ACCIDENT INVESTIGATION COMMISSION

FINAL REPORT

AIC 24-2001

Tropicair Ltd

P2-BBM

DHC-6-300 Twin Otter

Runway Excursion During Landing

Kikori Airstrip, Gulf Province

PAPUA NEW GUINEA

08 June 2024

About the AIC

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

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

The AIC performs its functions in accordance with the provisions of the *PNG Civil Aviation Act 2000*, and the *Commissions of Inquiry Act 1951*, and in accordance with *Annex 13 to the Convention on International Civil Aviation*.

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

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

About this Report

On 8 June 2024 at 13:23 local time (03:23 UTC), the AIC was notified by Tropicair Limited (Ltd) about an occurrence which had occurred on the same day at 11:43 local time (01:43 UTC). The occurrence involved a DHC-6-300 Twin Otter aircraft, owned and operated by Tropicair Ltd. The AIC immediately began gathering information pertinent to the occurrence and commenced the investigation. A team of investigators were dispatched to perform on-site activities on the day of the occurrence.

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

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

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

Readers are advised that in accordance with *ICAO Annex 13 to the Convention on International Civil Aviation*, it is not the purpose of an AIC aircraft accident or serious incident 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

3 February 2025

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GLOSSARY OF ABBREVIATION

AFM	: Aircraft Flight Manual
AGL	: Above Ground Level
AIC	: Accident Investigation Commission
AMM	: Aircraft Maintenance Manual
AMSL	: Above Mean Sea Level
ATC	: Air Traffic Control
ATPL	: Air Transport Pilot License
ATS	: Air Traffic Services
CPL	: Commercial Pilot License
CRM	: Crew Resource Management
CVR	: Cockpit Voice Recorder
EIS	: Engine Indicating System
FDR	: Flight Data Recorder
FIS	: Flight Information Service
FL	: Flight Level
GPS	: Global Positioning System
hPa	: Hectopascal
ICAO	: International Civil Aviation Organization
IFR	: Instrument Flight Rules
ILS	: Instrument Landing System
kg	: Kilogram(s)
km	: Kilometre(s)
Kts	: Knots (nm/hour)
MTOW	: Maximum Take-off Weight
NM	: Nautical mile(s)
PF	: Pilot Flying
PIC	: Pilot in Command
PM	: Pilot Monitoring
QNH	: Query Nautical Height (atmospheric pressure at sea level)
QRH	: Quick Reference Handbook
SSCVR	: Solid State Cockpit Voice Recorder
SSFDR	: Solid State Flight Data Recorder
TAF	: Terminal Aerodrome Forecast
UTC	: Universal Time Coordinate

SYNOPSIS

On June 8, 2024, at 11:43 local time, a Tropicair Ltd De Havilland Aircraft of Canada Limited, DHC-6-300 Twin Otter aircraft, registered P2-BBM, encountered a runway excursion while landing at Kikori Airstrip, Gulf Province, Papua New Guinea. The aircraft was operating an IFR Fares and Freight flight, the aircraft departed Kerema Airport with 16 persons onboard; two crew and 14 passengers. After veering left off the runway, the aircraft entered a drainage ditch and impacted an embankment. All occupants were evacuated, and no injuries were reported.

The flight departed as planned from Kerema Airport at 11:04, climbed to 8,000 feet AMSL and followed a northwest track to Kikori Airstrip. Weather conditions along the route and in the Kikori area were reported as light clouds without precipitation. The crew conducted a GPS-guided approach, descending to visual conditions approximately 4 NM from Runway 30 at an altitude of 700–800 feet AGL. The approach was stabilized, with the aircraft configured for landing and maintaining appropriate airspeed and descent rate.

The landing was uneventful with the aircraft touching down at 11:43:27 at an airspeed of 73 knots. However, following touchdown and on the initial landing roll, the application of Beta caused the aircraft to yaw to the left. This was determined to be an asymmetric condition as a result of the left Beta system being more effective than the right, inducing asymmetric drag. Efforts to counter the yaw, including adjustments to the power levers as well as rudder inputs, led to controllability issues. The crew actions, coupled with a delay in the Beta response, caused the aircraft to veer right of center. The investigation found that due to the control inputs maintained by the crew, the aircraft continued to track up the airstrip with its right main wheel on the grass strip edge for about 120 meters before tracking back onto the runway. Control inputs were done to get the aircraft back to centre. This included rudder pedal input as well as asymmetric power applications to correct the aircrafts tracking. Tyre markings showed that the aircraft made a positive turn back onto the strip just before the taxiway, however, due to the control input being maintained, shortly after tracking back onto the strip, the aircraft continued further left of the strip. The crew controlled the aircraft back onto the strip, however, rudder pedal inputs and asymmetric power application resulted in the aircraft continuing further left of the strip towards the strip edge drainage ditch.

As the aircraft rolled off the runway and onto the grass, it slowed significantly but continued moving toward the drainage ditch, along the western edge of the strip edge. Full reverse thrust and braking were ineffective in preventing the roll into the drainage ditch and subsequent impact. After coming to rest in the ditch, the crew initiated a safe evacuation through designated exits.

The investigation concluded that pilot actions or inactions interacted with the pre-existing conditions (latent) which are as follows: maintenance issue, Beta asymmetric condition of the aircraft on landing and environmental conditions such as strip surface damp with standing water and physical characteristics of the strip, which breached all defenses in the system, hence creating an opportunity for the serious incident to occur.

The AIC issued safety recommendations to the operator (Tropicair Ltd) with respect to Beta Asymmetry, emphasising it to technical crew and establishing special procedures or guidance on the operation of Beta and recommendation for appropriate maintenance actions to be carried out after a major work on the control systems of the aircraft.

1 FACTUAL INFORMATION

1.1 History of the flight

On 8 June 2024, at 11:43 local (01:43 UTC[1]), a De Havilland Aircraft of Canada Ltd DHC-6-300 Twin Otter aircraft, registered P2-BBM, owned and operated by Tropicair Ltd, was conducting an IFR[2] Fares and Freight flight from Kerema Airport to Kikori Airstrip, Gulf Province, Papua New Guinea, when, during the landing roll at Kikori, it experienced a runway excursion and rolled into a drainage ditch which runs along the left side of the runway and impacted the embankment.

Figure 1. Serious incident at Kikori Airstrip.

There were sixteen (16) persons on board: two (2) crew and fourteen (14) passengers. The Pilot in Command (PIC) was Pilot Flying (PF) and the co-pilot was Pilot Monitoring (PM).

The recorded data[3] showed that P2-BBM departed Kerema Airport at 11:04 and commenced a climb to an altitude of 8,000 ft AMSL and began tracking Northwest to Kikori Airstrip with an estimated arrival time of 11:45 (Refer Figure 2).

The crew reported no significant weather along the route. On arrival in the Kikori area, they observed light clouds and no rain over the airstrip. Recorded data showed that the aircraft continued to track Northwest towards Kikori Airstrip.

The crew conducted the approach in accordance with the published GPS[4] arrival procedures in the *Niusky Pacific Limited Papua New Guinea Aeronautical Information Publication Flight Supplement*. The PIC stated that he commenced the approach in light cloud, becoming visual at 4 nautical miles (NM) from runway (RWY) 30, at around 700-800 feet (ft) above ground level (AGL).

The recorded data indicated that the aircraft was established on final approach about 3 NM from the RWY 30 threshold. At 11:41:39, the crew then set the flaps to 10° and gradually reduced speed, while maintaining a height of 700 ft AGL.

At 11:42:00, when the aircraft was 2.4 NM from RWY 30 threshold, the recorded data showed that the crew fully configured the aircraft for landing by setting the flaps to 20°, advanced the propeller levers to the full fine position, and maintained an airspeed between 80 to 90 knots (kts), with a descent rate of about 960 ft per minute

1 Universal Coordinated Time

2 Instrument Flight Rules

3 The recorded data from both the L3 FA5000 Flight data recorder aircraft and the Appareo AIRS-400, which have been synchronised. For further details, see section 1.11

4 Global Positioning System

(FPM). The crew stated during the interview that they maintained an airspeed within 10 kts of the Vref, which was about 80 kts, and a descent rate no greater than 1,000 FPM.

According to the Air Traffic Services (ATS) recording, at 11:42:14, the crew cancelled SARWATCH. At 11:42:55, the recorded data indicated that the aircraft was 0.8 NM from RWY 30 threshold. The aircraft maintained the runway heading while gradually reducing height and speed, and touched down at 11:43:27 with an airspeed of 73 kts and a groundspeed of 86 kts.

Figure 2. Depiction of P2-BBM flight path.

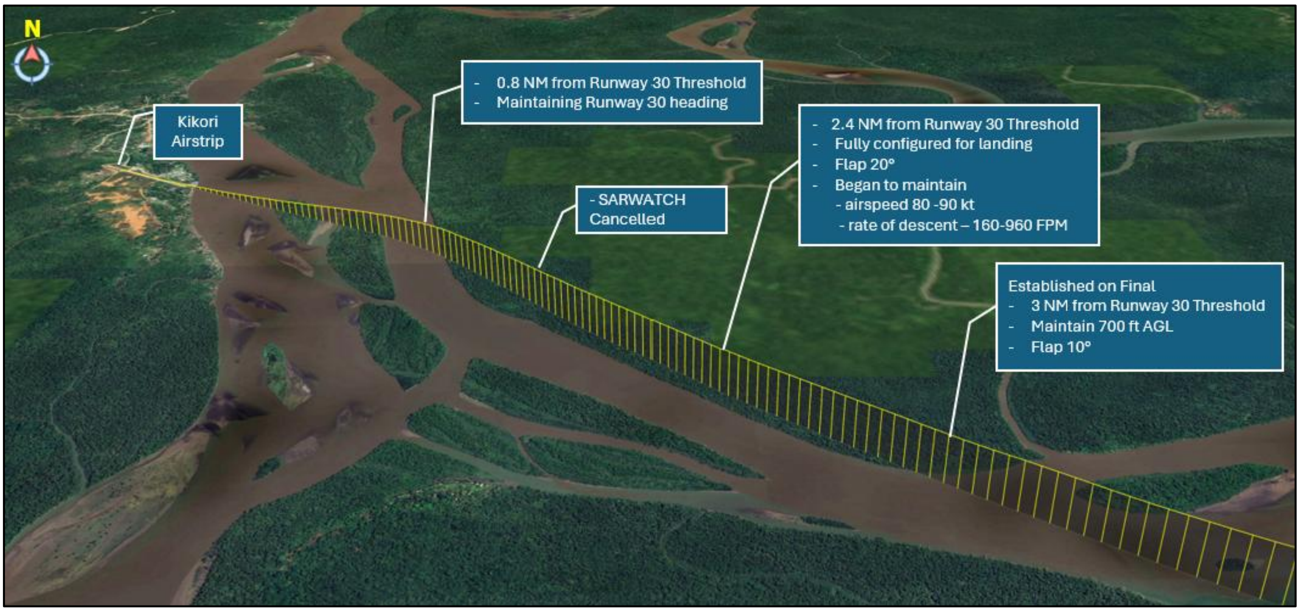


Figure 3. Recorded data showing where P2-BBM was established on final approach for Runway 30.

According to the crew, the touchdown and the initial roll were normal. The crew stated that following touchdown, they applied Beta, as per Tropicair's *DHC-6-300 Standard Operating Procedures Manual, 3.13.3 Use of Reverse* (Refer to Appendix 5.1), by pulling the power levers aft[5] of IDLE setting and placed them in the Beta range. They added that, after the application of Beta, they noticed that the aircraft began to yaw to the left. At 11:43:30, recorded data showed that three seconds after touchdown, the aircraft began drifting to the left of

5 Further back

the centreline, covering a distance of 188 metres (m) on the runway. This lasted for 5 seconds before the aircraft's heading began to turn to the opposite direction.

The crew stated that upon noticing the left yaw, they advanced the left engine power lever back to the IDLE position, in an attempt to realign the aircraft with the centreline. However, this led to an overcorrection and caused the aircraft to veer from left to right, past the centreline. The recorded data showed that at 11:43:35, the aircraft's heading began to turn to the right, lasting for 4 seconds and covering a distance of 120 m on the runway, before the heading began to shift back to the left.

According to the crew, to correct the right yaw, they advanced the right engine power lever to IDLE, however the aircraft continued veering right. The PIC stated that before the aircraft reached the right turn-off into the parking area on the airstrip, they were still attempting to counter the right drift, while also attempting to slow down the aircraft’s speed to below 40 kts by applying Beta once again.

The recorded data showed that at 11:43:39, as the aircraft passed the right turn-off to the parking bay, the aircraft’s heading subsequently began turning left with an airspeed of 38 kts and a groundspeed of 49 kts. The PIC added that while the aircraft had slowed down, after the second application of Beta, the aircraft continued to veer left past the centreline and rolled toward the left edge of RWY 30, covering a distance of 61 m in a trajectory path that lasted for 8 seconds.

The PIC stated that he had also applied right rudder to assist with steering the aircraft back to the right, however, the rudder input was ineffective. He added that, when the aircraft rolled onto the grass surface of the strip edge, he then applied full reverse and braking, however, the aircraft continued to roll past the runway edge and into an adjacent drainage ditch.

Figure 4. Aerial view of the airstrip and P2-BBM track from touchdown to final resting position.

The aircraft impacted the embankment of the drainage ditch and came to rest. The PIC subsequently shut down the engines and advised the co-pilot to evacuate the passengers. The co-pilot and the passengers egressed the aircraft through the left rear exit door and the PIC egressed the aircraft from the left-side cockpit door. There were no reported injuries to the crew and passengers.

1.2 Injuries to persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	2	14	16	Not applicable
TOTAL	2	14	16	-

Table 1. Injuries to persons.

1.3 Damage to aircraft

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

1.4 Other damage

There was no other damage to property and/or the environment.

