speed of the aircraft. Eyewitnesses[7] reported that they saw the aircraft briefly get airborne then got back on ground again. The onsite team identified the expected airborne point to be about 500 m from the departure end.

The pilot recalled that by the time the aircraft got back on the ground, he realised that he had passed the nominated committal point, which was identified during onsite activities to be about 540 m from the departure end. The pilot stated that he decided to continue with the take-off roll, with full power hoping that the aircraft would regain speed on the dug-up[8] part of the strip, to get airborne again. Refer to *Figure 2*.

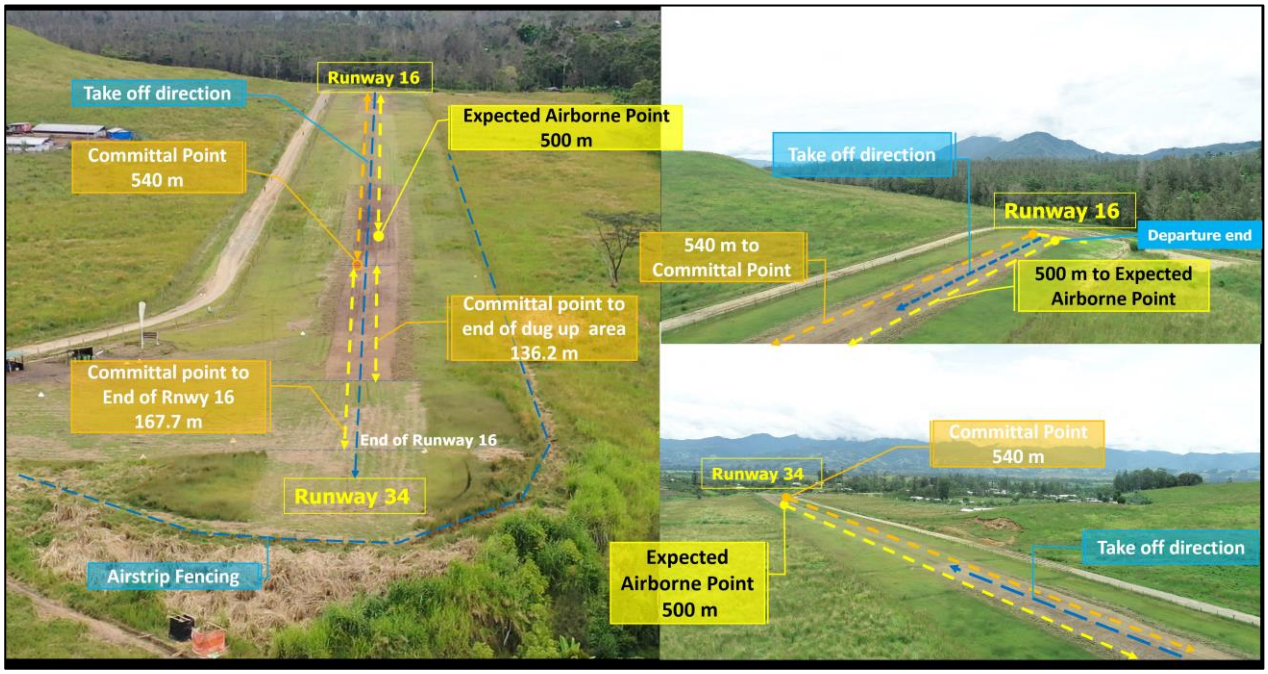

Figure 2: BJD's expected airborne and committal points

The pilot recalled reaching the end of the runway and getting airborne again with an airspeed passing 50 kts. During the on-site activities, the AIC observed from the wheel track marks on the strip that the aircraft got airborne about 19 m past the end of the runway.

According to the pilot, subsequent to the aircraft getting airborne, it struck the perimeter fence wire that run across at the end of the runway. The onsite team observed that the aircraft main landing gears got caught on a 1.13 m high perimeter wire fencing located about 33 m from the end of the runway. Refer to *Figure 3*.

4 A web-based global positioning tracking company.

5 Aircraft departed runway 16. Refer to *Section 1.10* for more information on the Airstrip.

6 The pilot did not have a clear description of what he referred to as a soft spot. Refer to *Section 1.10.3* for onsite observation for more information.

7 Refer to *Section 1.10.4* for eyewitness statement.

8 Refer to *Section 1.10.3* for more information.

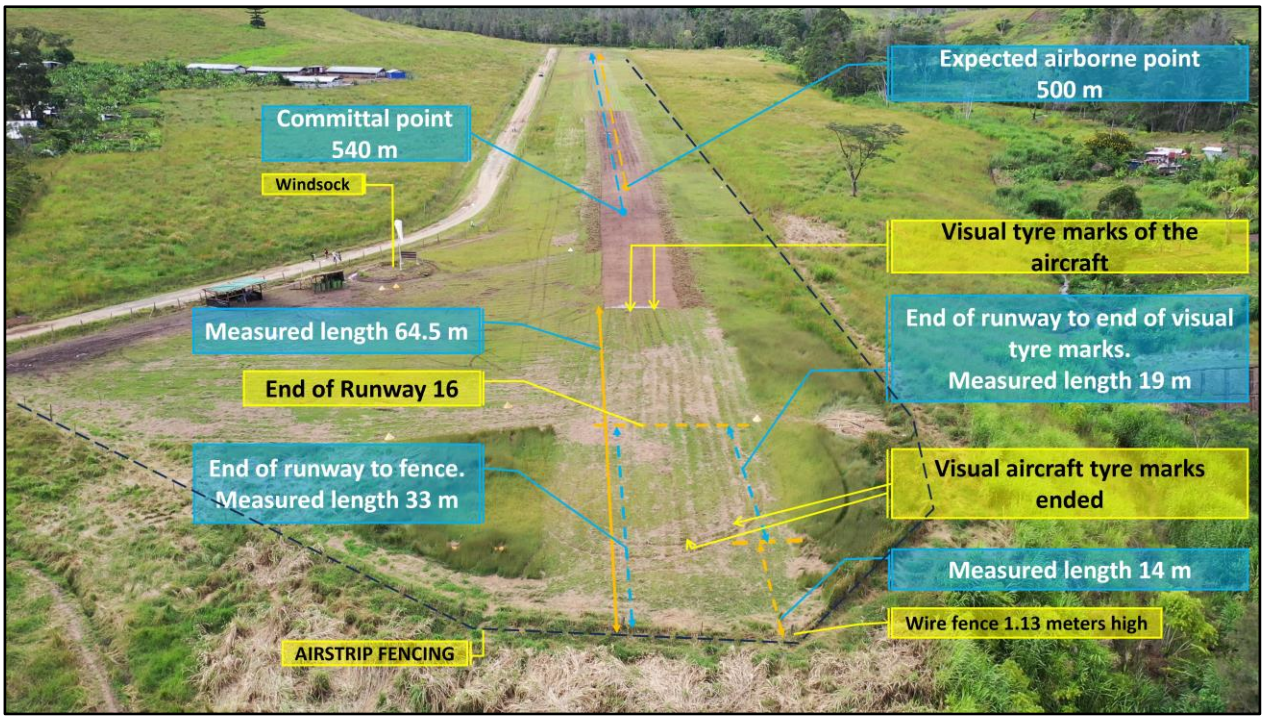

Figure 3: Overview of BJD's take-off path from committal point to perimeter fencing

The aircraft subsequently impacted terrain about 103 m from the end of runway. The pilot stated that he had no recollection from the time the aircraft initially impacted ground and there on, as he had lost consciousness.

The aircraft continued with the momentum and came to rest, in a local village garden 162 m from the end of the runway. Refer to *Figure 4*.

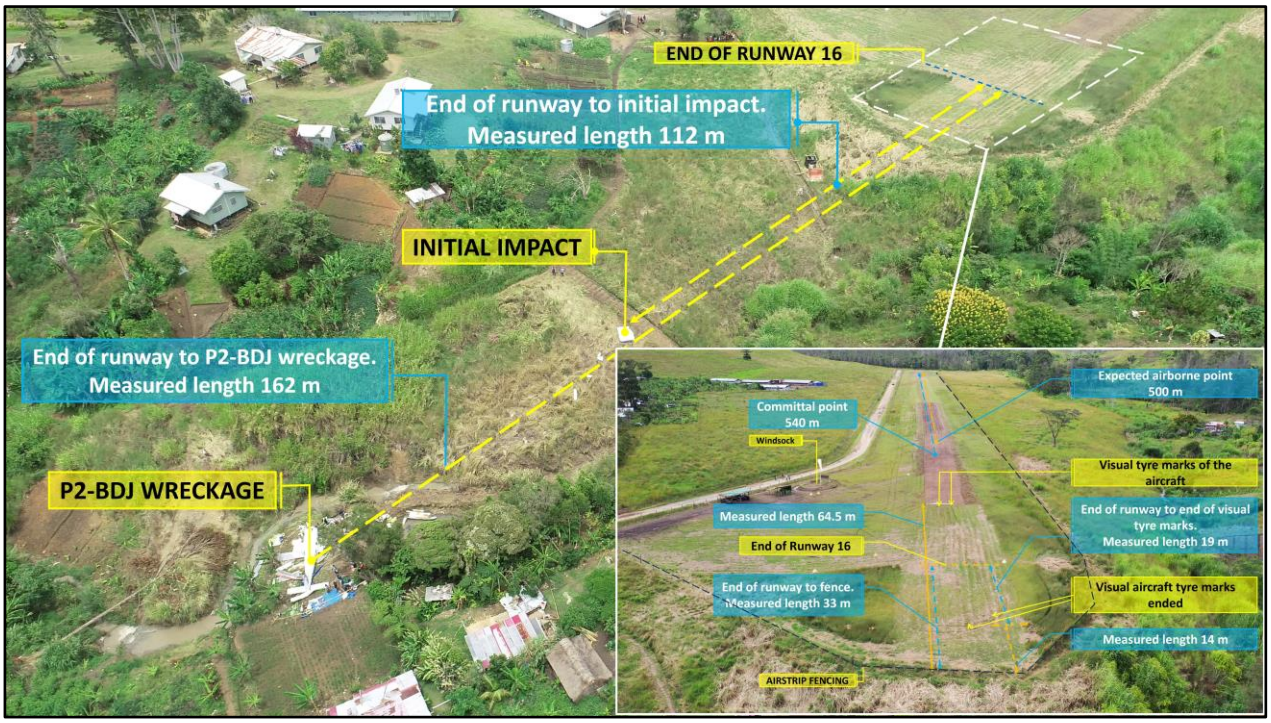

Figure 4: Overview of BJD's flight path from the end of the runway 16 to the resting position

According to local eyewitnesses, after the aircraft had come to its resting position, the locals assisted in evacuating the pilot and passengers from the aircraft and moving them away. The pilot was found to be unconscious at the time.

1.2 Injuries to persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	1	2	3	-
Minor	-	1	1	Not applicable
Nil Injuries	-	-	-	Not applicable
TOTAL	1	3	4	-

Table 1: Injuries to persons

1.2.1 Christian Leaders Training College Clinic reports of injuries

The three passengers were initially taken to the Christian Leaders Training college (CLTC) Clinic for medical attention. The nurse who was the Officer in Charge of the Clinic, administered medical attention to the passengers. During an interview, the nurse stated that the male passenger had a fracture on his right arm, so the nurse put a splint on his right arm. The female passenger was reported to have bruising and swelling on her left leg; however, the nurse could not identify whether the female passenger had sustained a bone fracture on her left leg. The nurse stated that the infant was distressed and showed signs of being in pain which the nurse suspected was due to internal injuries. The nurse administered antibiotics through an injection to the baby and immediately rushed all three passengers to the Nazarene General Hospital (NGH).

1.2.2 Nazarene General Hospital Report of injuries

The NGH provided *Emergency Room Patient Chart (ERP Charts)*, for the pilot and the three passengers to the AIC. All ERP charts were dated 9 February 2023. The NGH doctor also provided information on the treatment administered and discharge dates for the pilot and three passengers.

1.2.2.1 *Serious injuries*

Pilot

The pilot's ERP chart showed that he was admitted at the emergency room (ER) at 13:40 and initial assessments conducted on him indicated that his case was classified as Triage class: II[9], with bruises all over the body, deep laceration on the right elbow and he complained of pain in his chest and right wrist.

Further diagnosis revealed that the pilot had incurred Pulmonary/Lung Contusion and Right Radius Fracture. The pilot was treated and discharged on 16 February 2023, seven days after the accident.

9 Patients who need to be treated within 10 minutes are categorised as having a potentially life-threatening condition.

Male adult passenger

The male adult passenger's ERP chart showed that he was admitted at 14:20 with complaints of pain in his right arm, which he was unable to move at that time. The case was classified as Triage class: II.

Further diagnosis showed that he sustained Right Radius and Ulna Fracture. He was treated and discharged on 17 April 2023, sixty-seven days after the accident.

Male infant passenger

According to the infant's ERP chart, he was admitted at the ER at 14:35 and his case was classified as Triage class: I[10]. The patient's initial assessment records showed that he had facial / head swelling and was not responding at the time of admission.

Further diagnosis showed that the infant incurred closed head injury. He was treated and discharged on 20 February 2023, eleven days after the accident. According to the doctor who attended to the infant's case, they were unsure if the infant would have a full recovery or experience some neurological deficits thereafter, as he showed symptoms of right-side weakness.

1.2.2.2 *Minor injuries*

Female adult passenger

The female passenger's ERP chart indicated that she was admitted at 14:30 with painful swelling on the right leg and left forearm. She also had a swollen head and complained of headache.

The patient was treated and discharged on the same day. However, she remained in the hospital to nurse her infant who was admitted, until 20 February 2023, when the infant was discharged.