1.5 Personnel information

1.5.1 Pilot In Command

Age	: 42
Gender	: Male
Nationality	: Fijian
Position	: Pilot
Type of license	: CPL (A)[6]
Valid to	: Perpetual
Rating	: BN2; DHC-6
Total flying time	: 5918.37 hours
Total last 90 days	: 94.9 hours
Total on type last 90 days	: 94.9 hours
Total last 7 days	: 3.6 hours
Total on type last 7 days on type	: 3.6 hours
Total last 24 hours	: 3.6 hours
Total hours last 24 hours on type	: 3.6 hours
Total on duty last 48 hours	: 6.0 hours
Total rest period(s) last 48 hours	: 20.0 hours – 2 Rest Periods
Last recurrent training	: 24 January 2024

6 Commercial Pilot License (Aeroplane).

Last proficiency check	: 23 January 2024
Last line check	: 24 January 2024
Route recency	: 7 June 2024
Medical class	: One (1)
Valid to	: 25 April 2025
Medical limitation	: Multi Crew

The PIC's training records provided by the Operator were assessed to determine crew competency and currency at the time of the serious incident. Records showed that the pilot was current with his proficiency and currency checks in accordance with *CAR Part 61.807 "Currency Requirements for the holder of an instrument rating*" and *CAR Part 125.605 "Flight Crew competency checks*". His Class one (1) Medical, according to *CAR Part 67.61 "Effective date and duration of Medical Certificate*", was valid at the time of the serious incident.

The investigation determined that the PIC was familiar with Kikori Airstrip, and the surrounding area, having operated multiple flights into Kikori for the Operator. Records showed that he had last operated a flight to Kikori the day before the serious incident flight.

The PIC was the Pilot Flying (PF) from Kerema Airport to Kikori Airstrip (serious incident flight).

1.5.2 Co-pilot

Age	: 24
Gender	: Male
Nationality	: Papua New Guinean
Position	: Pilot
Type of license	: CPL (A)
Valid to	: Perpetual
Rating	: PA34, DHC-6
Total flying time	: 1,424.7 hours
Total last 90 days	: 85.5 hours
Total on type last 90 days	: 72.7 hours
Total last 7 days	: 3.1 hours
Total on type last 7 days on type	: 3.1 hours
Total last 24 hours	: 3.1 hours
Total hours last 24 hours on type	: 3.1hours
Total on duty last 48 hours	: 0.0 hours
Total rest period(s) last 48 hours	: 20.0 hours – 2 Rest Periods
Last recurrent training	: 25 January 2024
Last proficiency check	: 21 November 2023
Last line check	: 22 December 2023
Route recency	: 14 May 2024
Medical class	: One (1)
Valid to	: 10 October 2024
Medical limitation	: Spectacles

The co-pilot's training records provided by the Operator were assessed to determine crew competency and currency at the time of the serious incident. Records showed that the pilot was current with his proficiency and currency checks in accordance with *CAR Part 61.807 "Currency Requirements for the holder of an instrument rating*" and *CAR Part 125.605 "Flight Crew competency checks*". His Class one (1) Medical, according to *CAR Part 67.61 "Effective date and duration of Medical Certificate*", was valid at the time of the serious incident.

The co-pilot reported that he was wearing his prescribed spectacles at the time of the serious incident.

He was the Pilot Monitoring (PM) on the flight from Kerema Airport to Kikori Airstrip (serious incident flight).

1.6 Aircraft Information

The De Havilland Aircraft of Canada Ltd, DHC-6 Series 300 Twin Otter is an all-metal, high-wing monoplane with a fixed tricycle landing gear, equipped with a steerable nose wheel. It is fitted with two Pratt and Whitney, PT6A-34 turboprop engines, with short take-off and landing (STOL) capabilities. The aircraft is a passenger/utility aircraft, seating up to 20 passengers.

1.6.1 Aircraft data

Aircraft Manufacturer	: De Havilland Aircraft of Canada Ltd
Model	: DHC-6-300
Serial Number	: 542
Year of Manufacture	: 1977
Registration	: P2-BBM
Name of the Owner	: Tropicair Limited
Name of the Operator	: Tropicair Limited
Certificate of Registration number	: 356
Certificate of Registration issued	: 7 May 2015
Certificate of Registration valid to	: Non-Terminating
Certificate of Airworthiness number	: 356
Certificate of Airworthiness issued	: 25 November 2015
Certificate of Airworthiness valid to	: Non-Terminating
Total Hours Since New	: 39,322.0 hours
Total Hours Since Overhaul	: 6,598.28 hours
Total Cycles Since New	: 133,123
Total Cycles Since Overhaul	: 7,626

1.6.2 Engine data

Manufacturer	: Pratt & Whitney Canada Inc.
Model	: PT6A-34
Engine Type	: Turboprop
Engine number one (Left)	
Serial Number	: PCE – RB0793
Total Time Since New	: 6,462.42 hours
Engine Cycles	: 7,237
Time Since Overhaul	: 2,438.58 hours
Cycles Since Overhaul	: 2,411

Engine number two (Right)

Serial Number	: PCE-RB0794
Time Since New	: 6,148.20 hours
Engine Cycles	: 6,910
Time Since Overhaul	: 1,961.49 hours
Cycles Since Overhaul	: 1,880

1.6.3 Propeller data

Manufacturer	: Hartzell Propeller Inc
Model	: HC-B3TN-3D

Propeller number one (Left)

Serial Number	: BUA-25582
Total Time Since New	: 12,845.46 hours
Total Time (Cycles) Since Overhaul	: 1,001.31

Propeller number two (Right)

Serial Number	: BUA-28618
Total Time Since New	: 12,557.03 hours
Total Time (Cycles) Since Overhaul	: 457.44

1.6.4 Propeller – General Data

According to the *Viking DHC-6 Twin Otter, Series 300, Maintenance Manual, Volume 1, Revision 21 – Sep. 28/18*; P2-BBM engines are equipped with a Hartzell three bladed, constant speed, reverse pitch, fully feathering propeller, the operation of which is controlled in the constant speed and feather range by the propeller lever, and in the reverse range by the engine power lever.

The propeller is operated in one direction by engine oil, pressurised and controlled by a constant speed governor, which is delivered through the hollow propeller shaft. Counterweights and feather return springs operate the propeller in the opposite direction.

The propeller control system includes the constant speed and overspeed governors, and overspeed test switch. Refer to Appendix 5.2, for further details. Other controlling factors are the autofeather and beta range back-up systems and blade zero thrust stops.

Beta range indicating lights, propeller reset caution light, autofeather select and arming lights, and a propeller tachometer indicating system are provided.

1.6.4.1 Propeller

According to the *Viking DHC-6 Twin Otter, Series 300, Maintenance Manual, Volume 1, Revision 21 – Sep. 28/18*; the propeller consists of a hollow spider hub which supports three propeller blades and houses the feather return springs.

The propeller has a diameter of 8 feet 6 inches and a pitch range of 102 degrees, from -15 degrees reverse to +87 degrees feathered. When blade zero thrust stops are fitted, the zero-stop setting is at +1 degree.

The propeller is dowelled and bolted to the front of the engine propeller shaft flange. Blade movement is controlled by a servo piston, mounted on the front of the propeller spider hub, which is connected by links to each blade root.

During propeller operation, centrifugal counterweights attached to each blade, and the feather return springs in the spider hub, tend to move the blades into the high pitch or feather position, but this movement is opposed by oil pressure (controlled by the constant speed governor) acting on the piston. An increase in oil flow moves the blades towards the low pitch position (increased rpm), and relieving oil pressure allows the blades to move to the high pitch position, under the influence of the feather return springs and the blade counterweights. The piston is also connected to a low stop collar, mounted behind the propeller, by three spring loaded rods. Movement of the low stop collar in the beta range is relayed to a beta control valve (incorporated in the constant speed governor) by a carbon block and a propeller reversing lever, to control blade angles from the normal forward low pitch stop to full reverse.

1.6.4.2 Beta Range

According to the *Viking DHC-6 Twin Otter, Series 300, Maintenance Manual, Volume 1, Revision 21 – Sep. 28/18*; a Beta Range is the propeller operational mode in which the propeller blade angle is controlled by the beta reverse valve, not by the propeller governor.

The beta reverse valve controls the propeller blade angles in the beta range as selected by the power levers. Once on the ground the propellers can be used to assist with stopping the aircraft as well as for taxiing in reverse by operating the propellers in beta range.

Assuming the propeller is not feathered, the pilot can determine if the propeller is in beta range by comparing the propeller speed selected using the propeller control lever to the propeller speed indicated by the Np gauge. If the propeller speed indicated on the Np gauge is less than the propeller speed that has been selected with the propeller lever, the propeller is in beta range.

The propellers normally operate in beta range during all ground manoeuvring (other than the Take-off run), during the final portion of every approach and landing, once the propeller levers have been brought forward to the maximum RPM (96% Np) position prior to landing.

1.6.4.3 Controls and Indications

According to the *Viking DHC-6 Twin Otter, Series 300, Maintenance Manual, Volume 1, Revision 21 – Sep. 28/18*; the engine controls consist of three main systems, power, propeller and fuel.

Each system is basically of the cable and pulley type, with the addition of cable slides in the power and propeller control systems. To operate micro switches in relation to control lever positions.

The control levers are mounted in the flight compartment overhead console. Provision is made for the use of rigging pins to facilitate the rigging of each system. Friction dampers are provided in the overhead console of hold the power and propeller levers in any selected position. Refer to Appendix 5.3.

Control of an engine is achieved through the operation of the power lever control system, the fuel shut control and the propeller control system. The control levers for each system are mounted in the flight compartment overhead console.

A cable attached to each lever quadrant runs along the aircraft roof, wing leading edge, and engine nacelle to its respective control pulley on the engine firewall. From the control pulleys, a rod or Teleflex is used to actuate the fuel control unit (FCU), fuel shut-off valve and the propeller governor. Both engines are controlled by identical systems.

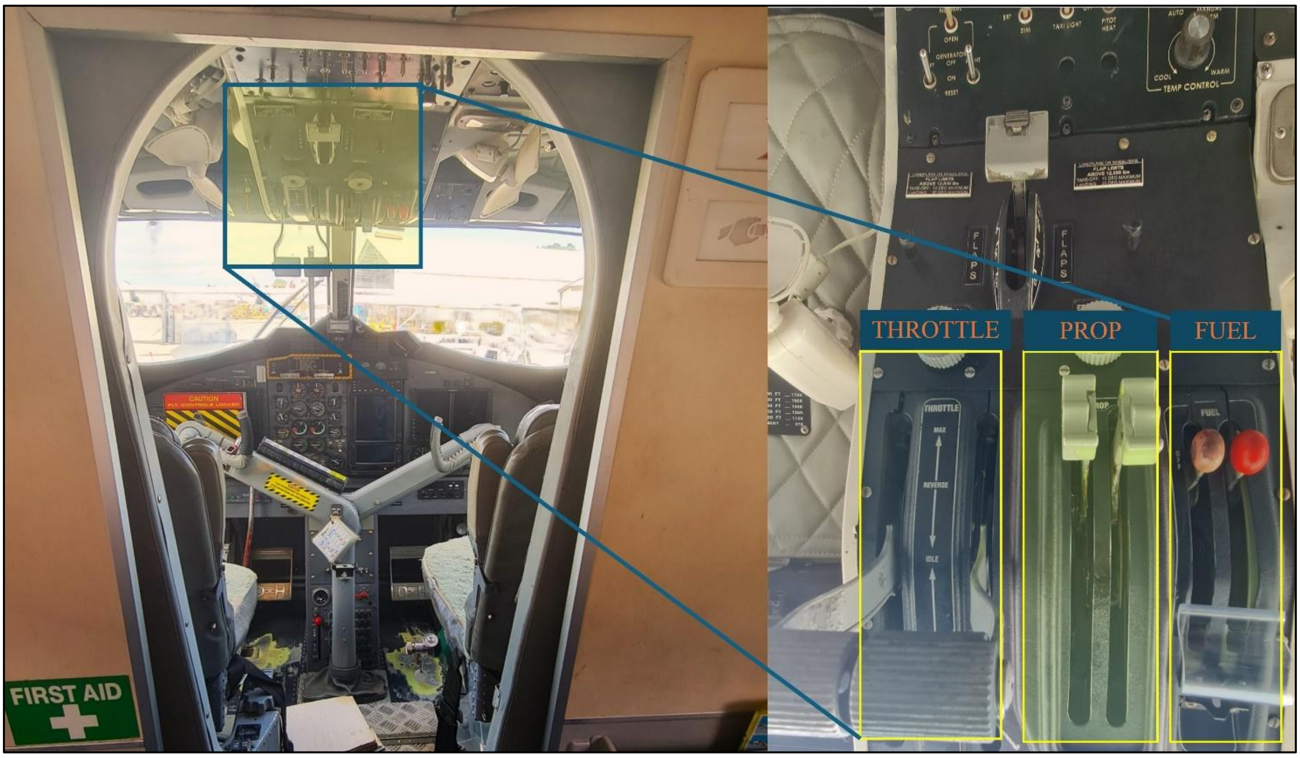


Figure 5. P2-BBM Power Quadrant.

1.6.4.4 Maintenance/ Airworthiness

At the time of the serious incident, P2-BBM had a valid Certificate of Airworthiness (CoA) and Certificate of Annual Airworthiness Review (AAR).

The maintenance records of the aircraft were reviewed during the investigation and identified that there were no outstanding scheduled maintenance, defects, and outstanding Minimum Equipment List (MEL) prior to the serious incident flight.

Therefore, it was identified that the aircraft was serviceable and airworthy at the time of the serious incident.

1.6.4.5 Pre-occurrence schedule maintenance- related to the Serious Incident - Right Hand (RH) Propeller

Maintenance records provided by the Operator to the AIC showed that on 20 May 2024, 19 days prior to the serious incident, the right-hand (RH) Propeller Assembly on P2-BBM was removed as it was due for an overhaul, and was replaced with another Propeller Assembly that was previously installed on another aircraft, a DHC-6-400 (P2-AXL) owned and operated by Tropicair Ltd. The replacement of the propeller assembly was carried out during a 250-hour scheduled maintenance check.

Records also showed that four (4) days after the installation of the replacement propeller; HC-B3TN-3D/T 10282 S/No. BUA28618, an assessment flight was carried out and operations were reported as satisfactory. P2-BBM was subsequently released to service on the same day.

TIMELINE

MAINTENANCE PRE-OCCURRENCE

17 May 2024	Engine 2 (RH) Power Lever Control, Reverse Control, Beta Arm forward end disconnected and removed for access to facilitate Propeller Assembly removal ***[17-20 May] – Duplicate Inspection Carried out.*** • Beta arm refitted and secured • Reverse checked
18 May 2024	Propeller SN: BUA-28618 – Removed from the DHC-6-400 aircraft P2-AXL
20 May 2024	Engine 2 (RH) Beta arm and slide actuator carbon blocks worn and slide actuator excessive play • Beta arm, Slide actuator and Carbon blocks replace with new items
20 May 2024	Removal of Right-hand Propeller SN: BUA-24443 due overhaul.
20 May 2024	Installation of replacement Propeller SN: BUA-28618
24 May 2024	Assessment Flight – satisfactory Released to Service (RTS)
24 – 28 May 2024	21 Flights were conducted Out of the 21 flights, 3 Flights conducted to Kikori
28 May 2024	Defect reported by technical crew, Logged in the Technical Log as Non-Airworthy Defect (NAD) • on take-off Prop full forward, LH Prop lever leading the RH Prop Lever by ½ knob to synchronise props – Re-rigging suggested
29 May – 7 Jun 2024	23 Flights conducted. Out of the 23 flights. 1 Flight to Kikori (1 June) 1 Flight conducted the day before the serious incident flight (7 June)
8 Jun 2024	Serious Incident (Runway Excursion after landing)

1.6.4.6 History of Replacement Propeller HC-B3TN-3D/T 10282 S/No. BUA28618

The propeller of interest was installed on to P2-BBM 19 days prior to the serious incident, according to maintenance records, was overhauled by the operator's overseas-based contracted overhaul service provider on 15 January 2024 and shipped back to the operator. The operator reassembled and installed the overhauled propeller on the left-hand engine of their DHC-6-400 aircraft (P2-AXL) on 25 January 2024. The investigation identified through the aircraft maintenance records that while the event propeller was installed on P2-AXL, from 25 January to 17 May 2024, there were no reported reversing inconsistencies. On 18 May 2024, the propeller was removed from another DHC-6 Twin Otter aircraft, P2-AXL and installed on P2-BBM on the right-hand engine.

TIMELINE	
MAINTENANCE PRE-OCCURRENCE	
15 Jan 2024	Propeller SN: BUA-28618 overhauled by Overhaul service provider overseas
25 Jan 2024	Propeller SN: BUA-28618 returned to Tropicair Ltd, reassembled and reinstalled on a DHC-6-400 (P2-AXL) aircraft owned and operated by Tropicair Ltd
18 – 21 Mar 2024	Propeller SN: BUA-28618- Periodic Inspection Checks and Lubrication carried out IAW OM No. 139. Satisfactory
18 May 2024	Propeller SN: BUA-28618- Removed from the DHC-6-400 aircraft (P2-AXL)
20 May 2024	Removal of Right-hand Propeller SN: BUA-24443 on P2-BBM due overhaul.
20 May 2024	Installation of replacement Propeller SN: BUA-28618

1.6.4.7 P2-BBM Maintenance – Post Occurrence, Ferry Flight

The aircraft was pulled out of the drainage ditch the day after the serious incident, on 9 June 2024 and an inspection was carried out by the Operator's engineers to determine the extent of damage. Refer to *Section 1.12 Wreckage and Distribution* for further details.

After the inspection was completed, minor repairs were carried out to prepare the aircraft to be ferried back to the Operator's base at Jacksons International Airport, Port Moresby. A Special Flight Permit was approved by CASA[7] PNG on 10 June allowing the Operator to conduct the ferry flight.
Prior to departure, the Operator's Maintenance team carried out a engine ground run and once they were satisfied, they proceeded with the flight.

TIMELINE	
ONSITE MAINTENANCE – BEFORE FERRY FLIGHT	
9 Jun 2024	P2-BBM recovered from drainage ditch On-site Damage Inspection carried out • Front fuselage only damaged area: minor composite damage to Nose cone and Nose section, Nose wheel flat on the wheel rim On-site maintenance carried out following inspection (for Ferry Flight back to POM): • Nose wheel tyre change • RH engine cleaned of sand around the Engine inlet • High-speed tape used to secure Nose Composite damage to ensure smooth airflow over forward fuselage • Engine Ground Run – all systems found to be operating within normal limits
FERRY LIGHT	
11 Jun 2024	P2-BBM flown back to Operator's Base – Jacksons International Airport, Port Moresby Observations During Ferry Flight: Observation of engine parameters after take-off:

7 Civil Aviation Safety Authority of Papua New Guinea

	• RH Prop RPM increased beyond redline of 96%, right through to white line and was observed to be governing at 100% • RHS Propeller RPM overspeed condition – reduced prop RPM to 96% which left an approximately 2-inch split between prop levers • Cruise flight no issues ops normal • Touchdown normal • During landing roll Reverse selected and a significant yaw to the left – 5metres from RWY centreline. Recovery: returned both levers to a position forward of gate, resulted in positive thrust, regained full directional control and returned to runway centreline achieved.

1.6.4.8 P2- BBM Maintenance – Post Occurrence Operators Base

According to an interview with the Operator's Licensed Aircraft Maintenance Engineer (LAME), after the aircraft was flown back to the Operator's base in Port Moresby, Tropicair engineering team conducted ground performance runs. The investigation established that the Tropicair engineering team observed no indication of Beta Asymmetry when the propeller levers were placed in the full fine position and the power levers were retarded to the Beta Range. When the power levers were further retarded into Reverse, it was observed that retarding the levers as far as 30PSI, the reverse indications were normal. However, when the power levers were further retarded to achieve 50 PSI, the right propeller came out of reverse (stalled), while the left propeller maintained its position.

The LAME stated that the aircraft returned to the Hangar where the RH Propeller was removed, and a "Post Run Up" Inspection was conducted on the RH Propeller Assembly. The inspection identified an abnormal noise which was described as a clunking sound, as well as a jumping action in the propeller hub. The Operator then shipped the RH Propeller to their contracted propeller overhaul service provider for further assessment and repair.

A full examination was carried out on the RH propeller and a report was provided to the Operator on 3 July 2024. According to the examination report, it was discovered that the noise was emanating from the interaction (catching) of the inner and outer feather compression springs in the Propeller Assembly. Wear marks had also been discovered on the outer spring, therefore, a new inner and outer spring of the spring assembly were installed and the spring assembly reassembled. In addition, new clamp gaskets and inner screws (undrilled) and a new mounting O'Ring were also installed (Refer to Appendix 5.4).

Maintenance records provided by the Operator to the AIC, indicated that there was significant rigging work being carried out on P2-BBM in the Tropicair hangar, post occurrence.

TIMELINE

POST OCCURRENCE – (AFTER FERRY FLIGHT) **MAINTENANCE: FOR POWERPLANT (ENGINE AND PROPELLERS) 12 JUN – 5 JUL 2024**	
12 Jun -5 Jul 2024	Both LH and RH engines to be ground run, rerigged according to faults found. RH engine reported to have Beta/ Reversing issue. A full check requested ***[15 Jun – 5 Jul]*** • Engine 1 and 2 Propeller controls and Power Lever Reverse Control Rigging and Adjustments carried out • Engine performance checks carried for parameter readings. Engine 2 (RH) PY Bleed Elbow Disconnected at Fuel Control Unit (FCU) and FWD Fitting (PROP GOV) line for inspection ***[23 – 27 Jun]*** • Engine 2 PY Line refitted and elbow secured RH Propeller Assembly removed for inspection and Beta Reversing Lever disconnected for access ***[27 Jun - 4 Jul 2024]*** • a serviceable propeller assembly was installed (HC-B3TNN-3D SN: BUA 21245) • Beta Reversing Lever refitted and secured RH Engine power lever reverse control cable removed for inspection. Reverse Control disconnected at AFT and FWD Clevis - Terminal, wire rope push pull control ***[27 Jun – 3 Jul]*** • replaced with a new wire rope and adjustment carried out Engine 1 (LH) Propeller Control Rigging & Travel checks to be carried out, due to control disturbed for trouble shooting purposes with Propeller governor [***27 – 28 Jun]*** • Engine 1 (LH) control rigging and travel checks carried out Engine 2 Prop Control Rigging & Travel checks to be carried out due to control disturbed for trouble shooting purposes with prop governor) ***[27- 28 Jun]*** • Engine 2 Prop Control rigging & Travel checks carried out, Satisfactory Engine power lever reverse control forward end to be adjusted due to removal and re-installation of Propeller Governor for trouble shooting purposes ***[27 -28 Jun]*** • Rigging and adjustments carried out with engine 1 Beta control forward end
5 Jul 2024	• Ground Performance Run – RH Propeller Change, LH and RH Engine control Adjustments carried out -Satisfactory • ***P2-BBM Released to Service***

1.6.5 Fuel information

The AIC determined that fuel was not a contributing factor to the serious incident.

1.6.6 Weight and Balance

The AIC determined that the aircraft was within the weight limits for take-off and landing and correctly loaded for the intended flight, therefore weight and balance was not a contributing factor to the serious incident.

1.6.7 Minimum Equipment List

There was no outstanding Minimum Equipment List (MEL) item at the time of the serious incident.

1.6.8 Collision Avoidance Systems

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

1.7 Meteorological information

1.7.1 Terminal Aerodrome Forecast (TAF)

The Terminal Aerodrome Forecast (TAF) for Kikori Airstrip was issued by the PNG National Weather Service at 03:30 on 8 Jun 2024. The validity of the forecast was between 05:00 to 19:00 for 8 Jun 2024 as follows:

Wind	Blowing 240 degrees at 6 kts
Cloud	Scattered at 1,700 ft and 3,000 ft; Broken at 13,000 ft
Visibility	Greater than 10 km in light rain and drizzles
QNH	1010 1012 1011 1009

The TAF also provided intermittent weather information valid for the period between 10:00 to 19:00 on 8 June 2024 as follows:

Cloud	**Broken at 1,000 ft**
Visibility	5km in rain and drizzles

1.7.2 Reported weather and pilot observation of weather at Kikori

Prior to departure from Kerema Airport, the crew received weather information for Kikori Airstrip from the local agent. The agent reported that it had rained throughout the week, however there was no rain at that time, and the weather was fine.

On arrival in the Kikori area, the crew observed light clouds and no rain over the airstrip, and no wind. They added that even though the approach began in cloud, they could see the river below along the approach path, and got visual 4 NM from RWY 30, at a height of about 800 ft AGL.

Figure 6. Photo taken on the day of occurrence by onsite investigation team (4:40 pm local, 8 Jun 2024).

1.8 Aids to navigation

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

1.9 Communication

The aircraft was equipped with a High Frequency (HF) and Very High Frequency (VHF) two-way communication radio. Both communication systems were determined to be serviceable and were not a contributing factor to this serious incident.

1.10 Aerodrome information

1.10.1 General Information

Kikori Airstrip is situated in the Kikori District of Gulf Province. It is about 96 NM northwest of Kerema Airport and about 219 NM northwest of Jacksons International Airport.

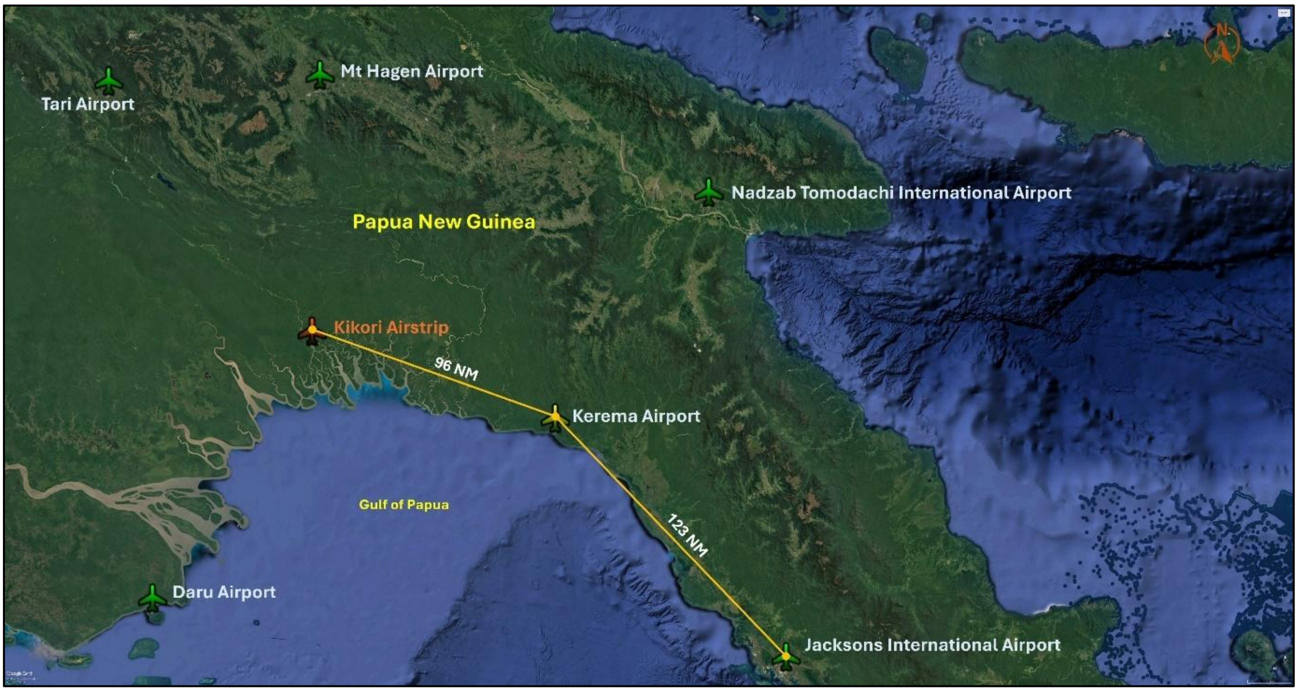


Figure 7. Location of Kikori Airstrip. (Source: Google earth, annotated by the AIC).

As stated in the Operator's *DHC-6 Route Guide* dated 1 December 2017, Kikori is situated inland, 20 NM from the Kikori River mouth on the PNG mainland's south coast in the Gulf Province. Kikori operates as an uncontrolled, daylight-only aerodrome within Class F airspace, serviced by a Flight Service Station (FSS) providing traffic advisories. The airstrip features a 705 m runway with steel matting, sloping 0.3% down toward the northwest, and is restricted to "Captain only" landings and take-offs. There are no available engineering facilities, refuelling stations, or ground handling services, and the parking area is limited and prone to bogging during heavy rains. Operational cautions are advised at Kikori due to several restrictions: unauthorized pedestrian and animal movement is common on and around the runway, requiring vigilance during operations. Due to its rural location, Kikori lacks advanced navigation aids; there are no DME or NDB, though a GNSS approach is available, and operations rely on GPS for distance and azimuth guidance. The Operator's requirements specify strict procedures to minimize ground taxiing risks, mandating mandatory strip reporting, with take-offs preferred on RWY 12 and landings on RWY 30 to reduce wear on aircraft tyres and avoid the matting's lifted edges, which may cause damage.