1.3 Damage to aircraft

The aircraft was destroyed. Refer to *Section 1.12* for a detailed description of damage to relevant components of the aircraft.

1.4 Other damage

According to onsite assessments conducted at the accident site, the environment around the areas of impact sustained significant damage.

Eyewitnesses reported that upon the initial impact, they observed what they described as a ball of cloudy-like mist, around the area of impact, which lasted for a few seconds before fading away. The onsite team identified that the cloudy-like mist, may have been aviation fuel spray following the initial impact which was evident from the presence of strong fuel odor and the burnt/dried up vegetation around the initial impact area and leading to the second impact area.

The final resting position was in a garden which was destroyed by the aircraft wreckage and fuel contamination. The creek and pond adjacent to the aircraft main wreckage were contaminated with fuel from the aircraft, aircraft debris and damaged cargo. There was also a shed near the pond that was destroyed.

10 Patients who need to have treatment immediately or within two minutes and are categorised as having an immediately life-threatening condition.

Figure 5: Damage to the environment and property along BJD's flight path

1.5 Personnel information

1.5.1 Pilot in command

Age	: 37 years
Gender	: Male
Nationality	: Australian
Position	: Line Pilot
Type of license	: Commercial Pilot License (CPL)
Type rating	: BN2A; PAC 750XL
Competency Line Checks	: 30 March 2022
Expiry Date	: 30 March 2023
Total flying time	: 3,582.5
Total hours on type	: 1,955.9
Total hours in command	: 2,689.5
Total hours in command on type	: 1,885.5
Total hours last 90 days	: 132.1
Total hours last 90 days on type	: 130.6
Total hours last 7 days	: 9.3
Total hours on type last 7 days	: 7.8
Total hours last 24 hours	: 4.5
Total hours last 24 hours on type	: 4.5
Medical class	: One
Valid to	: 10 March 2023
Medical limitation	: Nil

The pilot's records showed that the pilot had been employed by North Coast Aviation since 11 February 2019 as a captain on the BN2 aircraft fleet. The pilot's *PNG Flight Crew Licence*, issued on 26 March 2019 included PAC 750XL endorsement. The records also showed that on 26 February 2020, the pilot successfully completed his PAC 750XL line check with the operator.

The records showed that the Single Pilot Crew Resources and management & CFIT[11] Training, and Safety Management System Training were last completed by the pilot on 24 June 2019.

The records also showed that the pilot successfully completed a route and aerodrome familiarisation check[12] on 2 July 2022, which included the Giramben aerodrome.

The investigation reviewed the pilot's logbook and identified that the pilot commenced operations into Girmaben Airstrip on 26 January 2023. On the day of commencement of operations into Giramben, the pilot conducted flights from Chimbu-Giramben-Koinambe-Giramben. According to the pilot, the two landings and two take-offs conducted at Giramben Airstrip that day were test flights. The pilot's logbook shows that he had conducted a total of 7 landings and 6 take-offs at Giramben Airstrip prior to the accident flight.

1.5.2 Ground handlers

There were no personnel records of the Ground Handlers provided to the AIC, as requested.

1.6 Aircraft Information

1.6.1 Aircraft data

Aircraft manufacturer	: Pacific Aerospace Corporation
Model	: 750XL
Serial number	: 124
Year of manufacture	: 2007
Total airframe hours	: 13,811.95
Total airframe cycles	: 17,220
Number of landings	: 30,264
Registration	: P2-BJD
Certificate of Registration issued	: 24 February 2012
Certificate of Registration valid to	: Perpetual
Name of the owner	: North Coast Aviation
Name of the operator	: North Coast Aviation
Certificate of Airworthiness issued	: 24 February 2012
Certificate of Airworthiness valid to	: Non-terminating

11 Controlled flight into terrain

12 Refer to *Appendix B, 5.2.1, NCA Training and Competency Manual, Section 5.3.2* for more information on Route and aerodrome familiarisation.

1.6.1.1 *Engine data*

Engine Manufacturer	: Pratt and Whitney Canada
Model	: PT6A-34
Serial number	: PCE-PG0248
Time Since New	: 13,983.35
Total time since overhaul	: 1,856.45
Cycle since new	: 17,224

1.6.1.2 *Propellor*

Manufacturer	: Hartzell Propeller Incorporated
Model	: HC-B3TN-3D
Serial Number	: BUA 25470
Hours since overhaul	: 696.45

1.6.1.3 *Fuel information*

During interview with the AIC, the pilot stated that BJD was last refuelled in Nadzab on 9 February 2023, prior to the flight to Giramben earlier that day. He also confirmed that it was Jet A-1 fuel.

According to NCA's *Flight Record No. 69934* for BJD, on the day of the accident, the *'fuel start'* when the aircraft operated out of Nadzab earlier that day was 700 litres (L) and *'fuel remaining'* after landing at Giramben was 500 L (400 kg).

The pilot also stated that were no abnormalities noticed with the aircraft performance from engine start to initial impact, where he lost consciousness. The investigation identified that fuel was not a contributing factor.

1.6.1.4 *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.

1.6.1.5 *Aircraft load and performance*

Aircraft Load

According to the manufacturer's *Pacific Aerospace (PAC) 750XL Aircraft Flight Manual (AFM) section 6.1*, the certified maximum take- off weight for BJD is 3,402 kilograms (kg).

During his interview with the AIC, the pilot confirmed that the *Passenger and Cargo Manifest* was completed by a Ground Handler, as instructed by the pilot. The Ground Handler reported that he completed the manifest, however the aircraft was loaded by the other ground handlers.

According to the pilot, prior to loading cargo and passengers, he had instructed the North Coast Aviation (NCA) Ground Handlers to reduce the weight of the load by 200 kg from a tonne, due to the wet strip surface he had observed during his pre-flight assessments.

According to the manifest of the accident flight that was retrieved during onsite investigation, the total calculated weight of the cargo that was loaded onto the aircraft was 651 kg, and the weight of the two adult passengers was 109 kg, with a total of 760 kg.

Manifest No: 209672			
Passenger Details	**Weight**	**Baggage Details**	**Weights**
Adult Male Passenger	58	B/Rice	400
Adult Female Passenger	51	M/Noodles	48
		Dina Tuna	33
		Klina Soap	18
		Cooking oil	36
		Ramu Sugar	20
		Repack - 4 pieces 36X1	36
		Repack - 3 pieces 27X1	27
		Repack - 3 pieces 19X1	19
		Repack - 2 Pieces 14X1	14
Total	109	**Total**	651

Table 2: Extract from the accident flight manifest

The person who assisted the charterer with packing of cargo stated that the *repacked pieces*, as indicated in the flight manifest were boxes containing some store goods, stationeries, kitchen utensils, and coffee and tea supplies that he had packed. The ground handler that completed the manifest confirmed that each repack baggage contained respective number of pieces. The weights used for each repack baggage, was the combined weight of all pieces in each repack baggage.

The manifest of the accident flight was not signed by the charterer, nor was it authorised by the pilot.

According to the operator's *Operations Manual*, the standard passenger weight for crew is 82 kg each, and 10 kg for children under 4 years. The investigation used the standard crew weight for the pilot and the infant onboard, giving a total of 90 kg. Therefore, the total weight of persons onboard on the day of the accident was estimated to be 201 kg.

Furthermore, a five yearly reweigh, in accordance with *CAR Rule Part 91.605 (e)(10*), was carried out on 19 January 2018 on BJD by Air Fleet Management. According to the Aircraft Weighing Summary, the aircraft's empty weight was 1,872 kg.

From the information available to the investigation, the total take-off weight of the aircraft, in accordance with the operator's manifest, was estimated to be 3,124 kg. This was calculated from the sum of the aircraft empty weight (1,872 kg), person on board (201 kg), cargo (651 kg) and fuel (400 kg).

According to the charterer and his assistant who witnessed the weighing and loading of cargo by the NCA ground handlers, they observed that the total weight was 1,010 kg. They were advised by the pilot that only 1,000 kg of load, including cargo and passengers was accepted for the flight. As a result, a bag of rice weighing 10 kg was removed and returned to them. Therefore, the investigation took into consideration the scenario of the total take-off weight as 3,354 kg, with 1,000 kg as the total weight of cargo and passengers and 82 kg as the weight of the crew.

Additionally, the operator's *SOPM* states that the following Structural / Performance and Operational Limits must never be exceeded:

- *Maximum Zero Fuel Weight (MZFW)*
- *Maximum Take-off Weight (MTOW)*
- *Maximum Loading Weight (MLW)*

Furthermore, photos taken at the accident site by a first responder and the onsite team showed that certain cargo and baggage items were not accounted for, on the manifest of the accident flight.

Figure 6: Evidence of cargo in the aircraft cabin and the surrounding

The charterer and the passengers of the flight provided details of their cargo and baggage to the investigation. The evidence included receipts and lists of baggage / cargo items. The investigation was unable to verify the cargo and baggage, as all cargo were removed from the aircraft and accident site, prior to the arrival of the onsite team.

From the photos in *Figure 6*, it was identified that the cargo that was loaded in the aircraft cabin were not tied down using restraints.

The pilot stated during interview that the trim sheets are usually completed online, however, at that time he did not have any iPad, therefore he did not complete a trim sheet for the flight. The pilot indicated that he did not complete a hard copy of the trim sheet either. As a result, a pre-flight calculated centre of gravity at the time of the occurrence was not determined by the pilot.

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

Aircraft Performance

The investigation used the Take-off Performance chart provided in the *Pacific Aerospace P750-XSTOL Pilot's Operator's Handbook, Section 5.7 Take-off Performance* (refer *Appendix A, 5.1.2*), to determine the aircraft's ground roll distance required at Giramben Airstrip. The data required to determine the aircraft's ground roll distance were the aircraft weight, rotation speed, speed at 50 feet (ft), altitude and the temperature from which the ISA[13] deviation would be calculated.

According to the *Pacific Aerospace P750-XSTOL Pilot's Operator's Handbook, Section 5.7 Take-off Performance, Section 4.11 Normal Take-off,* the required rotation speed for the aircraft on take-off is 61 kts. The pilot stated that he usually got airborne at 65 kts, however, airspeed between 52 kts to 55 kts was satisfactory during take-off at Girmaben Airstrip. According to the Take-off Performance Chart, the relative speed at 50 ft for a rotation speed of 61 kts is 73 kts.

13 International Standard Atmosphere.

The pilot stated that he could not recall the exact temperature on the day of the accident, however, he stated that it would have been about 25 °C. The investigation used this temperature to calculate the ISA which was about +5. According to the operator's *PAC 750 Standard Operating Manual (SOM)*, it states that:

> *When actual conditions do not correspond exactly with table conditions, conservative planning figures can be established by reading the chart at the next higher value of weight, altitude or temperature, as appropriate.*

The investigation assessed the three respective calculated take-off weights that were determined and opted to use the manufacturer's certified maximum take-off weight of 5,700 pounds (3,402 kg) in consideration of conservative planning. The elevation of Giramben Airstrip (5,090 ft) was also taken into consideration. The data collected was then used to plot on the Take-off Performance Chart as follows:

7500 lbs						
Vrot (KIAS)	V50 (KIAS)	ALT (ft)	Δ ISA (°C)	Sg (ft)	Sa (ft)	Stot (ft)
61	73	Sea Level	-10	1,173	427	1,600
			0	1,244	451	1,695
			10	1,316	475	1,791
			20	1,426	532	1,958
			30	1,587	641	2,229
		2,000	-10	1,289	467	1,756
			0	1,371	494	1,865
			10	1,463	527	1,990
			20	1,612	623	2,236
			30	1,790	754	2,544
		4,000	-10	1,426	513	1,939
			0	1,522	544	2,067
			10	1,662	622	2,284
			20	1,831	741	2,572
			30	2,024	899	2,923
		6,000	-10	1,588	569	2,156
			0	1,735	649	2,384
			10	1,896	747	2,643
			20	2,086	894	2,980
			30	2,311	1,115	3,425
		8,000	-10	1,891	715	2,606
			0	2,068	822	2,890
			10	2,260	955	3,215
			20	2,485	1,151	3,636
			30	2,752	1,471	4,223
		10,000	-10	2,257	918	3,175
			0	2,469	1,063	3,533
			10	2,704	1,257	3,961
			20	2,969	1,533	4,502
			30	3,292	2,024	5,316
		12,000	-10	2,694	1,195	3,890
			0	2,953	1,411	4,364
			10	3,244	1,718	4,962
			20	3,562	2,149	5,711
			30	3,942	2,940	6,882
		14,000	-10	3,223	1,611	4,833
			0	3,552	1,979	5,531
			10	3,905	2,488	6,392
			20	4,289	3,255	7,544
			30	4,747	4,849	9,596

TABLE 5-4 TAKEOFF PERFORMANCE (SHEET 4 OF 4)

Figure 7: Take-off Performance Chart

Given the ISA +5, and the elevation of 5,090 ft of Giramben Airstrip, the investigation interpolated the ground roll distance (Sg) between ISA 0 and +10 for the altitudes 4,000 ft and 6,000 ft as follows:

At ISA 0 and +10 at 4,000 ft: (1,522 ft + 1,662 ft) ÷ 2 = 1,592 ft
At ISA 0 and +10 at 6,000 ft: (1,735 ft + 1,896 ft) ÷ 2 = 1,815 ft

Therefore, the interpolated ground roll for an elevation of 5,090 ft at ISA +5 is 1,704 ft.

According to the *Pacific Aerospace P750-XSTOL Pilot's Operator's Handbook* Takeoff Performance notes, the following were taken into consideration also:

4. For operations off dry grass surfaces increase distances by 15% of the ground roll figure.

5. Sloping runways. Decrease distances by 4% per 1% down slope and increase distances by 6% per 1% of up slope.

Therefore, the ground roll distance of Giramben Airstrip was increased by 15% due to its grass surface, and later reduced by 8% due to its 2% downslope in the takeoff direction. Therefore, the total required ground roll distance in accordance with the Takeoff Performance Chart and relevant Takeoff Performance notes is 1,803 ft (550 m). Giramben Airstrip had a runway length of 2,428 ft (740 m), which was about 625 ft (191 m) more than the required ground roll. From the onsite investigation, it was observed that there was a gulley after the end of the runway and therefore, there was sufficient obstacle clearance.

1.6.2 Aircraft systems

There were no system malfunctions or abnormalities identified that could have been a contributing factor to the investigation.

1.7 Meteorological information

1.7.1 PNG National Weather Service Forecast Data

The PNG National Weather Service (NWS) Terminal Aerodrome Forecast 2 (TAF 2) for Major Port (Mt. Hagen) provided to the AIC, by NWS was effective from 0900 to 2100 on 9 February 2023.

Overview	Scattered showers and thunderstorms with rain areas				
Upper Winds	7000 ft	10000 ft	2000 ft & 5000 ft	14000 ft	18500 ft
	320 degrees at 20 kts	320 degrees at 30 kts	Variable at 10 kts	310 degrees at 20 kts	300 degrees at 15 kts
Clouds	Isolated cumulonimbus at 1800ft tops at 45000ft	Broken Stratus at 500 ft and 3000 ft in precipitation	Scattered Cumulus at 1500 ft tops at 10000 ft in broken showers	Scattered Stratocumulus at 3000 ft and 8000 ft in broken rain and drizzle	Scattered Altocumulus Alto Stratus at 10000 ft and 18000ft
Visibility	500 m in fog 3000 m in thunderstorms and rain, 4000 m in showers of rain and drizzle				
Turbulence	Severe in vicinity of Cumulus and Cumulonimbus Moderate adjacent mountains associated with cumulus.				

Table 3: Mt. Hagen Terminal Aerodrome Forecast 2

The investigation used the Mt. Hagen TAF 2 information as Giramben Airstrip is located 15 Nautical Miles (NM) within the terminal area of Mt. Hagen.

1.7.2 Actual weather information

During an interview with the AIC, the pilot stated that the weather at the time was high overcast, and the airstrip surface was a bit wet as a result of the rain from the night before. The pilot recalled that at the time he decided to take-off, he observed that the strip was sufficiently dry enough for him to use the runway.

The pilot reported that the windsock indicated variable winds blowing directly from the North and from the East as he was lining up at the end of the runway, for take-off.

1.8 Aids to navigation

Ground-based navigation aids and on-board navigation aids 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.

1.10 Aerodrome information

1.10.1 General information

Giramben Airstrip is located in Jiwaka Province and about 15 NM East of Mt. Hagen Airport.

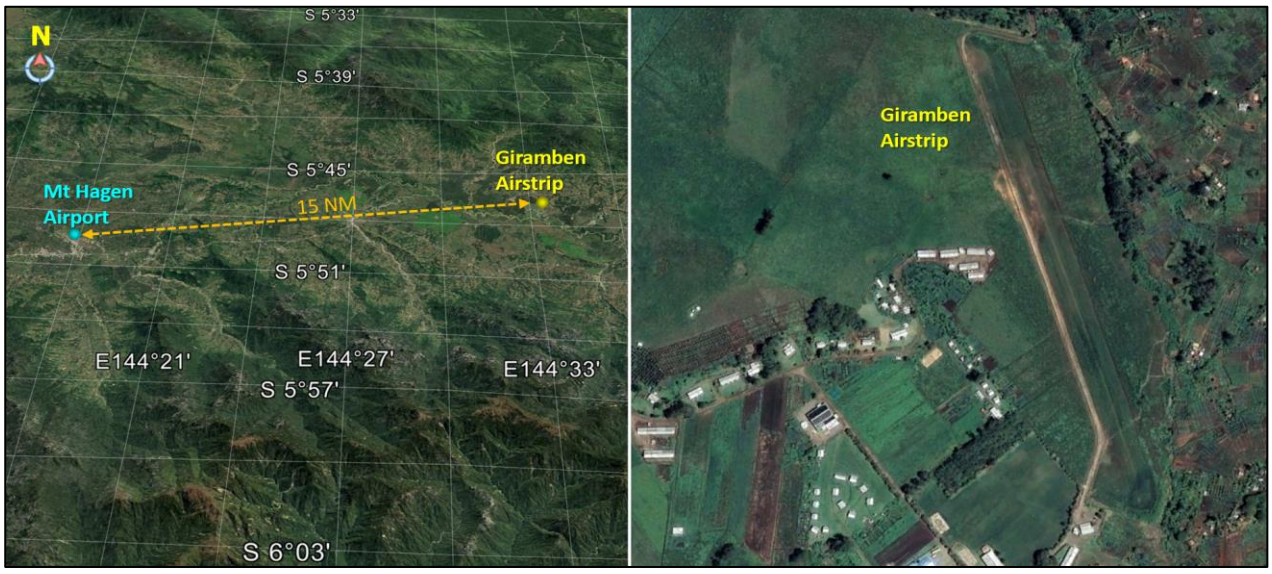

Figure 8: Giramben Airstrip location

1.10.2 Airstrip data

During the investigation, the Rural Airstrip Agency (RAA) provided AIC with the Rural Airstrip Survey Report of Giramben Airstrip (refer to *Appendix B, 5.2.2*). The survey was conducted on 14 May 2019 using the guideline from CASA PNG *Advisory Circular (AC) 139*. The survey showed that although the airstrip was a two-way airstrip, the RAA technical team at that time chose to survey the airstrip as a one-way airstrip due to tall trees obstructing the splay and clear way at the Northwestern end.

Table below provided the data of Giramben as per the survey carried out on 14 May 2019.

Runway Characteristics	RAA Survey Data
Province	Jiwaka
Take off direction:	167
Co-ordinates *(at parking bay)*	S 05° 47.137'
	E 144° 33.457'
Elevation *(at parking bay)*	5,090 ft
Elevation (*at threshold*)	5,090 ft
Runway Direction	16/34
Length	2,428 ft (740 m)
Width	177 ft (54 m)
Slope	2 %

Table 4: Giramben Airstrip information

The investigation found that the operator's *Route and Aerodrome Guide Manual* did not have a register of the aerodrome data for Giramben Airstrip in accordance *Civil Aviation Rule (CAR) Part 135.77 (c)*. Refer to *Appendix B, 5.2.3.*

1.10.3 Onsite observation

During the onsite investigation, the strip was surveyed by AIC using a drone and measuring equipment. The measurement of the runway length and width of the airstrip were taken and found to be 740.7 m and 15 m, respectively.

The strip surface was observed to be predominantly short grass, however, parts of it were dug up exposing ground that was composed of fine silt. According to the pilot, he engaged some locals at Giramben to dig up parts of the airstrip. The pilot described the grass that was dug up as thick, causing him to experience drag on the aircraft wheels during operations at Giramben Airstrip.

The entire length of the strip was intermittently dug up.

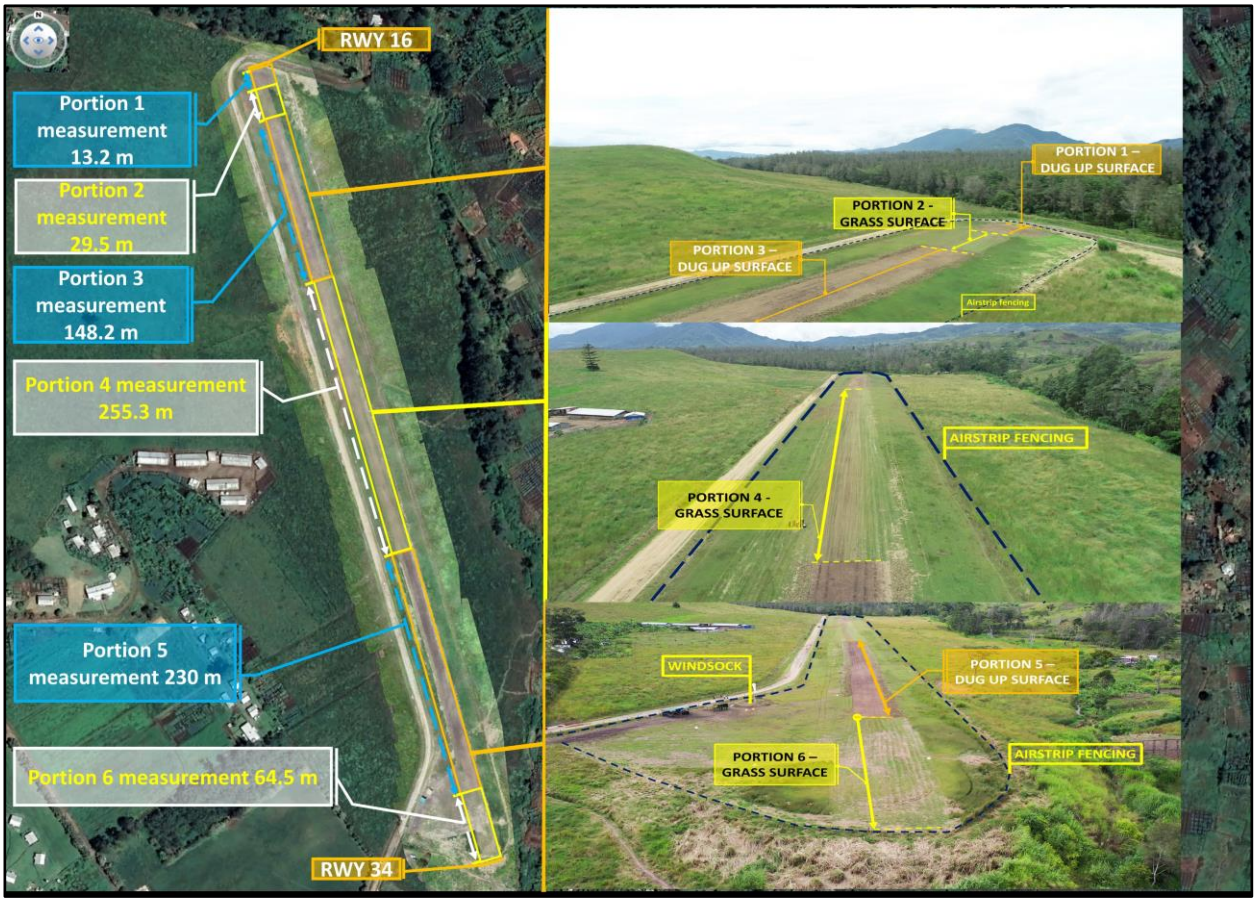

Figure 9: Giramben Airstrip constructed in Pix4D using drone images showing portions of the strip

Portions 1, 3 and 5 were dug up while portions 2, 4 and 6 were grass surfaces.

The onsite team also observed that the exposed silt surface had scarce standing water on parts of it throughout the length of the strip, while the rest was damp soil and wet short grass. It was identified from the drone images of the airstrip that portion 5, which was dug up, was visibly most damp in comparison to the other portions of the airstrip. From the interview with the pilot, the investigation identified that the 'soft spot' that he was referring to, was within portion 5 area. The onsite investigation was unable to identify a soft spot on the airstrip that had markings that indicated that the aircraft wheel had dug in.

The onsite team selected a surface of exposed silt that had no standing water, along portion 5 of the airstrip, and assessed the surface condition by standing on that area. Water immediately emanated from the surface showing just how saturated, yet porous the soil was. The silt soil, although wet, did not stick on the boots. The exposed strip surface was found to be composed of compact soil, with loose sedimentary silt atop.

Figure 10: Selected portion 5 surface condition on assessment

There was a windsock located at the Southeastern end of the airstrip, at the parking bay. Yellow cones were lined up at about 55 m in from the fencing at the end of the strip. This was on the sixth portion of the strip. The fencing post that showed evidence of being impacted by the aircraft measured to be 1.13 m in height, and 5.2 m to the next post, to the right. The fencing posts provided support to the barbwires that ran across the end of the strip.

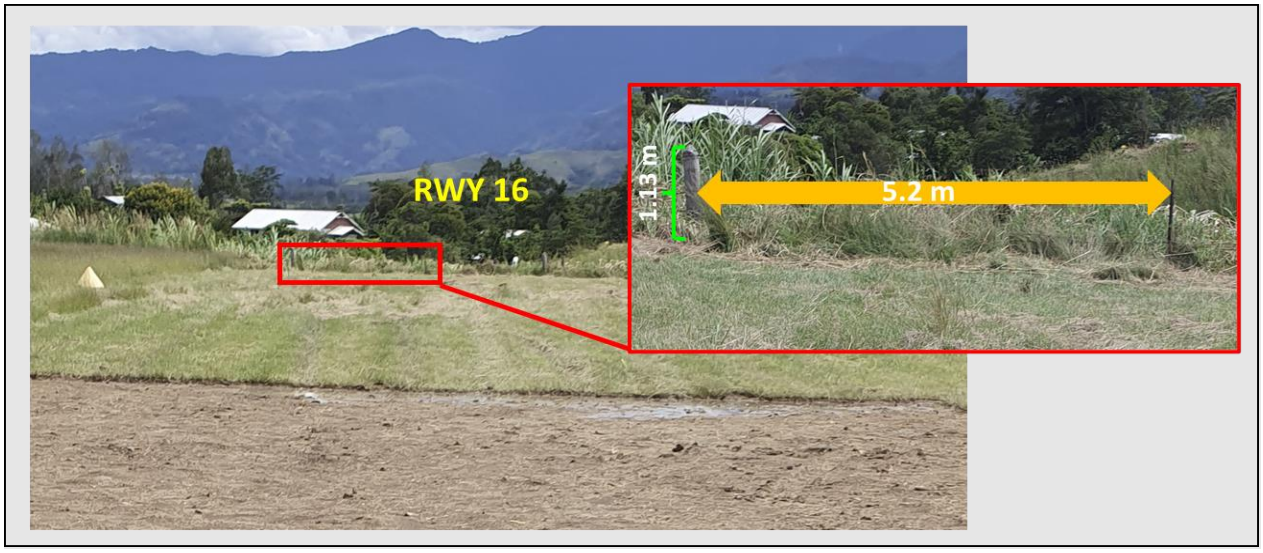

Figure 11: Image looking towards runway 16 showing airstrip fencing and impacted fencing post

1.10.4 Eyewitness statement

One of the ground handlers and a local eyewitnesses indicated in their interview statements, that they saw the aircraft lift off briefly and got back on the ground during take-off roll. The investigation identified that the take-off point that both eyewitnesses were referring to, was in portion 5 of the airstrip. Refer to Section *1.10.3 Onsite observation*.