Aerodrome name:	Kikori Airstrip	
Indicator:	ICAO: AYKK	IATA: KRI
Coordinates:	Latitude: 7°25'12"S	Longitude: 144°14'56.55"E
	Elevation (AMSL): 40ft	Runway length: 705 m
Airstrip type:	Two-way landing and take off	
	Runway 12	Runway 30
Surface characteristic:	Compacted, unpaved limestone gravel	
Hours of operations:	Day light	

Table 2:Kikori Aerodrome information

Figure 8. Aerial view of Kikori Airstrip.

1.10.2 Onsite Observation of Kikori Airstrip

During the onsite investigation, investigators observed that the runway surface of Kikori Airstrip was mostly even with potholes in certain areas on the runway surface, and on firm and compact limestone with grass edges.

The grass edges leading to the drainage ditches composes mostly of soft silt as well as mud when it rains.

It was evident on the airstrip that vehicles and people commute within and through the airstrip perimeters due to a lack of perimeter fencing. A public vehicle road also crosses the airstrip midway, with another before the Northern end of the airstrip. This road leads from main road, through to the parking bay, across the airstrip and towards a primary school near the airstrip.

There is one parking bay on the Northern part of the airstrip approximately three quarters of the total length towards RWY 12. It was also noted that the parking bay infringes on the main public road that passes parallel to the airstrip.

The airstrip had two windsocks. One windsock was situated near the parking bay at the northwestern section of the airstrip. On observation, this windsock was worn, torn and unserviceable. The other windsock situated near end of RWY 30 is serviceable.

Figure 9. Kikori Airstrip onsite assessment. (Source: Google earth, annotated by the AIC).

Figure 10. Aerial view of P2-BBM final resting position.

1.10.3 Rural Airstrip Agency (RAA) Survey Report

The Rural Airstrip Agency (RAA) conducted a Subsurface Strength Assessment at Kikori Airstrip on 21 September 2021.

The general assessment at the time of testing found that the runway and strips were adequate, and recommendations were made for maintenance work to be carried out, which included keeping the grass on the runway and strips (edge of the strip, and along the drainage) cut, as well as maintaining the perimeter drains.

1.11 Flight recorders

The aircraft was fitted with an L3 Harris FA5000 Solid-State recorder. The table below outlines the additional information of the recorder.

Manufacturer	L3 Harris
Model	FA5000
Part Number	5311-6143-21
Serial Number	001057738

The AIC downloaded the recorder's data in a .dfd extension file, with a total size of 1.98 GB. This data was subsequently forwarded to the Australian Transport Safety Bureau (ATSB), where an Accredited Representative was appointed in accordance with ICAO Annex 13, Paragraph 5.23, to assist with decompressing the file and ensuring the proper protection of the information.

The file was decompressed and converted into two separate files, which were then unpacked, resulting in a new file with .upk as the file extension and had a data rate of 256 words per second (wps) and contained 144 hours and 21 minutes of recorded data.

The unpacked file was processed using a ROSE electronic data frame provided by the US National Transportation Safety Board (NTSB). The ROSE database was imported into the AIC's flight data tools, STARS, to convert the raw data into engineering values. Relevant data that was crucial to the investigation was extracted and used to support the investigation process.

1.11.1 Other Electronic Data Recording Device

1.11.1.1 Appareo - AIRS 400

The aircraft was fitted with an Appareo AIRS 400 recorder for flight data monitoring purposes. The unit captured the following information: cockpit image recording, intercom system audio for crew and air traffic control (ATC) communications and WAAS[8] GPS (latitude, longitude, groundspeed, vertical speed, GPS altitude, etc), Attitude data (G forces) and rates of rotation. The unit has an SD card for storing recorded information.

The AIC obtained the SD card and brought it to the AIC Flight Recorder Laboratory for data extraction. During the extraction process using the Appareo System's software, it was found that the SD card did not contain the datafile for the serious incident flight.

Therefore, the AIC used an alternative method to extract the datafile directly from the AIRS 400's internal memory, employing the appropriate software provided by the manufacturer. The AIC followed all recommended procedures as outlined by the manufacturer. After completing the internal memory extraction process, the AIC checked the SD card again, but the data was still missing.

The next step involved formatting and configuring the SD card before reinserting it into the AIRS 400 unit. Once the aircraft was serviceable, the SD card remained in the unit during subsequent flights. After several flights, the SD card was removed and checked, at which point the datafile for the serious incident flight, along with data from other flights (including those prior to the serious incident), was successfully stored on the card.

8 The Wide Area Augmentation System is an air navigation aid developed by the Federal Aviation Administration to augment the Global Positioning System, with the goal of improving its accuracy, integrity, and availability.

The recorded information and parameters from the serious incident flight were then extracted from the SD card and used in the investigation.

1.12 Wreckage and impact information

The AIC onsite investigation team observed that the tyre markings indicated that the aircraft initially touched down approximately 90 m beyond the RWY 30 threshold. The impact point was about 475 m from the touchdown point. The aircraft began veering left around 414 m from touchdown, as shown by the tyre markings. While the trye marks were prominent between the point where the aircraft started the second veer to the left up until the point of impact, they were less distinct in certain areas, particularly between the touchdown point and the initial veer to the left. This was due to a heavy downpour following the runway excursion as reported by the crew. Additionally, the hard surface of the runway, and the tyre marks from the rescue aircraft, made it difficult to clearly identify the marks that were imprinted by P2-BBM.

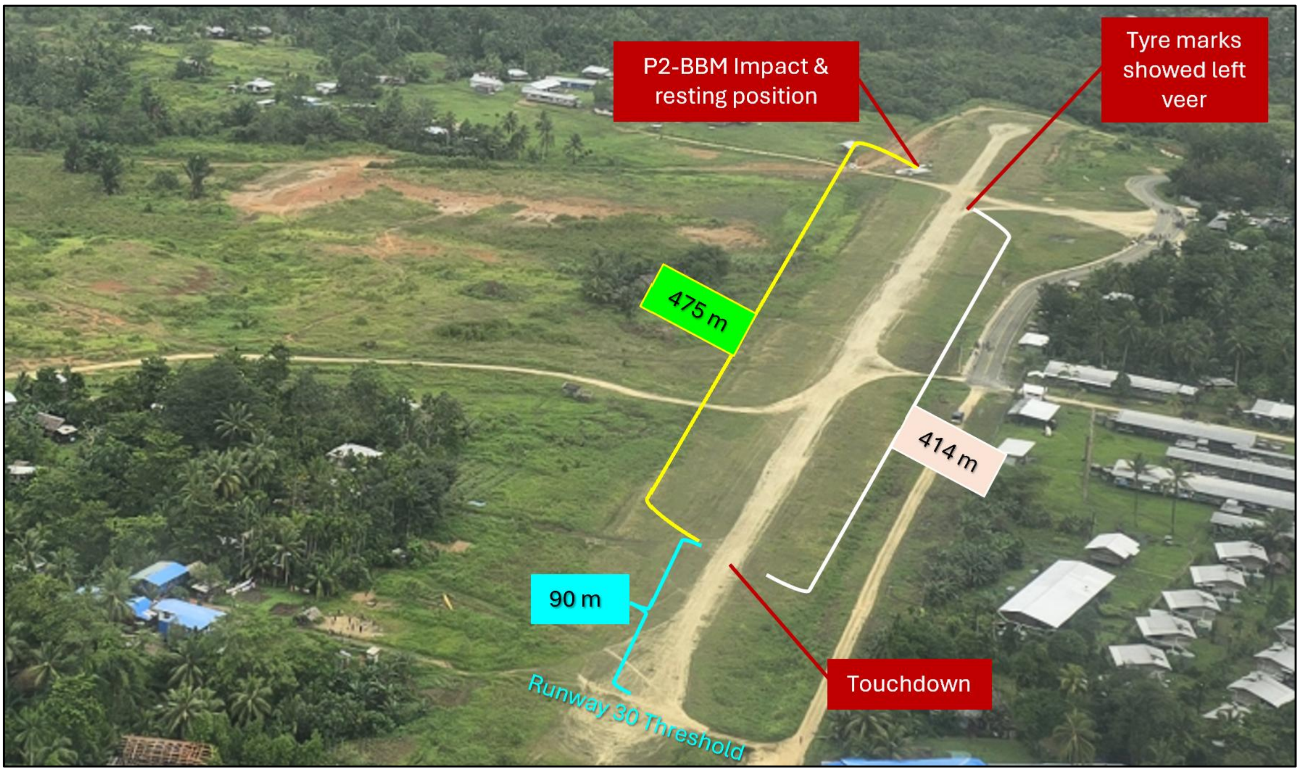


Figure 11. Accident site overview.

The tyre markings on both tyres showed that the aircraft began veering to the left along a trajectory. The distance covered by the markings of the aircraft's left veer on the right side of the runway to the point of impact on the airstrip was measured to be about 61m. The markings also indicated that heavy braking was applied during the final stages of the ground roll, before the aircraft entered a drainage ditch and struck the embankment, where it came to rest.

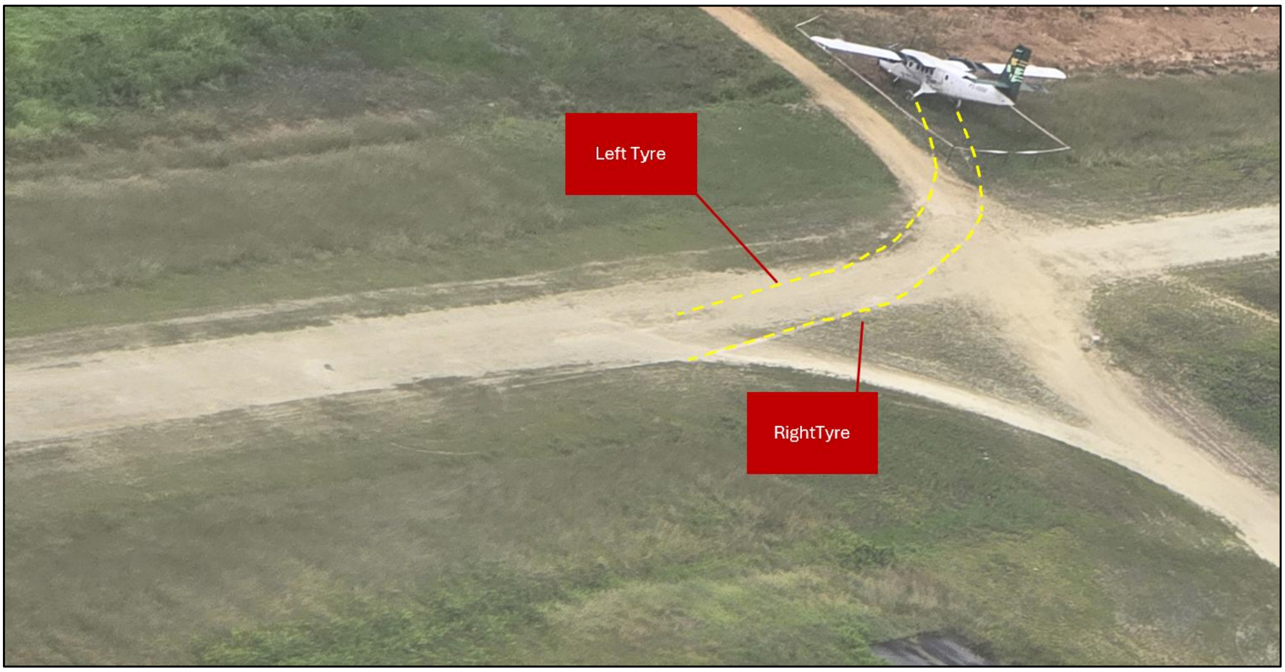


Figure 12. Tyre markings indicating the P2-BBM final tracks prior to impact.

The onsite assessment of the damage revealed that the aircraft sustained damage to its nose dome structure. The extent of the damage suggested that the impact occurred with minimal force.

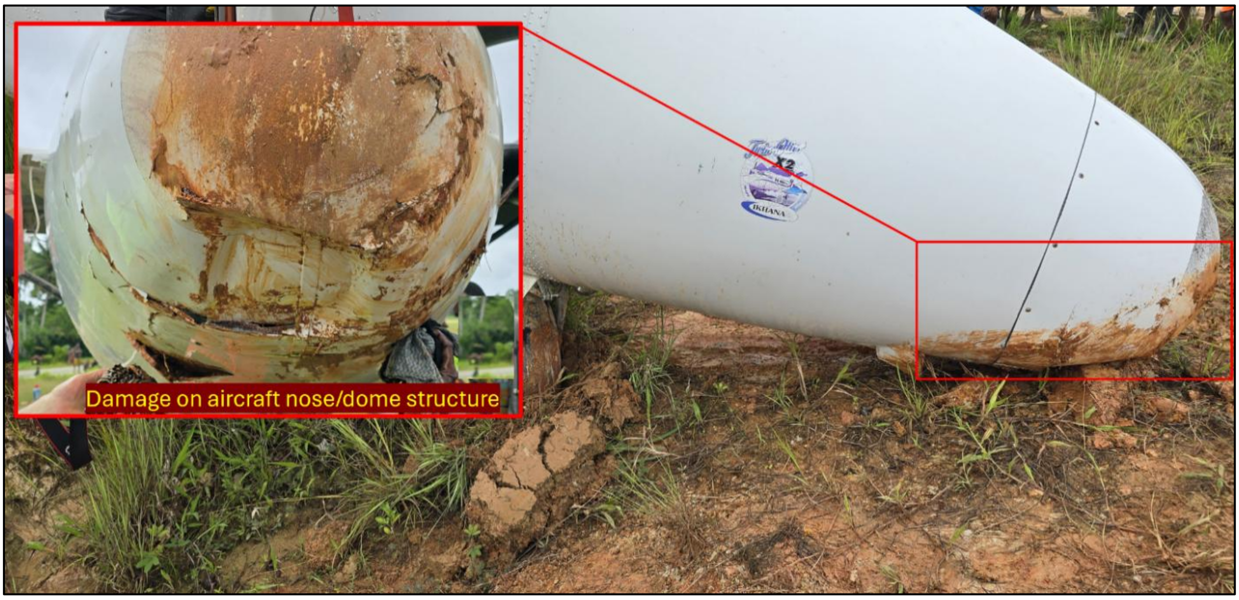


Figure 13. Damage to the nose cone/dome structure.