1.11 Flight recorders

The aircraft was not equipped with a flight data recorder (FDR) or cockpit voice recorder (CVR), neither were required under the *PNG Civil Aviation Rules* current at the time of the accident.

1.11.1 Spidertracks Real-time Tracking System

The Spidertracks tracking system is a web-based system which allows subscribed operators to track and monitor their aircraft using an internet connected device. A Spidertracks device, called the 'Spider' is installed on the aircraft to transmit GPS[14] information in real-time.

The Spider installed on BJD only recorded data up to 12:47, the time when the aircraft had lined up for take-off, at the departure end of the runway.

1.12 Wreckage and impact information

The accident occurred at the South of the Giramben Airstrip where the location is slopy grassland with a creek running through a gully.

The aircraft's detached components and debris were distributed along the flight direction within the vicinity of the impact points and the main wreckage. During the on-site investigation, all the detached components and debris were accounted for.

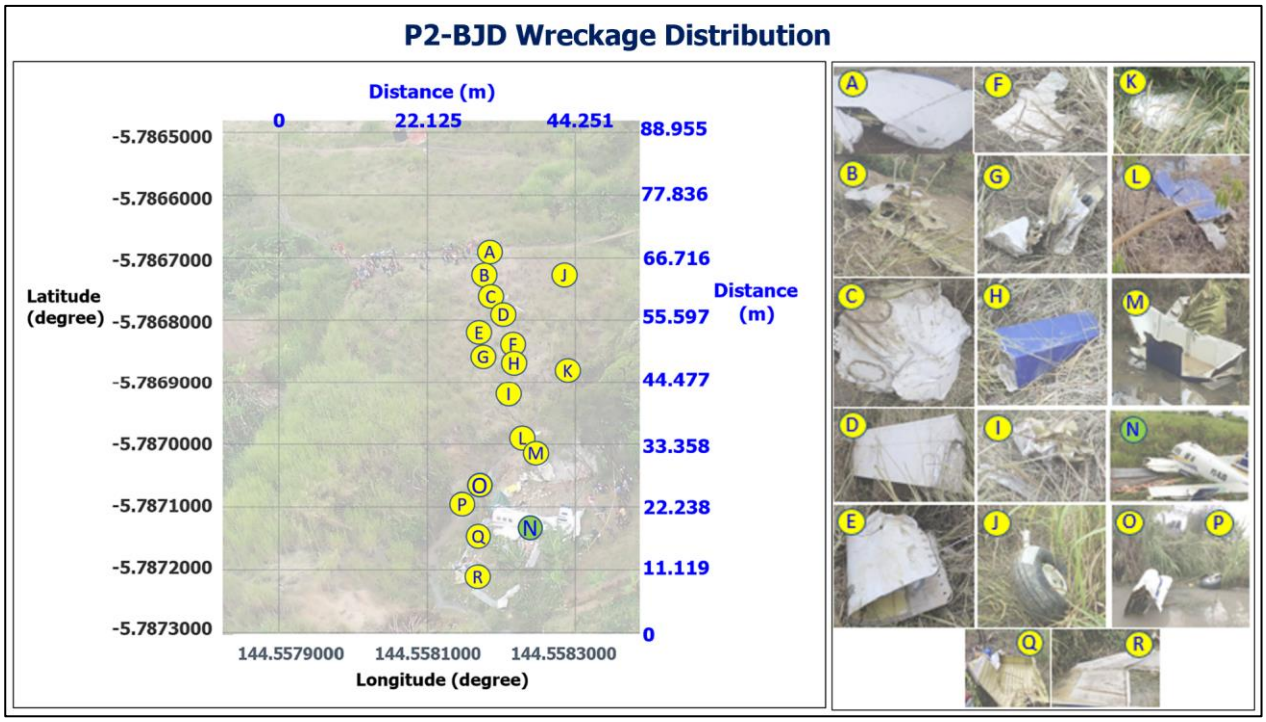

Figure 12: Overall wreckage distribution. *A=RH outer wing, B= integral fuel debri, C=Bottom integral fuel debri, D=RH flap, E=RH wingroot leading edge faitring, F=RH wing debri, G=Integral Fuel tnak cap, H=A cargo pod composite debri, I = integral fuel debri, J=Right MLG, K=RH wing inboard leading edge, L = A cargo pod composite debri, M=LH wing(integral outboard fuel tank), N=P2-BJD main wreckage, O & P= Lower engine cowl and nose wheel, Q=Cargo pod, R=LH wing tip wreckage*

14 Global positioning system

Evidence showed that the aircraft struck the 1.13 m high wire fencing, at the Southern edge of the airstrip then continued with a forward momentum for about 70 m from the wire fencing where it initially impacted ground. Subsequently, the right hand (RH) wing from the outer fuel tank, the right MLG and the right flap had all detached from the aircraft.

The RH outer wing and debris of the RH integral fuel tank, the outer RH flap and right MLG, the outer RH flap and right MLG were found within a 20 m radius of the initial impact area.

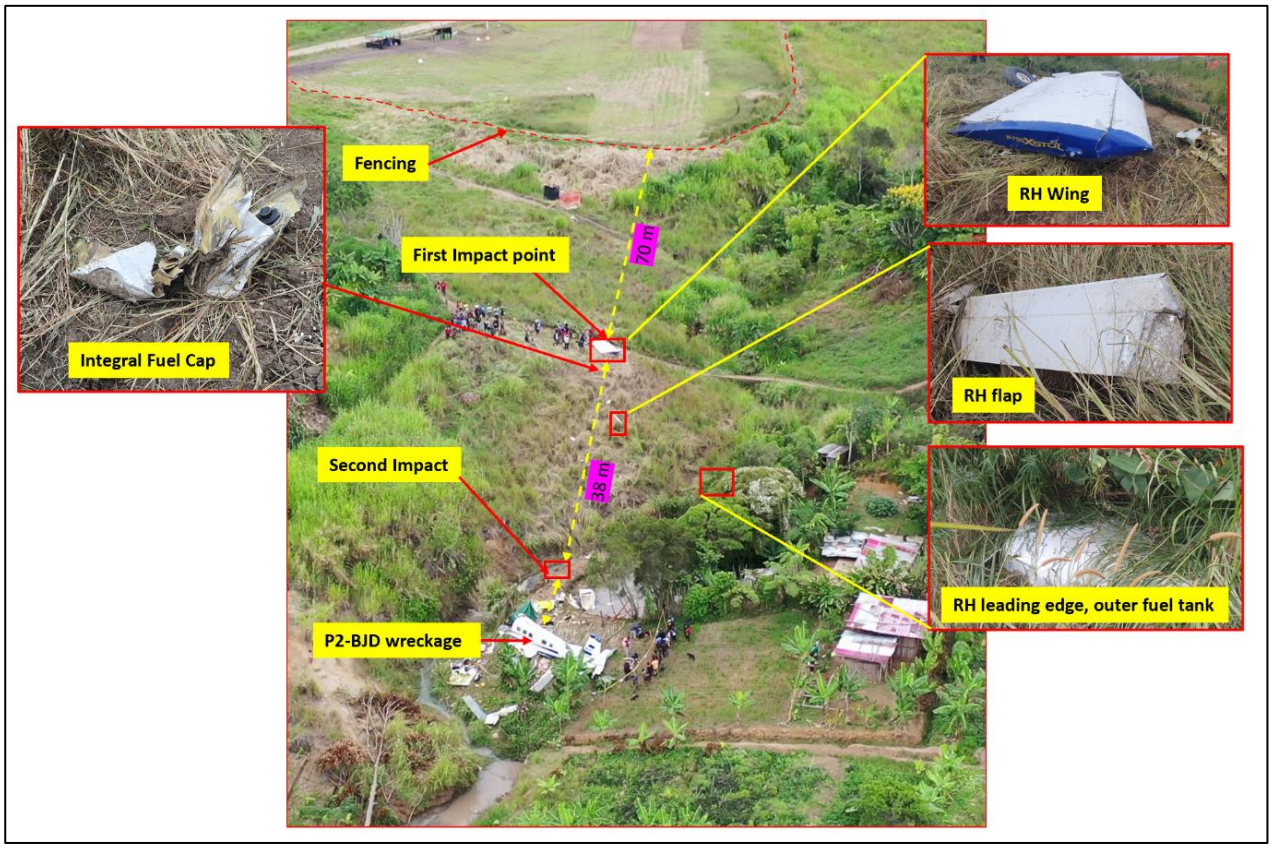

Figure 13: Wreckage distribution after initial impact

Following the initial impact, the aircraft bounced off, continued with the forward momentum for another 38 m, where it made a second impact in a gully then destroyed an unoccupied shed along the way, before coming to rest perpendicular orientation to its take-off direction.

The wreckage of the left outer wing, the cargo pod and the nose landing gear (NGL) were found in the vicinity of the second impact point. The damage on the outer left wing indicated that it was completely detached/snapped during the impact.

Subsequent to the aircraft coming to its resting position, its engine, instrument panel, engine control quadrants, rudder pedals, the flight controls yoke separated from the cockpit leaving behind the pilot seat and the right-hand side vacant seat only. A structural separation occurred at the Station 82.34[15] of the aircraft cockpit fuselage.

15 Station numbers are numbered in inches from a reference, or zero point known as the reference datum. The reference datum is an imaginary vertical plane at or near the nose of the aircraft from which all fore and aft distances are measured. Refer to *Appendix C, 5.3.1* more information on Station 82.34.

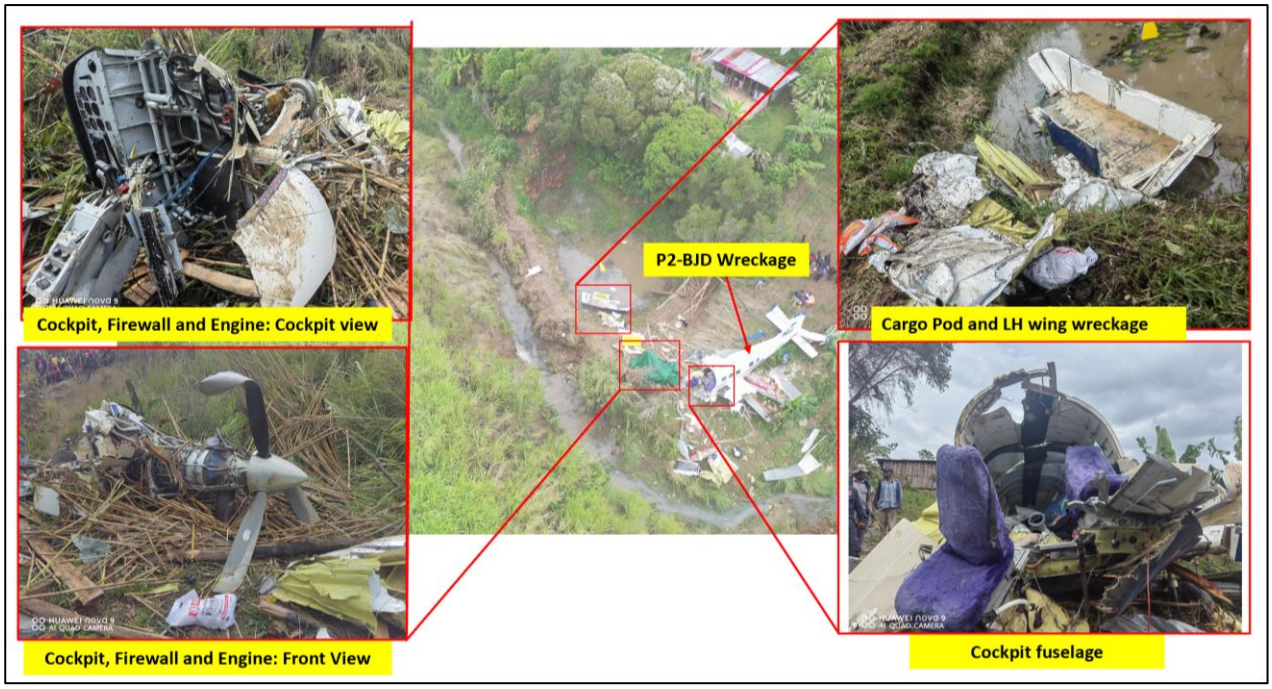

Figure 14: Wreckage distribution after second impact

The engine sustained substantial damage to the exhaust section and the propeller blades also sustained substantial damage. The propeller damage indicated that the engine was operating at the time of the impact.

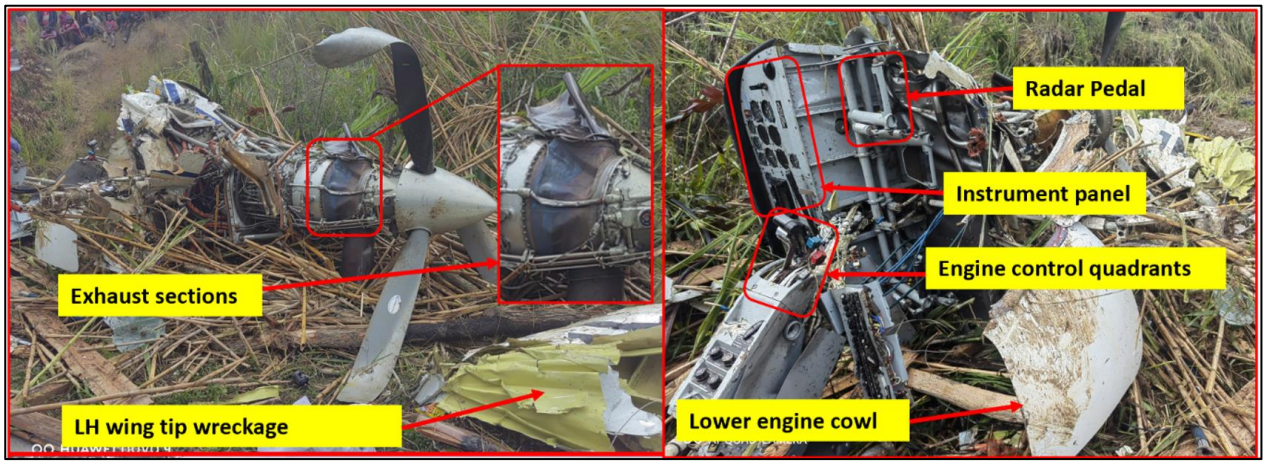

Figure 15: Damage to the aircraft engine and propellor

The outer LH wing was torn off from the inner integral fuel tank through to the trailing edge of the wing. A piece of timber used to build the shed penetrated underneath the wing root of the LH wing. The LH outer wing wreckage was found 2 m from the wreckage.

The elevators were bent inward from the trailing edge. The onsite investigation team also inspected the elevator system and identified that there were no abnormalities with the system and found that the damage was caused by impact forces.

Figure 16: Damaged LH Wing and Elevator

1.13 Medical and pathological information

There was no evidence that physiological factors or incapacitation affected the performance of the pilot.

1.14 Fire

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

1.15 Survival aspects

1.15.1 Aircraft occupants

The pilot and three passengers; two adults and one infant survived the accident.

According to information gathered from locals, the pilot was found unconscious and strapped in at the left-hand side seat in the cockpit. Subsequently, the locals unfastened the pilot's seatbelt, removed him from his seat and carried him away from the accident site.

The locals reported that the two adult passengers were found in a semi-conscious state, with their seatbelts still fastened; the male passenger in the left seat and the female passenger in the right seat. The infant was found unconscious amongst the cargo. The female passenger recalled that she lost consciousness following the initial impact and was unaware of the events in relation to the infant from thereon. The two adult passengers were assisted by the locals to egress the aircraft while the infant was carried out of the aircraft through the main entry door/emergency exit. (Refer to Figure 17).

The infant was not secured using an infant restraint/seatbelt, nor was it required by the operator.

Evidence gathered showed that the cargo that had been loaded in the cabin were not secured using safety restraints. (Refer to Figure 18).

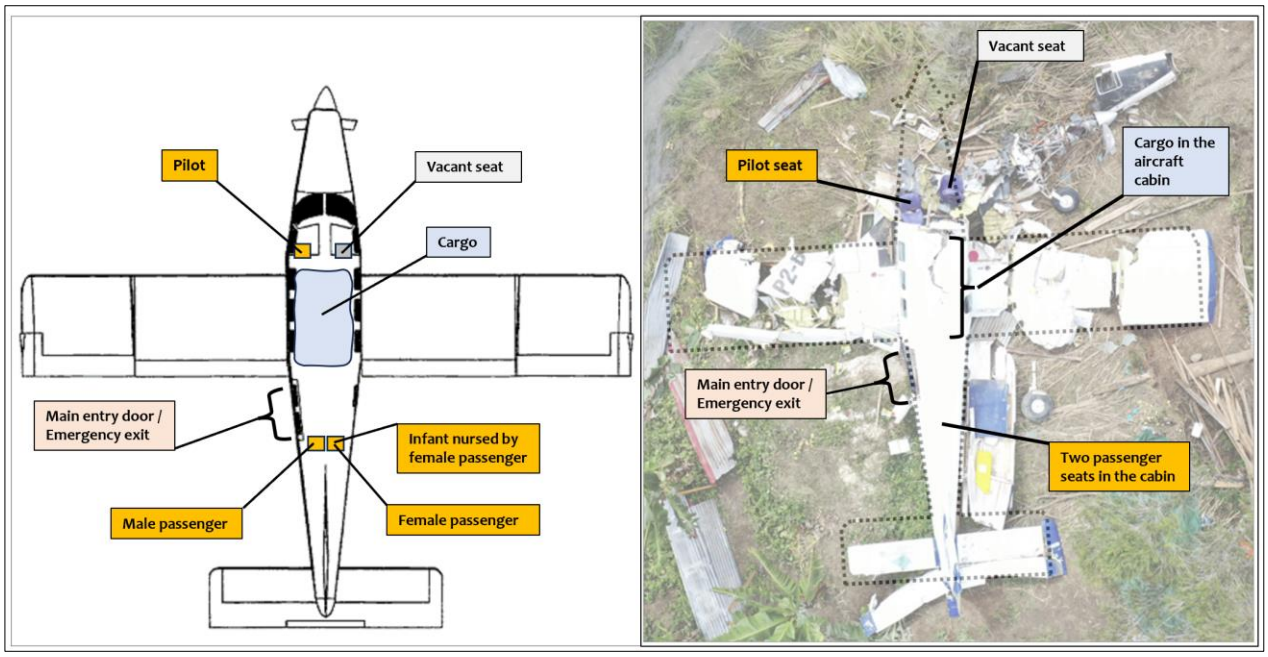

Figure 17: Aircraft schematic and main wreckage

Figure 18: Aircraft seats and cabin with cargo and after cargo removed

1.15.2 Emergency Locator Transmitter

The aircraft was fitted with an Artex ME406 Emergency Locator Beacon (ELT) which transmits on frequencies 121.5 and 406 MHz. The ELT automatically activates when certain G-forces act on the aircraft and transmits the standard swept tone on 121.5. It also transmits a 406 MHz encoded digital message to the COSPAS-SARSAT[16] satellite system.

The NiuSky Pacific Limited (NSPL) confirmed that no ELT Distress COSPAS-SARSAT message relating to BJD was received on the day of the accident.

The onsite team found BJD's ELT still intact in the control unit with its switch in the ARM position. The ELT's battery expiry date was April 2023. The Artex ELT switch located on the instrument panel was also in the ARM position.

The operator's maintenance records showed that on 11 November 2022, there was an operational functional test carried out on BJD's ELT, which was certified as satisfactory.

1.16 Tests and research

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

1.17 Organisational and management information

1.17.1 North Coast Aviation (The operator)

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's Certificate (AOC) in accordance with *CAR Part 119 (119/009).* The AOC is effective from 1 November 2021 and expires on 1 November 2023.

The operator also holds a Maintenance Organisation Certificate (MOC) in accordance with *CAR Part 145 (145/009),* which enables them to carry out their own aircraft maintenance at Nadzab, Morobe Province. NCA also carries out maintenance for other operators similar to their operations, upon agreement. The MOC was issued on 1 November 2021 and expires on 31 October 2023.

1.17.2 Crew resource management and SMS training

The pilot's training and competency records were reviewed, specifically his CRM and SMS records, and it was identified that both trainings were attended in 2019. The records show he had attended the following:

Single Pilot Crew Resource Management & CFIT Training on 24 June 2019 which covered the following modules:

- *Aeronautical Decision Making*
- *Automation Management*
- *Task Management*
- *Situational Awareness*
- *Risk Management*
- *CFIT Avoidance*

16 International satellite system for search and rescue.

The SMS training was completed on 25 June 2019 and covered the following modules:

- *Basic Safety concept*
- *Introduction to Safety Management*
- *Hazards*
- *Risks*
- *SMS Regulation*
- *Introduction to SMS*
- *SMS Planning*
- *SMS Operations*

The recency table in sub-section *2.2.1* of the operator's *Training & Competency Manual* showed that CRM recency is more than 12 months. The pilot was overdue for CRM recurrency training.

Section *12.6 (A)* of the operator's *Safety and Quality Manual* states that the SMS Training programme is to begin on the first day of an employee's orientation. Section *12.7 SMS Recurrent Training* states that all employees will attend occupational specific safety training seminars prepared by the Safety and Quality Manager once every 24 months. This seminar will educate employees on the hazards in their environment and what the Company is doing to mitigate those hazards. The investigation identified that the pilot was overdue for the SMS Recurrent Training.

1.17.3 Operator's route and aerodrome qualification

The operator's *Training and Competency Manual (TCM), Section 5.3.3 Training at Special Characteristics Aerodrome*[17] states:

> *A pilot will demonstrate to a Check Captain or Line Training Captain, the ability to land and take off an aeroplane at an operating weight equivalent to the maximum permissible for an aerodrome which has any of the following features:*
>
> 1. *One-way landing strip*
> 2. *One-way take-off strip*
> 3. *Longitudinal surface gradient of more than 1.50 (2.0%)*
> 4. *Uneven longitudinal surface gradient*
> 5. *Is subject to wind conditions conducive to the formation of subsidence or wind shear*
> 6. *Is subject to excessive cross wind conditions for the aeroplane type in use*
> 7. *Is subject to excessive tailwind conditions for the aeroplane type in use*
> 8. *Special knowledge required to execute a baulked approach*

In addition, the operator's *TCM, Section 5.3.5 Variation to route and aerodrome qualification training* states:

> 1. *At the discretion of the flight operations manager, the training for route and aerodrome qualification may be reduced but not below one return flight*
> 2. *The pilot requiring qualification as in access of 500 Hours experience of flying in Papua New Guinea.*
> 3. *The aerodrome concern is not one that would come under the description of having special characteristics.*
> 4. *The aerodrome is listed in the Route Intelligence Manual and the pilot has studied the details relevant to it and in the AIP AGA.*

The investigation found that based on the RAA Survey data, Giramben Airstrip meets the operator's classification of a Special Characteristic Airstrip. Therefore, the pilot was required to demonstrate to a Check Captain or Line Training Captain, the ability to land and take off at Giramben Airstrip, in accordance with the operator's *TCM Section 5.3.3 and 5.3.5 (3),* however, this requirement was not implemented.

17 Refer to *Appendix B, 5.2.1.*

1.17.4 Loading and balance – Aircraft balance

The operator's *PAC 750 Standard Operating Manual (SOM), Section 6.8* states that the aircraft will depart only when loading and load/trim sheet are complete, and the aircraft is cleared to depart.

The *SOM Section 6.9* states:

> *The following preventive actions to be taken to avoid overload of the aircraft:*
>
> *Anyone tasked with loading/unloading must have had training prior to carrying out work.*
>
> *The raining syllabus to include safety on the ramp.*
>
> *Staff to refrain from accepting extra baggage for relatives, friends and other extra baggage, that are not accounted for, to be loaded after close out of check-in.*
>
> *Only checked-in baggage to be loaded (as it is accounted for), and any extra baggage should be made known to the Supervisor wither to be loaded or offloaded.*
>
> *Any loads that cannot be stowed must be immediately advised to the Supervisor.*
>
> *To avoid OVERLOADING of the aircraft, it will be the responsibility of the Supervisor to visually check the cargo hold contents and sign acceptance of the load in accordance with the Load/Trim sheet description prior aircraft departure.*

The investigation identified that the aircraft was loaded without thorough supervision by the pilot of the accident flight. Furthermore, the pilot did not complete a load/trim sheet for the flight.

1.17.5 Ground handler training records

According to the operator's *Operations Manual*, Section *2.27.1 Training Requirements*, it states that:

> *A. North Coast Aviation requires ground handling personnel, including external service providers, to be competent in their roles.*
> *B. Training of ground staff includes (as applicable to their role) job knowledge and skills, company policies and procedures and the following safety elements: safety management awareness, human factors, rules and regulations, accidents and incidents, personal protection, work place hazards, equipment operation, house keeping, emergency situations, airside markings, security and dangerous goods.*
> *C. Recurrent training for Load master and Dangerous Goods Handlers will take place within 24 months of previous training to ensure knowledge is current and for the purpose of reauthorization.*
> *D. Refresher training will take place within 24 months of previous training for the following discipline.*
>
> *1. Passenger, Baggage and Cargo Handling Procedures.*
> *2. Ramp Handling Procedures.*
> *3. Ramp Safety Training.*
> *4. Equipment Operator Training.*

The investigation requested a copy of training records for the Ground Handlers who assisted with the ground handling of the aircraft at Giramben Airstrip on the day of the accident. However, the operator did not provide any training records to the investigation. Furthermore, one of the ground handlers stated that since his employment with NCA, he was not provided training.

1.17.6 Operator's assessment of Giramben Airstrip and approval to commence operation

The operator provided context as to why Giramben Airstrip was nominated as the alternative for operations following National Airports Corporation (NAC's) restrictions on them operating out of Mt. Hagen Airport. Refer to *Section 1.18.2 for more information.*

According to the operator, the assessment on Giramben Airstrip, prior to commencing their operation, was conducted by the pilot of the accident flight. The operator also revealed that they did not receive any written airstrip assessment report from the pilot of the accident flight, however, they did receive verbal advice from the pilot that the airstrip was good for use after the pilot's assessment of the airstrip, and that there was availability of customers in the area.