Figure 14. Removal of P2-BBM from the drainage ditch - Post occurrence.

1.13 Medical and pathological information

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

1.14 Fire

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

1.15 Survival aspects

As stated in *Tropicair Ltd Part A – Volume 2 – Operations Manual, Section 2: Conduct of Flight, 2.18 'Passenger Safety Briefing'*, the PIC must ensure that a safety briefing is conducted for passengers prior to take-off. This briefing shall be provided by either the pilot or another crew member after the passengers have boarded the aircraft and taken up their seats. According to the Operator, the passenger safety briefing was provided by the co-pilot, prior to departure of the first sector flight from Jacksons International Airport, Port Moresby, to Kerema Airport and the second sector flight, from Kerema Airport to Kikori Airstrip.

The co-pilot reported that once the aircraft had come to a complete stop and the engines were shut down by the PIC, following the occurrence at Kikori, he opened the right hand (RH) flight compartment door and egressed the aircraft. He then went around to the rear left side of the aircraft and opened the cabin aft left hand (LH) door of the aircraft, from the outside, and deployed the stairs to facilitate passenger evacuation. He observed that the passengers appeared shaken and were reluctant to leave the aircraft. Subsequently, he encouraged them to exit, and they egressed the aircraft.

The co-pilot confirmed that the passengers egressed the aircraft through the cabin aft LH door while the PIC egressed the aircraft through the LH flight compartment door. The passengers were then relocated to a safe area away from the aircraft.

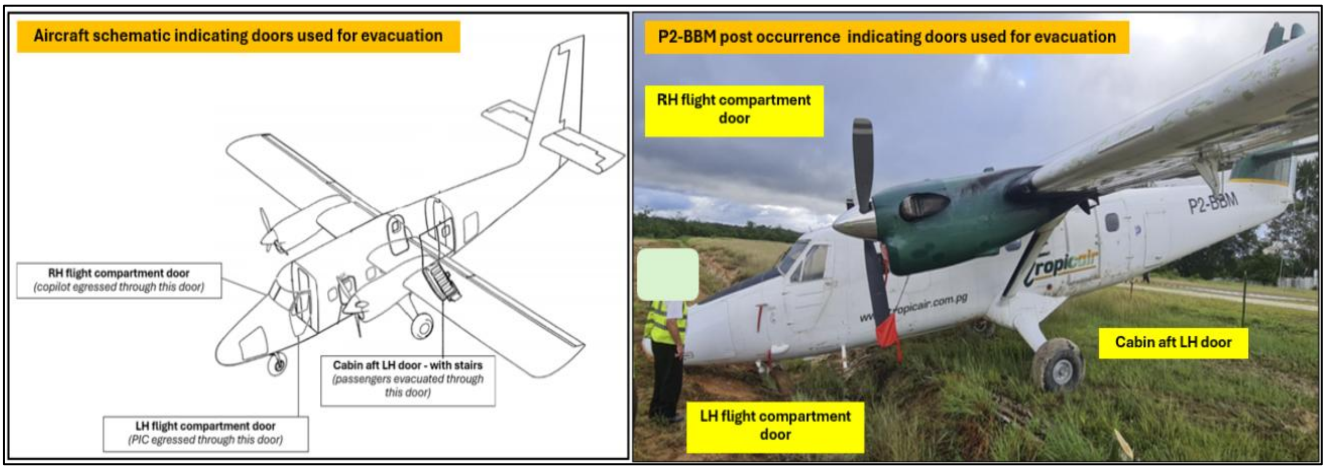


Figure 15. Aircraft schematic and P2-BBM post occurrence indicating doors used for evacuation.

The co-pilot added that after the aircraft was secured and everyone was safe, they unloaded the cargo and secured the site of the serious incident. The PIC then contacted the Civil Aviation Safety Authority of Papua New Guinea (CASA PNG), and the operator to notify them of the incident.

According to the passenger manifest for the serious incident flight, there were a total of 14 passengers: 7 destined for Kikori, 6 for Balimo and 1 for Sasareme. The PIC reported that the Kikori passengers retrieved their baggage and cargo and left the airstrip. The remaining 7 passengers were later transported by the operator to their respective destinations.

1.16 Tests and Research

No tests and research were conducted as a result of this occurrence.

1.17 Organisational and Management Information

1.17.1 Aircraft Owner and Operator: Tropicair Limited

The Tropicair Limited (PNG) Head Office and Maintenance Facility is in the National Capital District, Port Moresby, Papua New Guinea. Tropicair operates domestically and internationally where approval has been granted by CASA PNG.

At the time of the serious incident, the Operator had an Air Operator Certificate (AOC) # 119/015 issued on 24 November 2023 and effective from 30 November 2023 to the end of 30 November 2028.

The AOC is issued pursuant to *Section 47 (3)* and *49* of the *Civil Aviation Act 2000* and *Civil Aviation Rule Part 119* and authorises Tropicair Limited to perform commercial air operations in accordance with the approved operations specifications and company exposition.

The Operator has a Maintenance Organisation Certificate (MOC) #145/015 issued on 01 June 2024 and effective from 01 June 2024 until 31 May 2027. The company also contracts out its aircraft Maintenance to authorised maintenance organizations.

1.17.2 Completing the Technical Log

According to the Operator's *Maintenance Control Manual, Part A, Volume 8, section 3.9.2,* Form TAF400 Aircraft Technical log consists of 5 parts for each aircraft except for aircraft registration P2-BBM which has 6 parts.

Part 1	contains the maintenance programme type, annual airworthiness review date, next scheduled maintenance check type required to be done on the aircraft (column 2) at the specified due date or time (column 3). Once the maintenance is completed, column 4 must be certified. If the maintenance is completed or transferred to another work order or Technical Log, the work order number or technical log number must be stated in column 4 and certified. Other fields to be filled in are Time, Date, Signed and AME Licence or Authority No. for Release to Service of the aircraft.
Part 2	is used to record any deferred discrepancy or defect(s) (DDL). Only deferred items from Part 4 are to be entered in this section. The Maintenance Log (ML) No., Description, Rectify Before (Hrs/Date) columns must be filled in correctly and accurately. Once the defect or discrepancy is cleared, ensure the columns Cleared By and the Date Cleared are completed.
Part 3	is used for Daily Inspection Certifications, Aircraft Time in Service and Trend data. Fill in required fields Date, Sign, Lic No., Hrs and Landings since last entry and the Progressive Totals correctly and accurately. This must be done for every sector the aircraft flies. Fill in Trend data when required including oil added.
Part 4	is used to record the Maintenance of defects. This part is divided into 2 halves. The top part is used for entering the Details of the Defect. The bottom part is used for entering the Rectification details. All fields where applicable including certification after the rectification action are required to be filled in correctly and accurately. Any defects deferred here must be recorded in Part 2 as well.
Part 5	is used for Recurring Maintenance. This part comprises of Part A Compressor Desalination Wash, Part B ECTM Data Notification, Part C Cockpit Deep Cleaning, Part D Aircraft GPS NavData Update, Part E High Humidity Areas inspection and Part F Routine A and E inspections. These maintenance events to be carried out will be stated in Part 1 of the Technical Log and will be referred to here. Certification of these events must be done in each respective part of Part 5. Ensure all fields are filled in correctly and accurately.
Part 6	is used to record operations above 12,500lbs (5,670Kg). This is ONLY for aircraft registration P2-BBM. For each sector in Part 3 this aircraft operates with a MTOW of 12,500lbs (5,670Kg) or greater, this part of the technical log must be completed.

1.17.2.1 Deferral and Recording of Non-Airworthiness Defects (NAD) on the Technical Log

The AIC reviewed the operational Technical Log for P2-BBM, *Traxxall Work Order Number WP 028* and noted that Part 4, Item Number 6 of the Technical Log (Refer to Appendix 5.5) had details of defect entered by a Pilot, dated 28 May 2024.

The Details of Defect were recorded;

> *On take off with props full forward left prop lever leading the right prop lever by half a knob to synchronize the props. Needs rerigging.*

The defect was also recorded by the Pilot as 'NAD', to be actioned by Maintenance and Maintenance Action deferred.

According to the operator's *Maintenance Control Manual, Part A, Volume 8, section 3.3.1* '*Defect Classification'*;

> *Defects are classified into two categories; Airworthiness related and Non-Airworthiness related. These are further classified into subcategories AOG, MEL and NAD respectively. These are defects arising on the aircraft whilst 'in-service';*

not defects found whilst under scheduled maintenance by the Maintenance Contractor.

1. Airworthiness related

a) ***AOG*** *- An airworthiness related defect which is serious enough to prevent an aircraft from flying.*

b) ***MEL*** *- An airworthiness related defect that is considered a permissible unserviceability, which allows the continued operation of an aircraft for a defined period of time, IAW with aircraft approved Minimum Equipment List (MEL).*

2. Not Airworthiness related

Non-airworthiness defects or advisories are used by a Pilot or LAME to bring something to the attention of the Maintenance Controller and Maintenance Contractor, for further evaluation and possible action at the hangar check servicing downtime maintenance.

c) NAD *- is a Non-Airworthiness Defect that will require some form of assessment and possibly rectification, and if left uncorrected, would not compromise the safe, effective and efficient operation of the aircraft.*

Also, a defect or damage which is within tolerances / allowable limits, has no airworthiness implications and does not pose any inter-operability considerations with the safe, effective and efficient operations of the aircraft

Maintenance Control Manual, Part A, Volume 8, Section 3.3.2 'Defect Control' states;

NAD *category defects must be assessed by the Maintenance Contractor within three [3] days from the day the defect is noted (excluding the day noted), and a determination made that an item or system is, or is not, fit for its intended purpose. Items or systems determined not to be fit for their intended purpose, and affects airworthiness, must be rectified before further flight. Otherwise, the defect may be deferred IAW deferral procedure in 3.3.2.1.*

All defects must be entered without delay into both the Hard Copy Technical Log and where possible, the EMT Software log entry, by the PIC, LAME[9] or DMC[10].

Maintenance Control Manual, Part A, Volume 8, Section 3.2.2.1 (a) states;

a) If after inspection, a LAME determines that the aircraft airworthiness is not affected and the item or system is fit for its intended purpose, the defect may be classified as a NAD on the Tech Log, noting a deferral period before certifying the deferral, and then Transferring to the Deferred Defect Log (DDL).

The investigation found from review of P*2-BBM, Traxxall Work Order Number WP 028* that Part 2 of the Technical Log (Refer to Appendix 5.6), which is used to record any deferred discrepancy or defect(s) DDL from Part 4 was not completed where necessary to ensure that the defect was deferred.

The details recorded in Part 2 would be the following;

- Maintenance Log Number;
- Description of the defect;

[9] Licenced Aircraft Maintenance Engineer
[10] Deputy Maintenance Controller

- Due Date for rectifying the defect (deferral period);
- Cleared By and;
- Date Cleared

The investigation also noted that on 20 May 2024, the RH Propeller Assembly was removed for overhaul (scheduled maintenance) and the LH Propeller from a DHC-6-400 aircraft was installed on P2-BBM. A test flight of the propeller installed was conducted on 24 May 2024 and the aircraft was subsequently released to service.

1.17.2.2 Non-Airworthiness Defect (NAD) Rectification

According to the operator's *Maintenance Organisation Exposition, Part A, Volume 9, section 2.11.1*;

> *Non routine or Non-scheduled maintenance actions shall be recorded on an Aircraft Maintenance Log sheet in accordance with this Exposition. Non routine or Non-scheduled maintenance actions may also be certified for on any recognised form from the Operators approved Maintenance Control Manual (or equivalent) provided the certification includes Tropicair MOC reference, for example: "For and on behalf of Tropicair MOC #145/015*

The investigation found that on 15 June 2024, defect details from *Work Order Number WP 028* were entered on *Aircraft Maintenance Log (AML), No. 003352* (Refer to Appendix 5.7) as;

> *Both LH & RH engines to be ground run, rerigged according to faults found, RH engine reported to have beta/reversing issue. Full check please.*

Maintenance Action was carried out on 5 July 2024 and recorded on *AML 003352* as;

> *ENG 1 & 2 PROP CONTROLS & POWER LEVER REVERSE CONTROL RIGGING & ADJUSTMENTS C/O SATIS IAW AMM 76-10-00, EMM 76-10-00 ENGINE PERFORMANCE CHECKS C/O SATIS IAW AMM 71-00-00 REF TAF 417 & TA416 FOR ENGINE PARAMETER READINGS.*

1.18 Additional information

1.18.1 First Sector from Jacksons International Airport to Kerema Airport

According to records provided by the Operator to the AIC, seven (7) sectors were planned for the day from Jacksons International Airport to Kerema, Kikori, Balimo, Sasereme, Kamusi, Kikori and then back to Jacksons International Airport in Port Moresby, where the flight would terminate for the day.

The passenger manifest showed that, for the first sector from Jacksons International Airport to Kerema Airport, there was a total of 14 persons on board: two (2) crew and twelve (12) passengers. The co-pilot was PF and the PIC was PM.

Recorded data showed that at 09:30, P2-BBM departed Jacksons International Airport, climbed to 10,000 feet (ft) AMSL and began tracking Northwest to Kerema Airport. The crew stated that they planned to refuel on arrival at Kerema Airport and collect two additional passengers for the next flight, which was the flight to Kikori Airstrip. According to the crew, the flight to Kerema was uneventful.

At 10:23 the aircraft landed at Kerema Airport. According to the co-pilot, after the main wheels touched down, he pulled the power levers back into Beta to slow the aircraft down, as per the Standard Operating normal procedures. Following the application of Beta, he noticed the aircraft yaw left of centreline, he added that, to counter the left yaw and bring the aircraft back on centreline, he pushed the left power lever forward to IDLE creating an asymmetric thrust setting, which resulted in the aircraft turning right and back on to centreline. The aircraft slowed down to 40 kts, where he then handed over controls to the PIC. The PIC taxied to parking bay and shut down the engines in preparation for refuelling.

According to the crew, after refuelling was completed, the two passengers boarded the aircraft for the flight to Kikori Airstrip.

1.18.2 Kerema Airport

According to the *Aeronautical Information Publication Papua New Guinea, (AIP PNG)* the Kerema Airport is a small aerodrome offering limited services and infrastructure. The airport lacks cargo handling facilities and fuel services, meaning no refuelling or storage capacities are available on-site. A basic passenger terminal is present with sanitation facilities for travellers. Rescue and firefighting capabilities are absent, with no equipment or resources for aircraft recovery in case of emergencies. The apron, surfaced with bitumen and rated at PCN 14, supports limited aircraft operations, while taxiways are narrower at 7.5 meters wide, unsealed, and rated at PCN 12. Surface movement is assisted by runway markings, though navigation aids such as VOR/INS checkpoints are not provided.

Aerodrome name:	Kerema Airport	
Coordinates:	**Latitude:** 07° 57’49.7” S	**Longitude:** 145° 46’18.7” E
Elevation:	8 ft	
Dimension:	Length: 944 m	Width: 45 m
Airstrip type:	Two-way landing and take off	
	Runway 14 - 140°	Runway 32 - 320°
Surface characteristic:	Bitumen sealed	
Slope:	Level	
Hours of operations:	Day light	

Table 3. Kerema Aerodrome information. (Source: Aeronautical Information Publication Papua New Guinea).

Meteorological services at Kerema Airport are supported by the Port Moresby Meteorological Watch Office (MWO), offering 24-hour weather monitoring and Terminal Aerodrome Forecast (TAF) preparation. However, specific landing forecasts are not available. Consultations and briefings for weather-related planning can be accessed via telephone or NAIPS[11]. These limitations highlight the airport's basic operational nature and dependence on external support for advanced services and emergency response.

The *AIP PNG* classifies Kerema Airport as an uncertified aerodrome[12].

11 National Aeronautical Information Processing System: is an Australian multi-function, computerized, aeronautical information system. It processes and stores meteorological and NOTAM information as well as enables the provision of briefing products and services to pilots and the Australian Air traffic Control platform. Source: Air Services Australia.

12 An "uncertified aerodrome" refers to an aerodrome that does not hold a formal aerodrome certificate under PNG's aviation regulations Part 139 – Aerodromes – Certification and Operations.

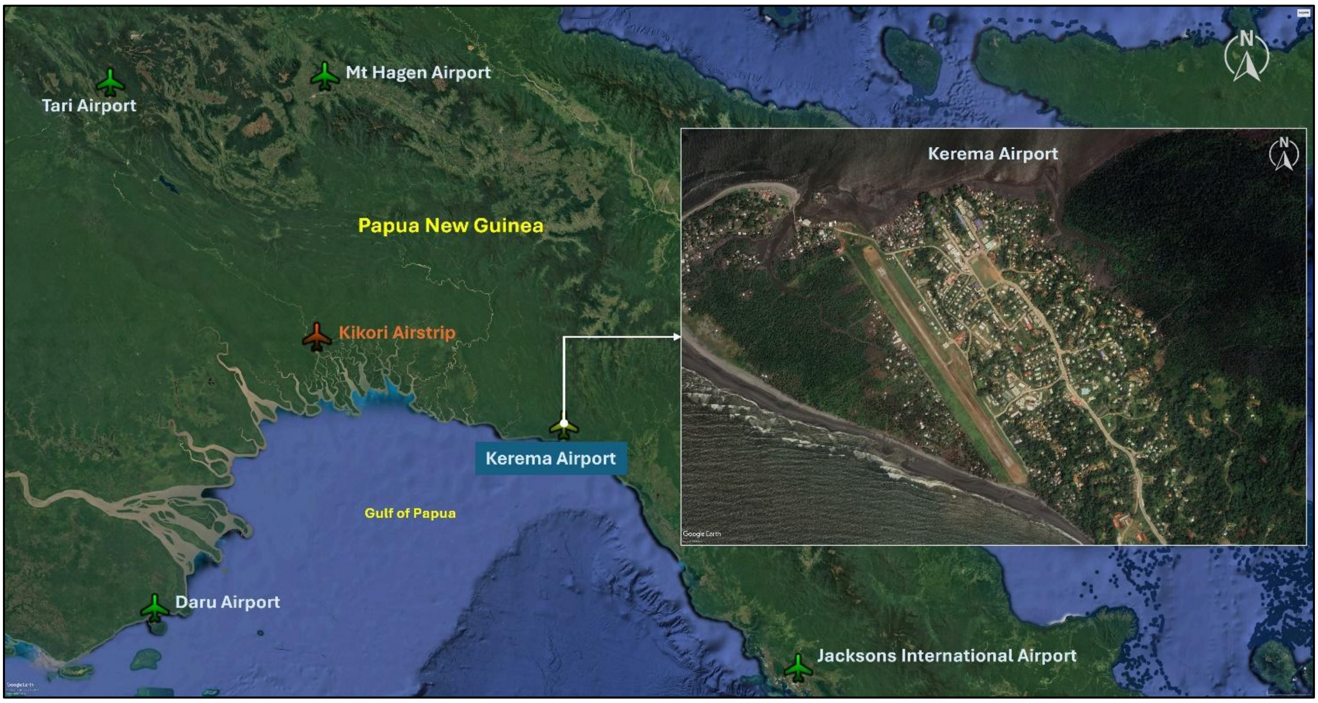


Figure 16. Kerema Airport.

With the limitation of Kerema Airport as established in the *AIP PNG*, the Operator stores its own Jet A1 fuel drums and refuelling equipment at the airport.

According to the Operator's *DHC-6 Route Guide* dated 1 December 2017, the Operator attests that the airport infrastructure presents notable operational challenges. As stated within the *DHC-6 Route Guide*, the small parking area, unsealed and prone to bogging in heavy rain, demands careful ground handling. While navigation aids such as NDB and DME have been decommissioned, the Operator’s crews may use a DME Arrival plate referencing AYKM for guidance. Safety risks include potential wind shear on Runway 14 during strong south-easterly winds and unauthorized movements of pedestrians and animals on the airfield. Despite these constraints, there are no performance limitations for DHC-6 aircraft operating at Kerema, allowing the Operator to conduct its flights effectively while maintaining safety and operational standards.

1.19 Useful or effective investigation techniques

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

2 ANALYSIS

2.1 General

The analysis part of this report will discuss the relevant issues resulting in the serious incident involving a DHC-6-300 Twin Otter aircraft, registered P2-BBM that experienced runway excursion after landing. The investigation identified that the aircraft experienced technical issues within the Propeller assembly when operated in the Beta and Reverse function. The investigation also noted that the aircraft was certified as airworthy prior to departure for the flight.

The analysis will therefore focus on the following issues, but not necessarily under separate headings:

- Flight Operations
- Aerodromes
- Aircraft Systems and Maintenance

2.2 Flight Operations

The flight operations analysis focused on the crew actions throughout the normal operation of the flight as well as the crew actions and inactions during the handling of the abnormality experienced on touchdown at Kikori. Although the investigation did not identify any issues or abnormal operation throughout the flight up to the landing at Kikori, it was however noted that the Beta asymmetry was evident on the previous sector when the aircraft landed at Kerema. It was an uneventful flight from the departure from Kerema up to the approach into Kikori, where the crew executed a GPS approach for landing.

Following the GPS approach into Kikori, the aircraft established on a 4 NM final, and after becoming visual at about 700 feet, the crew fully configured the aircraft for landing. As per normal operating procedures, both propeller levers were advanced to full fine in preparation for landing, or a go-around if required. The aircraft was appropriately configured for landing, and a stable approach was flown all the way to touchdown.

Given the airstrip characteristics in Kikori, Beta was applied upon touchdown to help slow the aircraft. The system initially operated normally however, the aircraft began to yaw, and track left of centre. This was a result of beta asymmetry where on application, the Left beta system was more effective compared to the right beta system, inducing a condition of asymmetric drag. As a counter to the abnormality, power lever adjustments were made together with rudder pedal input to correct the aircraft’s tracking. The investigation found that due to an overcorrection, coupled with a delay in the beta response, the aircraft veered right of centre where it experienced a partial runway excursion as a result of the over steering, together with the thrust asymmetry. Onsite investigations found that the aircraft continued to track up the airstrip with its Right main wheel on the grass strip edge for about 120 meters before tracking back onto the runway.

The investigation found that while the aircraft tracked on the right edge of the strip, control inputs were being done to get the aircraft back onto the strip and back on to centre. This included rudder pedal input as well as asymmetric power application to correct the aircrafts tracking. Tyre markings showed that the aircraft made a positive turn back onto the strip just before the taxiway, however, due to the control input being maintained, shortly after tracking back onto the strip, the aircraft continued left of the strip resulting in a runway excursion where it came to rest in the drainage ditch that runs along the western edge of the strip edge.

Wreckage assessment showed that by the time the aircraft impacted the drainage ditch, it was at a much slower groundspeed. Therefore, the airframe sustained minimal impact damage, particularly on the composite nose cone. The investigation concluded that the aircraft got back onto the strip from the right edge and overshot onto the left edge of the strip where it experienced the runway excursion. This was a direct result of crew input to correct the aircrafts tracking from the right edge.

Onsite investigation observed certain environmental factors that may have contributed to the lack of ground controllability of the aircraft at the time of the serious incident. Onsite inspection of the airstrip found that a lack of maintenance of the airstrip resulted in degraded conditions in areas such as vegetation control, drainage for standing water management and overall strip surface maintenance and leveling. The physical characteristics of the airstrip at the time of the occurrence suggests that when it rains, the strip surface would stay damp, to wet for a longer period due to the standing water, and this in turn would result in degraded traction on aircraft wheels during operation. The onsite investigation also concluded that at the time of the serious incident, the strip surface was damp with standing water in certain areas due to rainfall on the preceding day. It is therefore the view of the AIC that following the beta asymmetry, these environmental factors also had a negative impact to the crews attempt in recovering and maintaining directional control on the landing roll. The investigation noted that despite the crew's input to correct the aircrafts tracking from the right of the strip, it is highly likely that factors such as a damp and narrow strip surface may have made it challenging for the crew to recover from the loss of directional control that resulted from the beta asymmetry.

Additionally, it is the view of the AIC that when the aircraft eventually tracked back onto the strip from the right, the low groundspeed meant that the nosewheel now had more traction, and that, coupled with the left rudder pedal input, as well as the power asymmetry application, all contributed to the aircraft overshooting centre and continue tracking further to the left where it experienced the runway excursion and impact with the runway edge drain.

It was noted during the investigation that Beta asymmetry was also evident on the previous sector when the aircraft landed in Kerema, as well as on landing in Port Moresby, when the aircraft was ferried back to base. However, due to a sealed runway surface, and a much wider runway width in Kerema and Port Moresby, the crew were able to correct accordingly and maintain directional control on the landing roll. The investigation established that following the Beta asymmetry condition experienced on the landing in Kerema, a decision was made to continue with the subsequent flight to Kikori, following a brief discussion on the abnormality. It was however noted during the investigation that there was a lack of assertiveness in planning for counter measures in the case that a similar underlying Beta asymmetry condition was to be expected in Kikori.

2.3 Aircraft Systems and Maintenance

The Investigation established that the Runway excursion on landing in Kikori was a result of ground controllability issues experienced by the crew when reacting to a Beta Asymmetry condition that was noticed when beta was applied to slow the aircraft following touchdown. On the crew's application of beta, the aircraft was subject to a left yaw, which was countered by control inputs by the crew to maintain runway tracking, however, the adverse effects of their corrective actions resulted in the serious incident. It was later established, during the course of the investigation, that the aircraft had a latent underlying condition where, at times when certain conditions permitted, a situation of thrust or drag asymmetry would occur. The investigation noted that this first became evident more than a week and half prior to the serious incident, when pilot control inputs were necessary to counter asymmetric conditions. The investigation determined that the asymmetric conditions were evident when operating at High RPM, and in all situations, the Left engine and propeller would lead the Right engine and propeller. When analysing engine and propeller operating parameters, the investigation concluded that both the Left and Right engines were operating normally, showing optimum performance. However, Propeller data, showed distinctive differences between the Left and Right propeller parameters in different phases of flight, with increased differences observed during High RPM operation as well as on Beta application.

The investigation found that almost three weeks prior to the serious incident, the Operator had conducted a 250-hour scheduled maintenance check over a period of 10 days, where a propeller assembly change on the right engine was included. Apart from the propeller removal and installation on the rig, an overhaul of the Propeller Overspeed Governor, as well as the re-fitting of the Beta Arm, a new slide actuator and new Carbon Blocks on the Beta control system, were also carried out, with all duplicate inspections recorded as satisfactory. The overhaul and replacement of worn parts was in response to findings during the inspections where engineers found worn Beta Slide actuator carbon blocks with excessive play on the slide actuator. The investigation established that, in order to gain access to facilitate the removal of the previous propeller, the right-hand power lever control beta arm forward end had to be disconnected. It was also established that multiple work had been carried out within the right propeller and beta components, which involved disconnecting multiple links. The investigation, however, found from maintenance records reviewed that suggest that no rigging was done and only record of one assessment ground run was conducted although multiple work was done on the right propeller system. It was however, also noted that, a successful assessment flight was conducted 4 days after the scheduled maintenance, and the installation of the replacement propeller assembly, from which the aircraft was then signed off and released to service, where it continued to operate multiple fights that day.

The aircraft continued to operate additional scheduled flights, including a total of three flights to Kikori without any reported issues relating to the propeller system. However, 4 days after the aircraft was released to service, an entry was made in the aircraft's technical log regarding a propeller synchronisation issue experienced by the flight crew. This entry was classified by the flight crew as a Non-Airworthy Defect (NAD), which means that there is no MEL reference for such a defect, however, the investigation identified that the operator's Maintenance Control Manual showed that there is a requirement for NADs to be assessed within three days, not including the day the defect is noted, and a determination is to be made, to rectify if it affects airworthiness, or to defer otherwise. The investigation found no records of an assessment or determination carried out. Additionally, it is the view of the AIC that there was an opportunity for the maintenance personnel to identify underlying conditions within the propeller system. However, the NAD entry was not attended to within the prescribed 3 days period.

From the pilot's technical log entry, the investigation established that on application of full fine on the propellers for take-off, the propeller levers had to be placed offset, with the left propeller lever leading the right propeller lever by about 1 inch (half a knob), to synchronise the propellers. The technical log entry also showed a request by the flight crew, for engineers to carry out re-rigging on the propeller system to eliminate the propeller synchronisation issue. The investigation did not identify anything further in the technical log entry to suggest that there was a propeller governing issue, and therefore, it is the view of the AIC that the propeller lever split by almost half a knob at high RPM, may likely be associated to a rigging issue.