During an interview with the AIC, the pilot stated that he had visited the airstrip by road, and identified the tall trees at the Northwestern end of the airstrip to be an obstruction and instructed the locals to cut the trees. The locals subsequently cut the trees and also cut the grass on the airstrip as instructed by the pilot. The pilot further explained that once the trees were cut, he was satisfied with the conditions of the airstrip and proceeded to conduct a few test flight in and out of the airstrip following his assessment of the airstrip. According to the pilot's logbook, the test flights consisted of two landings and two take-offs at Giramben Airstrip on 26 January 2023.

The pilot stated that following the test flights, he deemed the airstrip as "*okay*" for use and further advised the locals to dig up grass on parts of the airstrip runway, as the grass caused drag on the aircraft wheels. Given the pilot's experience in conducting flights in PNG for the past three years, the NCA senior person accepted the pilot's independent assessment and verbal report of the airstrip.

NCA subsequently commenced commercial operations at Giramben Airstrip. Since then, the pilot of the accident flight operated all NCA flights into Giramben Airstrip until the day of the accident.

1.17.7 Change management

According to the operator's *Safety and Quality Management Manual*, section *15.1.2 Scope*, it states that:

> *The need for organisational change can result from the following triggers but not exclusive: the appointment of new senior managers, changes in customer requirements, changes in the work environment, an inadequate skills and knowledge base, leading to new training programs, poor performance, new technology, new contracts, recognition of operational problems, leading to a reallocation of responsibilities, regulatory or procedural changes*.

Section *15.1.4 Process (C)*, states –

> *Whether change is to be brought about through new projects, or through modifications to operating procedures, it will involve risks. There is a very strong link between change management and risk management—the two processes support each other and should be used together.*

The operator's change management process is documented in sub-section *15.1.4.1*. There are five steps in the change management process: Step 1: Develop the plan, Step 2: Conduct Risk Assessment and Planning, Step 3: Prepare the project plan, Step 4: Implement the Change and Step 5: Ongoing Monitoring and Review.

There was no record of the change management process carried out by the accountable person to mitigate the risks associated with commencing operations to Giramben Airstrip. The AIC found that there was no record of the process in section 2.5 '*Development Of new Routes'* of the *Route Guide Manual* which requires the accountable person to assess the operational feasibility of a proposed new route.

1.17.8 Quality Assurance and Safety Management Oversight

According to NCA *Safety and Quality Manual (SQM), Section 3*;

The primary role of the Safety Management System (SMS) is to manage safety through a continuing process of hazard identification and risk management. This also promotes procedures that support operational excellence, prevent accidents and incidents, and manage corporate risk. The SMS is proactive, predictive and data-driven in nature and its components include the collection, analysis and dissemination of safety information, for the purpose of which is to raise safety awareness throughout the Company.

The scope of the SMS is established by the Chief Executive Officer (CEO) who has the overall authority to establish and amend this document (Safety and Quality Manual) in consultation with the Safety & Quality Manager, being responsible for the quality of the content. It is described, documented, and communicated to employees throughout the Exposition suite of manuals. The Safety & Quality Manager serves as the primary liaison for implementation of the SMS and has direct access to the CEO on all aspects of the program.

There was no evidence provided to the investigation to show that the accountable persons for Safety Management and Quality Management System was involved during the Giramben Airstrip assessment prior to commencement operation to ensure risks associated with operating out of Giramben Airstrip was identified and mitigated to an acceptable level before operations as per the documented SMS and QMS processes were properly and fully implemented in accordance with the operator's *Safety and Quality Manual*.

1.18 Additional information

1.18.1 Loading and balance – General information

The operator's *PAC750 Standard Operating Manual, Section 6.1* states:

> *In order to achieve the performance and flight characteristics detailed in the flight manual it is essential that the airplane be operated within the approved weight and centre of gravity limits.*
>
> *Weight is important as it is the basis for many structural limits and critical flight characteristics.*
>
> *Weight in excess of the maximum take-off weight (3402 KG) may be a contributing factor in an accident, especially when combined with conditions of high altitude and temperature which may seriously reduce performance margins.*
>
> *Safe operations require careful planning and a sound knowledge of airplane performance capabilities as affected by weight, altitude and temperature. In conditions of high altitude and/or temperature it may be necessary to limit the operating weight to below maximum limits to ensure adequate performance.*
>
> ***WARNING:***
>
> *It is the responsibility of the pilot to ensure that the airplane is loaded properly and operated within the prescribed limits. Operating outside of prescribed limits may result in an accident and serious or fatal injury.*
>
> *A properly loaded and maintained airplane will perform as intended, and in accordance with the relevant performance predictions in this handbook.*

1.18.2 North Coast Aviation's Mt. Hagen Operations

During interview with the AIC, the pilot confirmed that prior to NCA commencing its operations at Giramben, it conducted its highlands operations out of Mt. Hagen under a Service Level Agreement (SLA), however the Mt. Hagen operations ceased when National Airports Corporation (NAC)[18] Mt. Hagen raised safety and security concerns.

According to the SLA copy provided to the investigation, the SLA was between NCA and Trans Niugini Tours (TNT)[19]. The agreement authorised TNT to provide Ground Handling services for NCA passengers and cargo in Mt. Hagen Airport, using Mt. Hagen Base TNT facilities. The SLA came into effect on 1 August 2021, however evidence showed that NAC Mt. Hagen was not aware of NCA extending its operations to include passengers, instead of freight only, as they were initially aware of.

On 20 December 2022, following receipt of a report regarding security breach by NCA, NAC Mt. Hagen took immediate action by preventing unauthorised airside access until an arrangement was made between NAC and NCA to properly control passenger movement within the aerodrome. Furthermore, demanded that both stakeholders formally request through NAC should they wish to continue operations using the office space.

Following the restriction to operate out of Mt. Hagen, NCA immediately requested to NAC Mt. Hagen for the restriction to be uplifted to enable continuation of operations, however, the issue was not resolved, hence the decision for NCA to commenced operations out of Giramben on 26 January 2023.

1.18.3 Additional information on Giramben Airstrip

According to reliable sources, Giramben Airstrip has some special cautionary as follows:

- *Any wind causes downdrafts – consider increasing take-off penalty.*
- *Very high trees on Northern side of the airstrip.*

The surface cautions were:

- *Draggy and soft spots off centerline*
- *Turn with caution*
- *Parking bay can get wet and soft.*

1.19 Useful or effective investigation techniques

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

18 A State-owned aviation enterprise established under and regulated by the Civil Aviation Act 2000 (As Amended). The owner and operator of 22 National Airports, located throughout Papua New Guinea's main provincial headquarters, including Mt. Hagen Airport.

19 An inbound tour operator that manages a selection of Lodges and own their own fleet of aircraft, vehicles, and boats. Trans Niugini has arrangements with partner airlines and have access to a variety of other aircraft (both fixed-wing and helicopters) to suit almost any flight requirement for up to 95 passengers. Trans Niugini owns a P-750-XS-TOL aircraft.

2 ANALYSIS

2.1 General

The analysis section of this report discusses relevant facts which contributed to the on-set of an emergency and subsequent accident.

2.2 Flight Operations

From the statement of the pilot and the propellor damage assessments conducted during onsite activities, there was no indication that an aircraft system malfunction contributed to this occurrence. As a result, the analysis will be focus on airstrip conditions, pilot technique and decision to continue with the take-off, and potential weight and balance issue.

The investigation found that the airstrip, together with its conditions and their associated penalties applied for surface conditions and airstrip slope, was more than sufficient in length for the aircraft to conduct a takeoff ground roll with weights up to the manufacturer's certified maximum take-off weight of 3,402 kg.

The airstrip surface at Giramben is predominantly short grass with portions of the runway length that have been dug up, exposing silt surface. Grass surfaces are known to contribute to drag, affecting take-off performance of aircraft. However, these conditions would have been present during the pilot's pervious operations at Giramben, except for the wet strip surface, due to the rains from the previous night. It is likely that the wet strip surface had caused significant resistance during the takeoff roll and impeded the aircraft's ability to reach its required liftoff airspeed.

The pilot assumed from his previous experience at the airstrip that the aircraft would be able to get airborne with a take-off roll of about 500 m down the runway with an airspeed of around 65 kt, as usual; however, it was also at this point the pilot recalls observing the airspeed approaching 60 kt when the right wheel hit what he described as a soft spot, subsequently reducing the speed and momentum of the aircraft dramatically.

Despite the reduction in speed, the aircraft was reported to have lifted off briefly and get back on the ground again, past the committal point and continued rolling. It is likely that the aircraft was unable to remain airborne due to a possibly overweight aircraft. In addition, since the aircraft loading was unsupervised, it is prone that centre of gravity (c-of-g) could have been placed outside of the approved limit or could have been shifted forward during the takeoff roll since the cargo in the cabin was not tied down or secured using restraints.

Since it was past the nominated committal point, the pilot elected to continue with the takeoff roll, using full power, hoping to regain speed on the remaining dug up part of the strip and get airborne again. The investigation determined that the pilot did not accurately grasp the fact that the remaining runway distance between his nominated committal point, and the threshold was not sufficient to continue the take-off roll, nor was he well aware of a likely overweight or imbalance aircraft affecting the take-off performance, hence his decision to continue with the take-off.

The pilot recalled lifting off at an airspeed of 50 kts; however, from tyre mark evidence, it was likely that the aircraft barely climbed away from the ground, resulting in its right wheel striking a 1.13 m high perimeter fencing wire that ran across the end of the strip. The investigation found that the right wheel of the aircraft got caught on the wire, resulting in a drag, subsequently causing the aircraft to initially impact ground. The structural damage sustained by the aircraft and the wreckage distribution suggested the likelihood of the aircraft having an overweight issue at the time of the accident. With the reduced take-off speed and a possibly overweight aircraft, the investigation determined that in the absence of the perimeter fencing, it was improbable that the aircraft would manage to safely clear off over the gulley at the end of the runway and gradually climb away.

2.3 Weight and balance

The manifest was completed by the ground handler, however, the investigation assessed evidential images of the cabin post-accident and identified cargo that were not catered for on the manifest. Additionally, cargo was not strapped in the cabin in accordance with the loading requirements.

With the absence of training files for the ground handlers, the investigation questions if the ground handlers were competent in carrying out their duties relating to loading cargo onto the aircraft. The investigation also notes that a ground handler stated he was not trained by the operator since he was employed. Therefore, the investigation considers that the aircraft was loaded by untrained ground handlers and cannot determine whether the untrained ground handlers loaded the aircraft appropriately in accordance with the manufacturer's approved load limitations.

Additionally, the manifest was not signed by the pilot which causes the investigation to determine that the pilot may not have been overseeing the loading of the cargo onto the aircraft. Furthermore, the pilot did not complete a Trim Sheet for the accident flight, to show how much cargo was loaded onto the respective compartments onboard the aircraft.

The investigation could not conclusively determine whether the pilot was in fact aware of the actual loads onboard the aircraft, and if he had appropriately determined the centre of gravity and balance of the aircraft prior to takeoff.

2.4 Quality assurance and safety management oversight

Even though NCA has an establish Quality assurance and safety management system, it was found during the investigation that it was lacking QA & SMS oversight by accountable persons for these systems not ensuring that the company documented SMS and QMS processes were properly and fully implemented to ensure risks associated with operating out of Giramben Airstrip was identified and mitigated to an acceptable level before operations.

In addition, an effective record-keeping system was not available to ensure the pilots recurrent training was done before or by the expiry date and ground handling staff training records maintained and kept up to date. Ground handlers had no training records, and the pilot of the accident flight was overdue for the SMS and CRM training. The pilot did not complete a route and aerodrome qualification for Giramben Airstrip, which fell under the operator's Special Characteristic Aerodrome category.

In the view of the AIC, lack of QA & SMS oversight by NCA had placed the Giramben operation in a potential adversely safety-significant position during their operation and thus resulted in the accident.

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 maintenance records indicated that the aircraft was equipped and maintained in accordance with existing regulations and approved procedures.

d) The aircraft was airworthy when dispatched for the flight.

e) The take-of weight and centre of gravity of the aircraft could not be determined due to unavailability of relevant information.

f) There was no evidence of any defect or malfunction in the aircraft prior to the accident.

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

h) The aircraft was structurally intact prior to Initial impact.

i) The aircraft was destroyed by the impact forces.

j) Propeller blade damage and twist was consistent with the engine producing power at impact.

3.1.2 Pilot

a) The PIC was licensed, medically fit and adequately rested to operate the flight. However, he was not appropriately trained in accordance the operator's CRM, SMS and Route and Aerodrome training requirements.

b) The pilot was in compliance with the flight and duty time regulations.

3.1.3 Flight operations

a) The flight was not conducted in accordance with the procedures in the operator's *Standard Operating Procedures Manual*.

b) The loading of the aircraft was not supervised by the pilot, in accordance with the procedures in the company Operations Manual, neither was it supervised by the ground handler, as delegated by the pilot.

c) The manifest completed by a ground handler, however, there were discrepancies with the weight calculations.

d) The pilot did not complete a trim sheet for the accident flight.

e) During landing roll, the right wheel of the aircraft hit what the pilot described as a soft spot at the expected airborne point which dramatically reduced the speed and momentum of the aircraft. The aircraft became airborne briefly at the expected airborne point, however, got back on the ground past the committal point.

f) The pilot decided to continue the take-off roll, after passing the committal for the aircraft to regain speed on the dug-up portion of the strip, to get airborne again.

g) The aircraft got airborne 19 metres past the end of the runway 16, however the main landing gears struck the perimeter fencing wire. Subsequently, the aircraft initially impacted ground 103 m from the end of the runway.

h) The pilot stated that he had no recollection from the time the aircraft initially impacted ground and there on, as he had lost consciousness.

3.1.4 Operator

a) The Operator's Quality Assurance systems did not provide effective oversight on the operator's to SMS and operational processes.

3.1.5 Flight Recorders

a) The aircraft was not equipped with a FDR and a CVR, nor was it required by the regulation.

3.1.6 Medical

a) Toxicological tests for common drugs and alcohol were not conducted prior to nor post-accident.

3.1.7 Survivability

a) The ELT did not activate. However, it was certified as serviceable on the last maintenance check.

b) All occupants of the aircraft survived the impact.

c) The seats, seatbelts and their associated structure maintained their integrity during the impact.

d) The head injuries sustained by the infant might have been prevented had he been secured with an infant seatbelt/restraint.

e) The pilot and infant were unconscious, and the two adult passengers were semi-conscious at the time they were rescued.

3.2 Causes [Contributing factors]

The pilot did not complete a trim sheet for the flight.

The manifest was completed by a ground handler who was not present at the time the cargo was being loaded by other ground handlers. The manifest was not signed by the ground handler who completed it, nor was it authorised by the pilot before departure.

Pilot's lack of supervision of the aircraft's loading process to ensure cargo is loaded correctly and in accordance with the prescribed limitations and to prevent calculation errors. As a result, it was likely that the aircraft was overweight when it departed.

Wet strip surface conditions that caused significant resistance during the take-off roll and impeded the aircraft's ability to reach its required lift off airspeed.

Pilot's decision to continue the take-off roll after passing the committal.

Training deficiencies of ground handlers and the pilot.

3.3 Other factors

The lack of adequate Quality Assurance systems oversight on the operator's operating standard procedures.

4 SAFETY RECOMMENDATIONS

4.1 Recommendations

As a result of the investigation into the accident involving the PAC 750XL aircraft, registered P2-BJD, at Giramben Airstrip, Jiwaka Province, Papua New Guinea on 9 February 2023, the Papua New Guinea Accident Investigation Commission issued the following recommendations to address concerns identified in this report.

4.1.1 Recommendation number AIC 23-R20/23-1001 to North Coast Aviation Limited

Date Issued: 24 December 2023

The PNG Accident Investigation Commission recommends that North Coast Aviation should ensure that all its operational personnel, including ground handlers are appropriately trained and qualified, and current in accordance with NCA's training and competency requirements when carrying out their respective duties and responsibilities.

Action requested

The AIC requests that North Coast Aviation note recommendation *AIC 23-R20/23-1001 and* provide a response to the AIC within 90 days of the issue date, nor later than 23 March 2024 and explain (including evidence) how NCA has addressed the safety deficiency identified in the safety recommendation.

STATUS: ISSUED.

4.1.2 Recommendation number AIC 23-R21/23-1001 to North Coast Aviation Limited

Date Issued: 24 December 2023

The PNG Accident Investigation Commission (AIC) recommends that North Coast Aviation Limited should enforce effective Quality and Safety oversight on its systems and processes to ensure risks associated with new operations are identified and mitigated to an acceptable level before commencement of operations.

Action requested

The AIC requests that Niugini Helicopters note recommendation *AIC 23-R21/23-1001,* and provide a response to the AIC within 90 days of the issue date, but nor later that 23 March 2024 and explain (including evidence) how NCA has addressed the safety deficiency identified in the safety recommendation.

STATUS: ISSUED.

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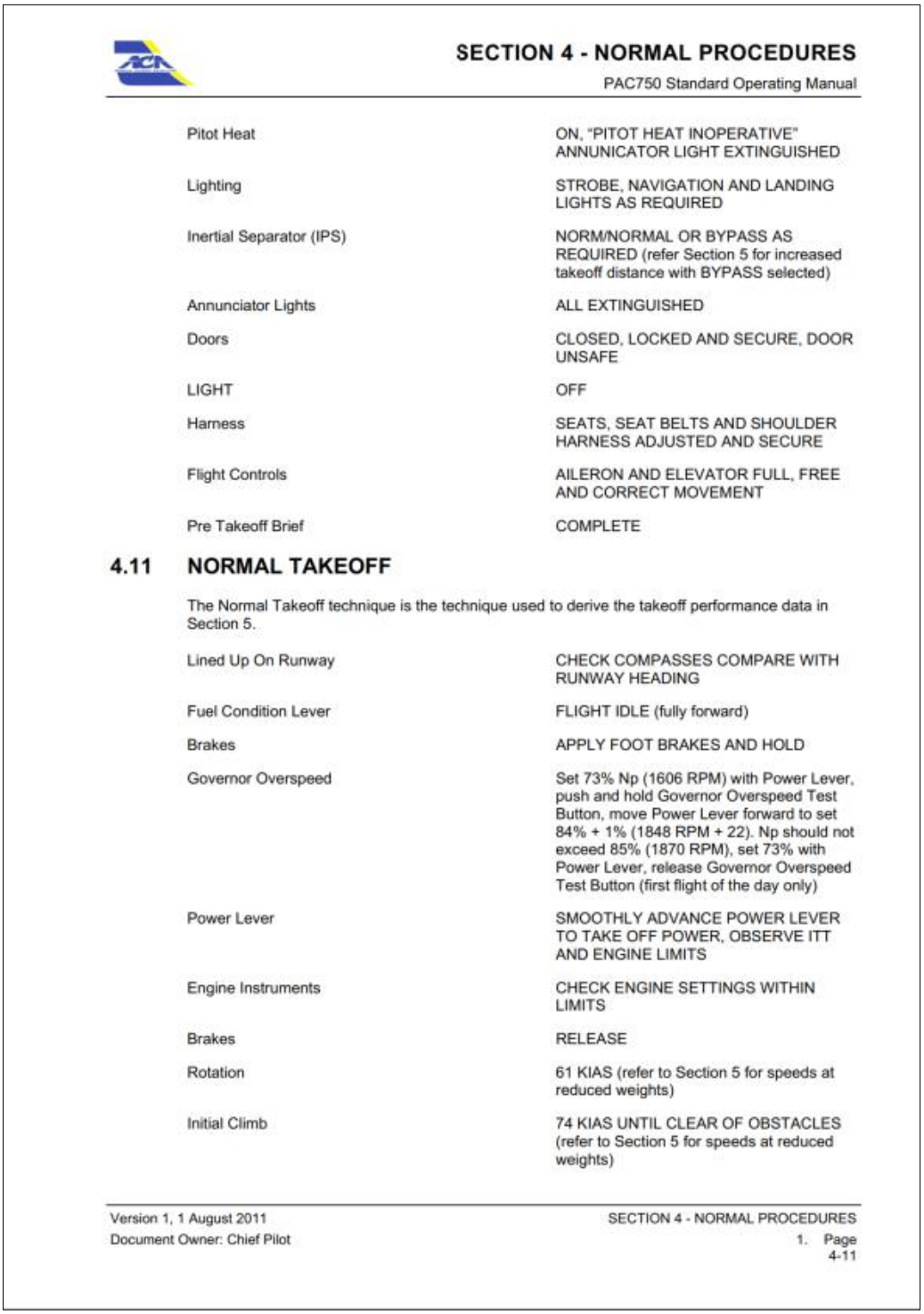
5 APPENDICES

5.1 Appendix A: Flight Operations

5.1.1 NCA PAC750 SOP Normal take-off procedure



Pitot Heat	ON, "PITOT HEAT INOPERATIVE" ANNUNICATOR LIGHT EXTINGUISHED
Lighting	STROBE, NAVIGATION AND LANDING LIGHTS AS REQUIRED
Inertial Separator (IPS)	NORM/NORMAL OR BYPASS AS REQUIRED (refer Section 5 for increased takeoff distance with BYPASS selected)
Annunciator Lights	ALL EXTINGUISHED
Doors	CLOSED, LOCKED AND SECURE, DOOR UNSAFE
LIGHT	OFF
Harness	SEATS, SEAT BELTS AND SHOULDER HARNESS ADJUSTED AND SECURE
Flight Controls	AILERON AND ELEVATOR FULL, FREE AND CORRECT MOVEMENT
Pre Takeoff Brief	COMPLETE

4.11 NORMAL TAKEOFF

The Normal Takeoff technique is the technique used to derive the takeoff performance data in Section 5.

Lined Up On Runway	CHECK COMPASSES COMPARE WITH RUNWAY HEADING
Fuel Condition Lever	FLIGHT IDLE (fully forward)
Brakes	APPLY FOOT BRAKES AND HOLD
Governor Overspeed	Set 73% Np (1606 RPM) with Power Lever, push and hold Governor Overspeed Test Button, move Power Lever forward to set 84% + 1% (1848 RPM + 22). Np should not exceed 85% (1870 RPM), set 73% with Power Lever, release Governor Overspeed Test Button (first flight of the day only)
Power Lever	SMOOTHLY ADVANCE POWER LEVER TO TAKE OFF POWER, OBSERVE ITT AND ENGINE LIMITS
Engine Instruments	CHECK ENGINE SETTINGS WITHIN LIMITS
Brakes	RELEASE
Rotation	61 KIAS (refer to Section 5 for speeds at reduced weights)
Initial Climb	74 KIAS UNTIL CLEAR OF OBSTACLES (refer to Section 5 for speeds at reduced weights)

Clear of Obstacles	Accelerate to 91 KIAS (refer to Section 5 for speeds at reduced weights)
Flaps	RETRACT to 0° AT SAFE HEIGHT

4.12 SHORT FIELD TAKEOFF

Refer to the Normal Takeoff procedures in Section 4.11. The Normal Takeoff technique is also the Short Field Takeoff technique. The takeoff performance data in Section 5 was derived using the takeoff technique detailed in the Normal Takeoff procedures in Section 4.11.

4.13 CLIMB

Flaps	RETRACT WHEN SAFELY AIRBORNE AND CLEAR OF OBSTACLES
Engine Instruments	CHECK TEMPERATURES AND PRESSURE WITHIN LIMITS

NOTE: Refer to Section 2 for engine limitations.

When operating at altitudes at or above 16,000 ft in high temperature conditions (ISA +30ºC) the fuel switch should be selected to MANUAL/MAN to minimize the possibility of cavitation of the engine driven fuel pump. The fuel switch should be selected to AUTO once the altitude reduces below 16,000 ft or when the ambient temperature has reduced below ISA + 30ºC.

Landing Lights	AS REQUIRED
Climb Speed	91 KIAS

4.14 MAXIMUM PERFORMANCE CLIMB

Flaps	RETRACTED
Airspeed	Best angle of climb Vx 85 KIAS Best rate of climb Vy 91 KIAS
Propeller Lever	MAX RPM
Power Lever	64 psi torque (5 min. limit) 54 psi torque (MCP)
Engine Instruments	MONITOR TEMPERATURES AND PRESSURE

NOTE: Refer to Section 2 for engine limitations.

When operating at altitudes at or above 16,000 ft in high temperature conditions (ISA +30ºC) the fuel switch should be selected to MANUAL/MAN to minimize the possibility of cavitation of the engine driven fuel pump. The fuel switch should be selected to AUTO once the altitude reduces below 16,000 ft or when the ambient temperature has reduced below ISA + 30ºC.

5.1.2 PAC 750XL Take-off Performance

5.7 TAKEOFF PERFORMANCE

TAKE OFF PERFORMANCE

Forward Centre of Gravity Limit to 118.99" Aft of Datum

NORMAL TAKEOFF TECHNIQUE

Conditions:

Power	Takeoff power set before brake release
Flap	20°
Propeller	91.2% Np (2,006 RPM)
Inertial Separator	Normal
Runway	Paved, Level, Dry Surface

Temperature expressed as deviation from ISA.

Use temperature conversion charts if required.

NOTES

1. *Normal Takeoff technique as specified in Section 4.*
2. *Decrease distances 7% for each 5 kts of headwind.*
3. *Up to 10 kts of tailwind increase distances by 12% for each 2.5 kts.*
4. *For operations off dry grass surfaces increase distances by 15% of the ground roll figure.*
5. *Sloping runways. Decrease distances by 4% per 1% down slope and increase distances by 6% per 1% of up slope.*
6. *With Inertial Separator in BYPASS increase distances by 3%.*

Glossary of Terms:

V_{rot}	Rotate speed (KIAS).
V_{50}	Speed at 50ft (KIAS).
ALT	Altitude (ft).
Δ ISA	Deviation from International Standard Atmosphere.
Sg	Ground roll (ft).
Sa	Airborne horizontal distance needed to accelerate and climb to arrive at the 50 ft obstacle height at or above the obstacle climbout speed
Stot	Total to Clear 50ft (ft) The sum of takeoff ground roll distance to lift off (Sg) **plus** the airborne horizontal distance needed to accelerate and climb to arrive at the 50 ft obstacle height at or above the obstacle climbout speed (Sa).