As per the aircraft design, the propeller levers are encased in the throttle quadrant that is mounted in the flight compartment overhead console. Propeller levers are linked to the Propeller Governor on the engine via a series of steel cables interconnected through a pulley system. When operating at high RPM, with the propeller levers at full fine, the blade angles into beta are controlled by the Power levers. A split on the propeller levers would induce thrust imbalance issues when the power levers are advanced for take-off, and there may be a tendency to balance using thrust asymmetry by splitting the power levers. For approach and landing, controllability issues will arise when propellers are full fine but out of sync, and the power levers are retarded to Flight idle, Ground idle and then with the transition into beta and reverse. Technical logs showed that following the flight crew's entry regarding the propeller synchronisation issue, no propeller rigging was done and the aircraft continued operation for a total of 11 days, up to the day of the serious incident in Kikori.

The investigation noted the observations recorded during the engine ground runs prior to the ferry flight as well as, observations during the ferry flight back to Port Moresby (Base). Most notably on departure from Kikori Airstrip however, just after the aircraft got airborne, an uncommanded increase was observed with the right propeller RPM exceeding 96% (Red line) and continued increasing through to the white line where it maintained governing at 100 %. The Overspeed condition was rectified by retarding the right propeller lever, reducing the right propeller RPM to 96% and the aircraft maintained symmetrical RPM in the climb with the left propeller lever leading the right propeller lever with a split of up to 2 inches apart. This was maintained throughout the climb, and in the cruise with cruise power set, the crew observed a propeller lever split of about 1 inch.

The investigation confirmed that the asymmetric condition was maintained throughout the ferry flight up to the landing in Port Moresby (Jacksons), where a left yaw was again experienced on beta application straight through to reverse after touchdown. Subsequent engine ground runs conducted post occurrence at the operator's base in Port Moresby, showed that the right propeller was unable to maintain reverse thrust up to 50 PSI. The propeller was eventually sent to a third-party propeller maintenance facility where a component strip down was conducted for inspection. The findings from the strip down include a clunking sound, which was found to be from worn inner and outer feathering compression springs. Both springs were replaced, together with associated screws and cups, and the propeller was returned to the operator, where it was installed on to a different aircraft. That aircraft had been operating without any reported propeller issues since the repair. The investigation carried out further analysis on the component design, and the effects of worn feathering compression springs on the propeller's performance in full fine settings and on beta application. It was noted during the investigation that the feathering spring assembly is always applying pressure on the piston and would only change propeller blade angles from fine to course. It was concluded that a faulty feathering spring would only affect the propeller's ability to feather.

Further review of post occurrence maintenance records showed no findings relating to a beta system control malfunction, nor were there any recorded findings to indicate a malfunction in the propeller governor system. Additionally, the investigation did not identify any findings to indicate a fuel control unit, or propeller oil supply malfunction. It was however noted on review of the operators post occurrence maintenance records that, as part of fault finding, apart from the propeller feathering spring replacements, a much more detailed rigging exercise was undertaken on the engine and propeller controls and links. As part of the post occurrence rigging exercise, a new propeller was installed with the associated ground runs conducted and recorded as satisfactory, and the aircraft was signed off and returned to service. It is therefore the view of the AIC that the persisting asymmetric condition may have been the result of insufficient rigging and ground runs following multiple maintenance work carried out on the propeller system during the aircraft's 250 hourly maintenance check which was completed 19 days prior to the occurrence. The AIC believes that certain underlying conditions may have been identified, had maintenance personnel addressed the Flight crew's technical log entry regarding propeller synchronising issues on the 28 of May.

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 Certificate of Registration and had been maintained in compliance with the regulations.

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

d) The mass and the centre of gravity of the aircraft were within the prescribed limits.

e) The maintenance records indicated that 19 days prior to the serious incident a replacement propeller assembly was installed on the right-hand engine of the aircraft.

f) The maintenance records indicated that 4 days after the replacement propeller assembly was installed an assessment flight was conducted and was found to be satisfactory. The aircraft was released to service on the same day.

g) The maintenance records indicated that 4 days after the assessment flight details of a defect entered in the Technical Logbook by a Pilot. The defect was that both propeller levers were not in sync on take-off, with the left propeller lever leading the right propeller lever.

h) The aircraft experienced technical issues within the Propeller assembly when operating in the Beta and Reverse function on landing at Kerema Airport however, the crew were able to recover from Beta Asymmetry.

i) The aircraft experienced technical issues within the Propeller assembly when operated in the Beta and Reverse function on landing at Kikori Airstrip which led to a loss of directional control and subsequently a runway excursion.

j) The aircraft was structurally intact prior to impact.

k) All control surfaces were accounted for and all damage to the aircraft was attributable to the impact forces.

l) The aircraft sustained damage to its nose dome structure on impact.

3.1.2 Crew/Pilot

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

b) The flight crew was properly licensed, medically fit and adequately rested to operate the flight.

c) The flight crew were in compliance with the flight and duty time regulations.

d) The crew’s actions and statements indicated that his knowledge and understanding of the aircraft systems was adequate.

e) The PIC had conducted a flight to Kikori the day before the serious incident flight on another DHC-6-300 aircraft and did not encounter any beta asymmetry issues.

f) The PIC had not operated P2-BBM since the installation of the replacement propeller assembly until the serious incident flight.

3.1.3 Flight Operations

a) The flight was conducted in accordance with the procedures in the company Operations Manual.

b) The flight crew carried out normal radio communications with the relevant ATC units.

c) There was evidence of a tailwind component present at the time of landing.

d) After touchdown and initial landing roll, the PIC applied Beta by retarding both power levers aft of the IDLE setting, to slow the aircraft down. Following Beta application, the aircraft yawed to the left, the PIC then advanced the Left power lever back to IDLE to counter the yaw left as well as right rudder input.

e) The right power lever was still in the Beta range during the corrective action to counter the left yaw.

f) The right propeller went into Beta causing the aircraft to veer further right of centreline and which resulted in the aircraft main right wheels contacting the grass surface of the runway edges that were wet with standing water following the rain experienced earlier that morning and throughout the past week.

g) The PIC advanced the right power lever back to IDLE setting to counter the right drift as well as left rudder input however the aircraft continued veering right.

h) The aircraft was maneuvered back towards the left onto centerline however, the aircraft continued the left trajectory path.

i) The PIC applied Beta for the second time, to slow the aircraft down further as well as right rudder input to turn the aircraft towards the right however the rudder input was ineffective.

j) The aircraft continued left past the runway and on to the wet grass surface of the runway strip edges. When the nose wheel made contact with the wet grassy surface the PIC applied full reverse and brakes in a further attempt to slow the aircraft and bring to a stop however, the aircraft did not stop and rolled into the drainage ditch on the edge of the wet grass surface. The aircraft impacted the drainage ditch embankment and came to rest.

3.1.4 Air Traffic Services and Airport Facilities

a) ATC provided prompt and effective assistance to the flight crew.

b) Kikori operates as an uncontrolled, daylight-only aerodrome within Class F airspace, serviced by a Flight Service Station (FSS) providing traffic advisories. The airstrip features a 705 m runway with steel matting, sloping 0.3% down toward the northwest, and is restricted to “Captain only” landings and take-offs.

c) There are no available engineering facilities, refueling stations, or ground handling services, and the parking area is limited and prone to bogging during heavy rains. Operational cautions are advised at Kikori due to several restrictions: unauthorized pedestrian and animal movement is common on and around the runway, requiring vigilance during operations.

d) Due to its rural location, Kikori lacks advanced navigation aids; there are no DME or NDB, though a GNSS approach is available, and operations rely on GPS for distance and azimuth guidance. The Operator’s requirements specify strict procedures to minimize ground taxiing risks, mandating mandatory strip reporting, with take-offs preferred on RWY 12 and landings on RWY 30.

e) Vehicles and people commute within and through the airstrip perimeters due to a lack of perimeter fencing. A public vehicle road also crosses the airstrip midway, with another before the Northern end of the airstrip.

f) There is one parking bay on the Northern part of the airstrip approximately three quarters of the total length towards RWY 12.

g) The parking bay infringes on the main public road that passes parallel to the airstrip.

h) The airstrip had appropriate visual aids available to flight crew. However, the primary windsock at the airstrip was located at an area that was obstructed by the surrounding environment and did not give a true indication of the prevailing winds at the time of the accident.

i) The airstrip had two windsocks. One windsock was situated near the parking bay at the northwestern section of the airstrip. On observation, this windsock was worn, torn and unserviceable. The other windsock situated near the end of RWY 30, serviceable.

3.1.5 Flight Recorders

a) The aircraft was fitted with an L3 FA5000 Flight Recorder.

3.1.6 Medical

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

3.1.7 Survivability

a) The accident was survivable.

b) There were no reported injuries.

3.1.8 Safety Oversight

a) The Civil Aviation Safety Authority's safety oversight of the operator's procedures and operations was adequate.

3.2 Causes [Contributing factors]

The investigation identified factors that contributed to the runway excursion at Kikori Airstrip. Pilot actions and inactions interacted with the pre-existing conditions (latent) in the system which breached all defences resulting in the runway excursion.

- The investigation also noted that 4 days after the aircraft was released to service following the installation of a right-hand propeller assembly on P2-BBM and,11 days prior to the serious incident. Four (4) days after the aircraft was released to service, an entry was made in the aircraft's technical log regarding a propeller synchronization issue experienced by the flight crew. The crew had suggested re-rigging. This entry was classified by the flight crew as a Non-Airworthy Defect (NAD). However, the defect was not assessed within 3 days, as per the Operator's Maintenance Control Manual requirements by maintenance personnel responsible to determine if the defect was to be rectified or deferred.

- Beta asymmetric condition of the aircraft on landing. After touchdown and initial landing roll, the PIC applied Beta by retarding both power levers aft of the IDLE setting, to slow the aircraft down. Following the Beta application, the aircraft yawed to the left, the PIC then advanced the Left power lever back to IDLE to counter the yaw left. Overcorrection (pilot technique) of the left yaw coupled with a delay in the Beta response caused the aircraft to veer right of centre. However, due to control inputs (rudder pedal input and asymmetric power application) maintained by the crew, the aircraft after tracking back onto the strip, continued left of the strip.

- Full reverse thrust and braking were ineffective in preventing the impact due to ground controllability issues due to environmental conditions (strip surface damp with standing water and physical characteristics of the strip).

3.3 Other factors

Not applicable

4 RECOMMENDATIONS

4.1 Recommendation number AIC 24-R13/24-2001 to Tropicair Limited.

Recommendation

The PNG Accident Investigation Commission (AIC) recommends that the Operator, Tropicair Limited ensures that:

a. Awareness is made during initial training, on the latent condition of Beta Asymmetry on landing, or aborted take-offs, to ensure that crew are situationally aware of the effects of Beta Asymmetry, and the appropriate handling techniques and or procedures to counter such a condition.

b. Incorporate guidance into Standard Operating Procedures, on the operation of Beta on runway surfaces that may pose controllability issues. Procedures may cover Runways that reduce safety margins, such as Narrow, Unpaved and Wet Unpaved Runways.

Action requested

The AIC requests that Tropicair Limited note recommendation AIC 24-R13/24-2001 and provide a response to the AIC within 90 days of the issue date, but no later than 27 February 2025 and explain, including with evidence, how Tropicair Limited has addressed the safety deficiency identified in the safety recommendation.

4.2 Recommendation number AIC 24-R14/24-2001 to Tropicair Limited.

Recommendation

The PNG Accident Investigation Commission (AIC) recommends that Tropicair Limited ensures that the maintenance personnel are aware of procedures associated to addressing defects that are classified as Non-Airworthiness Defects (NAD), and that such defects are assessed, and maintenance actions are determined by responsible maintenance personnel within the prescribed 3 days period as per the Operator’s Maintenance Control Manual.

Action requested

The AIC requests that Tropicair Limited note recommendation AIC 24-R14/24-2001 and provide a response to the AIC within 90 days of the issue date, but no later than 27 February 2025 and explain, including with evidence, how Tropicair Limited has addressed the safety deficiency identified in the safety recommendation.

5 APPENDICES

Appendix 5.1. Tropicair DHC-6-300 Standard Operating Procedures.

3.13.3 Use of Reverse

Reverse thrust, defined as power lever movement aft of the IDLE stop that results in an N_G increase at negative blade angles is most effective at speeds greater than 60 KIAS.

If required, full reverse should be selected (and held only as long as necessary) immediately after touch-down for maximum effectiveness with the objective being to use reverse thrust as a primary force to decelerate the aircraft speed to less than 60 KIAS. On dry runways that offer good braking action, reverse thrust is of little value once speeds decrease to less than 40 KIAS.

09th January, 2016

Page 3-30 Document Owner: Chief Pilot

Tropicair Commercial In Confidence

CASA Accepted

Normal Procedures

DHC-6-300 Standard Operating Procedures

In any case, Beta should be selected on all landings to slow the aircraft to taxi speed, thereby minimising the use of brakes.

NOTE: There is a one minute time limit on the use of reverse and the T5 limits of 790° C must be observed.

NOTE: Unless an emergency exists or the loss of brakes require its use, reverse thrust should be restricted to speeds greater than 40 KIAS to avoid propeller damage and possible FOD caused by ingestion.

Appendix 5.2. Viking DHC-6 Series 300 Aircraft Maintenance Manual: A Description of Propeller Controls.

Controlling – General Data

1. General

The propeller is controlled by the propeller and engine power levers in conjunction with a constant speed governor, overspeed governor, autofeather system (refer to 61-22-00, Propeller Autofeather System – General Data or 61-22-02, Propeller Autofeather System (Mod 6/1470) – General Data), and a beta range back-up system (refer to 61-24-00, Propeller Beta Range Back-up System – General Data). An overspeed governor test facility is provided for testing the overspeed governor on the ground. At the customer's option, a propeller synchronizer system, an unfeathering system, and a blade zero thrust stop system may be installed (when fitted, refer to 61-28-00, Propeller Synchronizer System (Mod S.O.O. 6099) – General Data, Para 3.F, and 61-26-00, Blade Zero Thrust Stop System (Mods S.O.O. 6022 and 6/1303) (Pre Mods 6/1659 and 6/1716) – General Data). A propeller tachometer indicating system and a reset caution light are also provided (refer to 61-40-00, Propeller Indicating – General Data).