7500 lbs						
Vrot (KIAS)	V50 (KIAS)	ALT (ft)	Δ ISA (°C)	Sg (ft)	Sa (ft)	Stot (ft)
61	73	Sea Level	-10	1,173	427	1,600
			0	1,244	451	1,695
			10	1,316	475	1,791
			20	1,426	532	1,958
			30	1,587	641	2,229
		2,000	-10	1,289	467	1,756
			0	1,371	494	1,865
			10	1,463	527	1,990
			20	1,612	623	2,236
			30	1,790	754	2,544
		4,000	-10	1,426	513	1,939
			0	1,522	544	2,067
			10	1,662	622	2,284
			20	1,831	741	2,572
			30	2,024	899	2,923
		6,000	-10	1,588	569	2,156
			0	1,735	649	2,384
			10	1,896	747	2,643
			20	2,086	894	2,980
			30	2,311	1,115	3,425
		8,000	-10	1,891	715	2,606
			0	2,068	822	2,890
			10	2,260	955	3,215
			20	2,485	1,151	3,636
			30	2,752	1,471	4,223
		10,000	-10	2,257	918	3,175
			0	2,469	1,063	3,533
			10	2,704	1,257	3,961
			20	2,969	1,533	4,502
			30	3,292	2,024	5,316
		12,000	-10	2,694	1,195	3,890
			0	2,953	1,411	4,364
			10	3,244	1,718	4,962
			20	3,562	2,149	5,711
			30	3,942	2,940	6,882
		14,000	-10	3,223	1,611	4,833
			0	3,552	1,979	5,531
			10	3,905	2,488	6,392
			20	4,289	3,255	7,544
			30	4,747	4,849	9,596

TABLE 5-4 TAKEOFF PERFORMANCE (SHEET 4 OF 4)

5.2 Appendix B: Aerodrome

5.2.1 Operator's Route and Aerodrome Qualification

2. When all the training modules have been completed the trainee will be presented with a Type Rating Certificate and have his/her logbook stamped accordingly.
3. Line training will be conducted with the trainee having the status of ICU S.
4. Until the Trainee has completed line training and been cleared to line the trainee must not be approved for Company In command operations on that type

5.3 ROUTE AND AERODROME QUALIFICATION

5.3.1 ROUTE QUALIFICATION

A Company pilot will not act as flight crew member of an aeroplane engaged in Air Service Operations unless the pilot has been certified as competent to operate over the particular route and to and from the aerodromes associated with that route, The pilot will complete:

1. A minimum of two (2) return trips over each route and, in addition, where an alternate route exists a minimum of one return trip over each alternate route, acting as pilot manipulating the controls under supervision
2. All training associated with route and aerodrome qualification will be conducted under VMC without the availability of the GPS
3. Training must be recorded in form NA 212
4. Approval for route and strip is recorded in form NA 213.

5.3.2 ROUTE FAMILIARISATION

During the familiarisation prescribed above, on outbound and inbound flights, a pilot will receive instruction on the following:

1. The general topography and orientation of valleys and prominent landmarks and applicable spot heights
2. The location of gaps and passes and the correct technique to negotiate same
3. The minimum safe altitude at which the route can be flown
4. The local area minimum lowest safe altitude
5. Critical areas where cloud formations are most hazardous
6. Location of escape routes in the event of sudden meteorological condition deterioration
7. Location of suitable alternate or emergency diversion aerodromes.

5.3.3 TRAINING AT SPECIAL CHARACTERISTIC AERODROMES

A pilot will demonstrate to a Check Captain or Line Training Captain, the ability to land and take off an aeroplane at an operating weight equivalent to the maximum permissible for an aerodrome which has any of the following features

1. One-way landing strip
2. One-way take-off strip
3. Longitudinal surface gradient of more than 1:50 (2.0 %)
4. Uneven longitudinal surface gradient
5. Is subject to wind conditions conducive to the formation of subsidence or wind shear
6. Is subject to excessive cross wind conditions for the aeroplane type in use

7. Is subject to excessive tail wind conditions for the aeroplane type in use.

8. Special knowledge required to execute a baulked approach.

5.3.4 RECORDING ROUTE AND AERODROME QUALIFICATION

1. Where the training for route and aerodrome qualification occurs during the conduct at Type Rating Line Training or specific route and aerodrome qualification that training will be recorded in the Daily Line Training Record.

At the completion of training:

1. The training records will be filed in the trainee pilot's training file.

2. Certificates of Route and Aerodrome Competency will be raised with one copy to the pilots training file and one to the pilot concerned,

5.3.5 VARIATION TO ROUTE AND AERODROME QUALIFICATION TRAINING

1. At the discretion of the Flight Operations Manager, the training for route and aerodrome qualification may be reduced, but not below one return flight when.,

2. The pilot requiring qualification has in access of 500 Hours experience of flying in Papua Now Guinea.

3. The aerodrome concerned is not one that would come under the description of having special characteristics.

4. The aerodrome is listed in the Route Intelligence Manual and the pilot has studied the details relevant to it and in AIP AGA.

END OF SECTION 5.

5.2.2 RAA Survey Report for Giramben Airstrip

Airstrip name:	**Giramben**		
Airstrip code:	No Code	Season:	☒ dry ☐ wet
Province:	Jiwaka	Date surveyed:	14 May 19
District:	Not Recorded	Date last surveyed:	No Previous
Airstrip type:	☒ one-way ☐ two-way	Surveyed by: *(name)* *(organisation)*	[redacted] Rural Airstrip Agency
Take-off direction:	167	Runway strip width:	54 m
Co-ordinates *(at parking bay)*:	S 05° 47. 137' E 144° 33.457'	Runway strip length: Average overall slope:	740 m 2 %
Elevation *(at parking bay)*:	5090 ft	Elevation *(at threshold)*:	5090 ft
Obstacle Limitation Surfaces (OLS)			
Take-off/ Approach Surface (AC139-6)		For two-way airstrips only (AC139-6)	
5% up from the horizontal, clear for 600m horizontally:	☒ Yes ☐ No/Non-serviceable	5% up from the horizontal, clear for 600m horizontally:	☐ Yes ☐ No/Non-serviceable
5% side splay (left & right), clear for 600m horizontally:	☒ Yes ☐ No/Non-serviceable	5% side splay (left & right), clear for 600m horizontally:	☐ Yes ☐ No/Non-serviceable
Transitional side surface (both sides) (AC139-6)			
20% side slope, clear for 2m above the runway strip:	☒ Yes ☐ No/Non-serviceable		
Additional 160m Clearway		For two-way airstrips only	
At same grade as airstrip, clear for 160m:	☐ Yes ☒ No	At same grade as airstrip, clear for 160m:	☐ Yes ☐ No
160m from threshold, 5% up, clear for 600m:	☐ Yes ☒ No	160m from threshold, 5% up, clear for 600m:	☐ Yes ☐ No
160m from threshold, 5% side splay (L&R), for 600m:	☐ Yes ☒ No	160m from threshold, 5% side splay (L&R), for 600m:	☐ Yes ☐ No
Distance to obstacle *(if present)*:	10 m	Distance to obstacle *(if present)*:	m
Describe obstacle *(if present)*: Line of 5m tall trees		Describe obstacle *(if present)*:	
Surface Type and Condition			
Surface cover: (select one only)	☐ Paved ☒ Short grass ☐ Long grass ☐ Patchy grass ☐ Bare	Surface hardness: *If Soft, further investigation required*	☐ Soft/ Non-serviceable ☒ Medium ☐ Hard
Surface roughness:			☒ Smooth ☐ Rough ☐ Very rough/ Non-serviceable
Soil type: (select one only)	☒ Fine-grain soil (silt, clay) ☐ Coarse-grain soil (sand, gravel)	Surface undulation/evenness comment: low	
Soil moisture:	☐ Dry ☒ Moist ☐ Wet ☐ Saturated /Non-serviceable ☐ Inundated /Non-serviceable	Other surface comments: There are wheel ruts on the runway	
Visual Aids for Navigation			
Windsock present:	☒ Yes ☐ No/Non-serviceable	Marker cones delineate the runway strip	☒ Yes ☐ No/Non-serviceable
Windsock setout:	☒ Complying ☐ Non-complying	More marker cones required	☐ Yes ☒ No
Windsock condition:	☒ Adequate ☐ Replace	No. marker cones required	#
Other comments: *Tall trees obstructing the splay and clear way at the north western end. There are also food gardens within the 160m clearway. The South eastern end is also not clear. Few trees obstruct the area and will need cutting.*			

GIRAMBEN AIRSTRIP

	
Picture taken on the runway centerline showing aircraft wheel ruts	Picture showing barbed fencing at the aristrip. Fencing is right around.

5.2.3 CAR Part 135.77 Use of Aerodrome

(4) any erasure made in accordance with paragraph (b)(3) is—

(i) of the oldest recorded data accumulated at the time of testing; and

(ii) recorded in the appropriate maintenance documentation.

135.73 Refuelling and de-fuelling operations

(a) Despite the requirements of rule 91.15(3), a person operating an aeroplane under the authority of an air operator certificate may refuel or defuel the aeroplane with a Class 3.1C or a Class 3.1D flammable liquid (aviation turbine grade fuel) when a person is embarking, on board, or disembarking the aeroplane, if the person operating the aeroplane ensures that safety and aeroplane evacuation precautions are taken in accordance with procedures specified in the certificate holder's exposition.

(b) A person operating an aeroplane under the authority of an air operator certificate may refuel or defuel the aeroplane with a Class 3.1C or a Class 3.1D flammable liquid (aviation turbine grade fuel) with one or more propulsion engines running, if-

(1) the person ensures that safety and aeroplane evacuation precautions are taken in accordance with procedures specified in the certificate holder's exposition; and

(2) the pilot-in-command is responsible for every aspect of the fuelling operation.

135.75 Fuel spillage

The certificate holder shall ensure that while refuelling or de-fuelling, where fuel is spilled onto an impermeable surface and is likely to endanger persons or property—

(1) refuelling or de-fuelling is stopped; and

(2) immediate action is taken to cover the fuel with sand, sawdust, dry earth, or an agent such as foam or dry chemical extinguisher powder, to reduce the fire hazard.

135.77 Use of aerodromes

(a) The certificate holder shall ensure that any aerodrome to be used in its operations has physical characteristics, obstacle limitation surfaces, and visual aids that meet the requirements for—

(1) the characteristics of the aeroplane being used; and

(2) the lowest meteorological minima to be used.

(b) The certificate holder shall ensure that any heliport to be used in its operations meets the requirements of rule 91.127.

(c) The certificate holder shall, where its aeroplanes use an aerodrome not promulgated in the PNGAIP, 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.

5.3 Appendix C: Engineering

5.3.1 Fuselage Stations

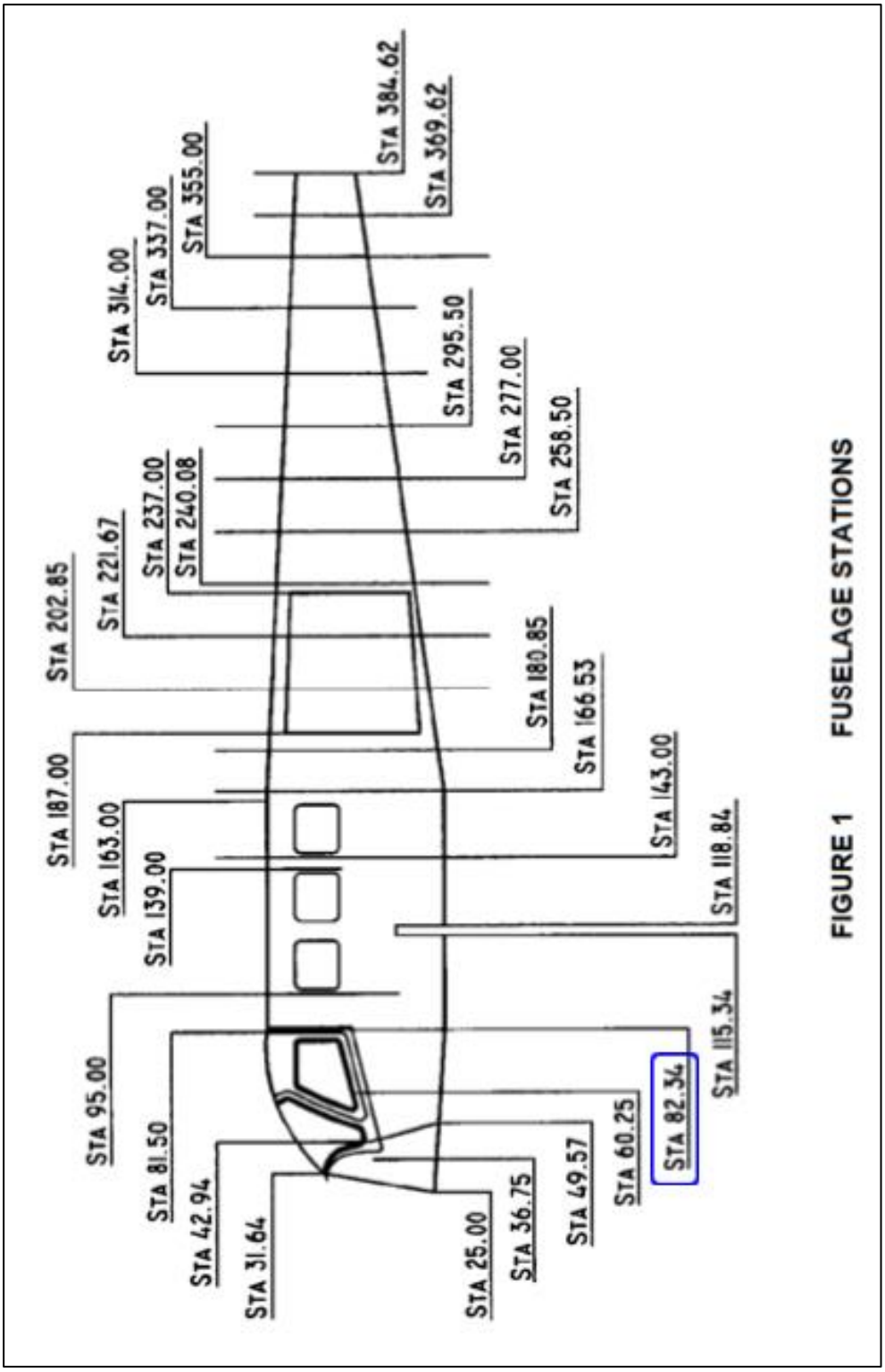


FIGURE 1 FUSELAGE STATIONS