2. Description

The constant speed governor combines the functions of a normal constant speed unit (CSU), beta range control valve, and fuel governor. As a CSU, it regulates power turbine speed by varying the pitch of the propeller to match the load torque to engine torque in response to varying conditions of flight. The beta range control valve controls the propeller blade angles in the beta range as selected by the engine power lever. The beta range is that segment in the overall pitch range of the propeller, which is directly controllable by the power lever; it extends from +17 degrees in the forward range to –15 degrees in the reverse range. During beta range operation, the propeller is kept in the under speeding condition as a function of airspeed. The fuel governor reset lever, which is linked to the power lever control operating the reversing lever, moves progressively to reset a lower maximum power turbine speed, relevant to the selected speed, to limit the power output of the gas generator, by restricting fuel flow to a value which prevents propeller speed exceeding a value 5% below selected propeller speed. The fuel governor section of the constant speed governor also protects the engine against propeller overspeeding, in the event of an overspeed governor failure during normal forward thrust operation, by reducing fuel flow.

The overspeed governor provides automatic control of a propeller overspeed condition by increasing the pitch of the propeller blades to absorb engine power, thereby decreasing propeller speed. The overspeed test switch, when operated on the ground, simulates an overspeed condition of the propeller by resetting the governor to a lower value.

Propeller feathering is accomplished by selecting the propeller lever to FEATHER.

A propeller lever/power lever interlock mechanism is fitted, which prevents movement of the power levers below IDLE, if both propeller levers are positioned at less than 91% propeller rpm. Individual operation of either propeller lever above 91% rpm disengages the interlock, to permit the power levers to be moved below IDLE.

3. Operation

A. Propeller On-speed

In the on-speed condition, forces acting on the engine, propeller and propeller constant speed governor are in balance. The pilot valve within the CSU section of the governor has closed off the oil ports to meter only sufficient oil to the propeller servo piston, to maintain blade pitch.

B. Propeller Overspeed

In an overspeed condition, the governor mechanism causes the pilot valve to lift and uncover oil ports so that oil acting on the propeller servo piston is allowed to return to the reduction gear sump. This results in the propeller piston moving rearwards under the combined influence of the blade counterweights and feather return springs, to turn the blades into a higher pitch. Increasing blade pitch decreases propeller speed and consequently governor speed, so that the pilot valve moves to close off the oil ports when an on-speed condition is reached. In the event of a propeller maximum overspeed condition occurring, the propeller overspeed governor mechanism lifts the overspeed governor pilot valve, to allow propeller servo piston pressure oil to be dumped to the reduction gearbox, so that the blades can move to increase their pitch and so reduce propeller speed.

C. Propeller Underspeed

In an underspeed condition, the constant speed governor mechanism lowers the pilot valve and uncovers ports to allow pressure oil to be directed to the propeller servo piston, which moves forward and turns the blades into a lower pitch, so allowing propeller speed to increase till the on-speed condition is reached.

D. Reverse Thrust Operation

During reverse thrust operation when the power lever is moved into the REVERSE range, the reversing lever and consequently the beta control valve is moved rearwards. In this position the beta control valve allows pressure oil to act on the propeller servo piston to turn the blades into reverse pitch. As the propeller piston moves forward, the low stop collar also moves forward and operates the beta control valve to close off the oil supply, so that when the propeller blades reach the pitch determined by power lever selection, the oil supply to the servo piston is just sufficient to maintain a balance.

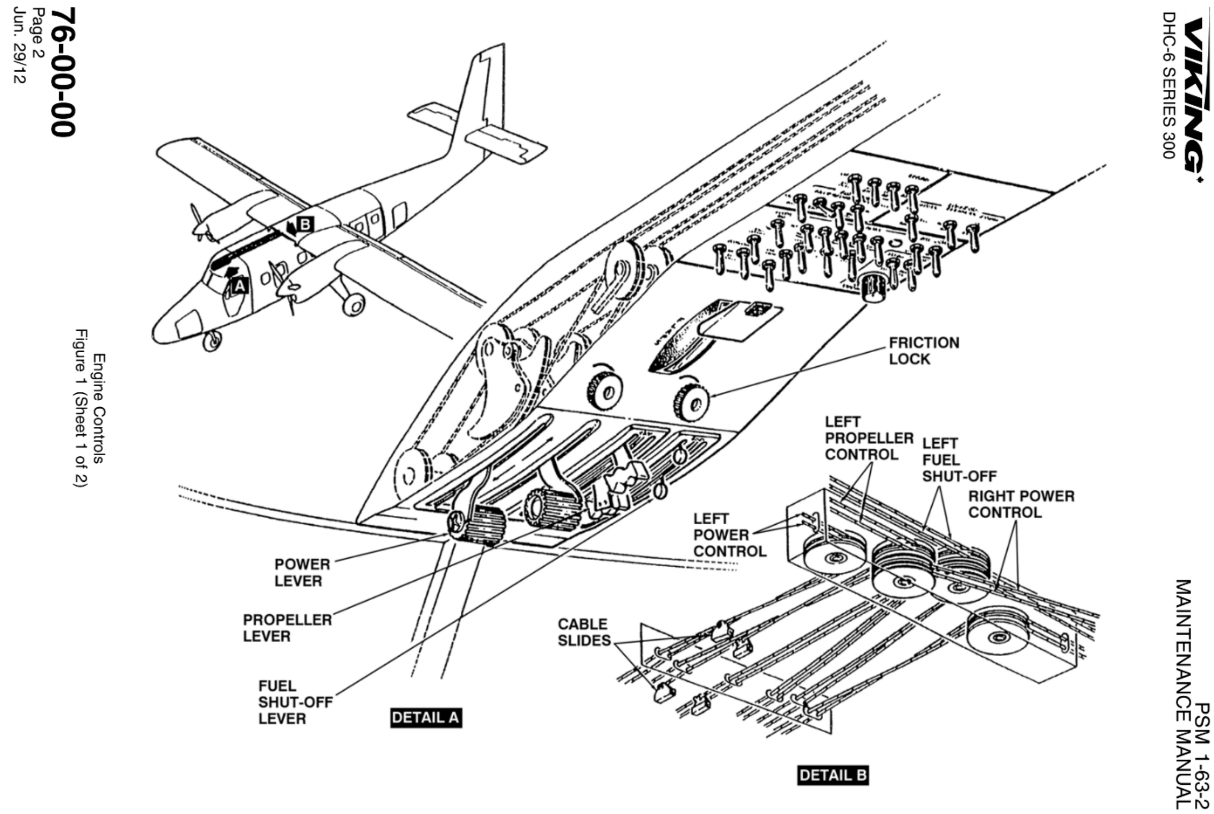
E. Propeller Feathering

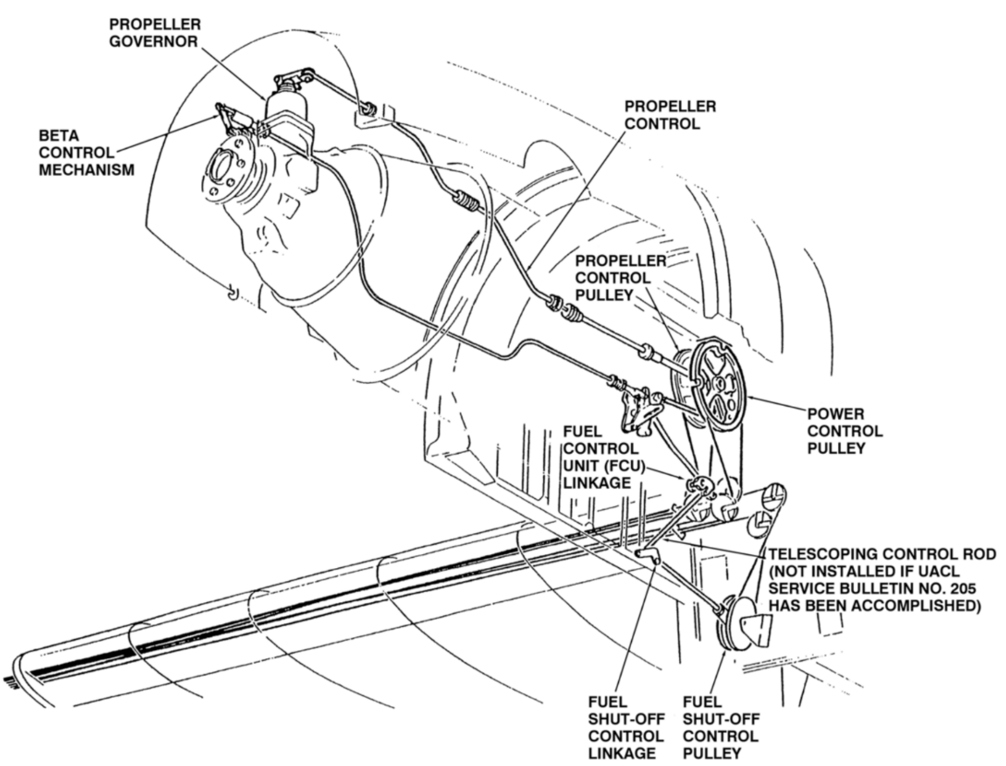
When the propeller lever is selected to feather, the CSU pilot valve is lifted and oil pressure acting on the propeller servo piston is relieved. This permits the combined effect of the blade counterweights and the feather return springs, to turn the blades into the feathered position (a pitch of +87 degrees).

F. Propeller Unfeathering

To unfeather a propeller, the propeller lever must be moved to full INCREASE to reset the constant speed governor, which in effect moves the pilot valve to open the governor oil ports, so that when the engine is started, pressure oil from the governor pump is directed to the propeller servo piston to turn the blades into low pitch. As the propeller piston moves forward, the low stop collar also moves forward and operates the beta control valve to close off the oil supply, so that when the blades reach the pitch determined by power lever selection, the oil supply to the servo piston is sufficient to maintain a balance.

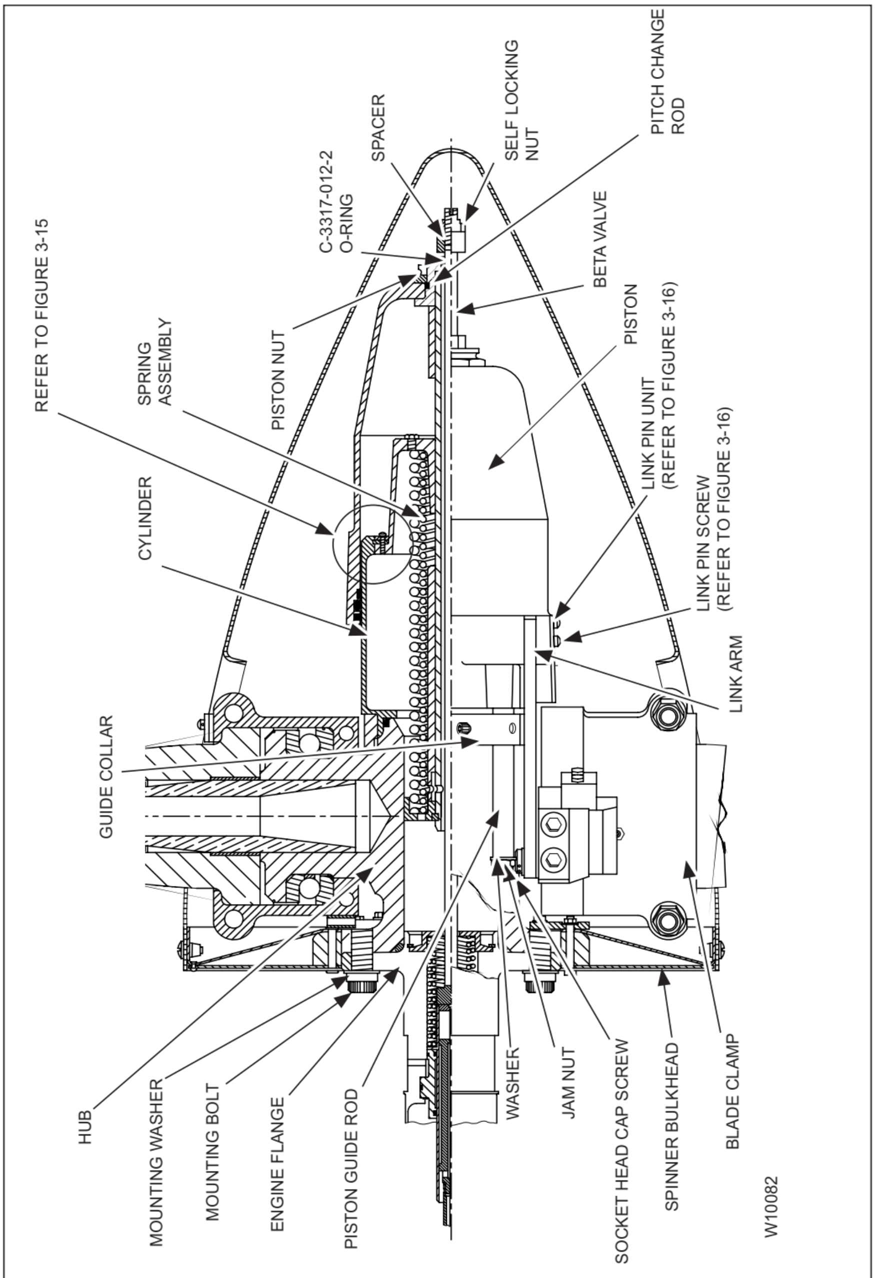
Appendix 5.3. Engine Control System showing the Power Quadrant.





Engine Controls
Figure 1 (Sheet 2 of 2)

Appendix 5.4. Hartzell Propeller Owner's Manual 139 – General Cross-section of a Propeller Assembly.



-7( ) Propeller Assembly
Figure 3-14

Appendix 5.5. P2-BBM, Technical Log, Traxxall Work Order Number, WP 028 – Technical Log-Part 4

P2-BBM S/N: BBM42

TECHNICAL LOG Part 4

MAINTENANCE LOG

5. Details of Defect	Initiated by (signature)	Lic. No.	Date

...ory Interval	Job No.
	028

6. Details of Defect	Initiated by (signature)	Lic. No.	Date
ON TAKE OFF WITH PROP'S FULL FORWARD LEFT PROP LEVER LEADING THE RIGHT PROP LEVER BY HALF A KNOB TO SYNCHRONISE THE PROPS. NEEDS RERIGGING	[redacted]	[redacted]	28/5/24

MEL Ref (if applicable)	Maint. Action (Y/N)	Ops. Action (Y/N)	Rectify Before Date	Category Interval	Deferred by (signature)	Lic. No.	Date
NAD	Y	N	—	—	[redacted]	[redacted]	28/5/24

Rectification Details	Job No.	Certification Clearing Endorsement Signature #	Lic. No.	Date
Refer to AML 03352		[redacted]	[redacted]	15/6/24

7. Details of Defect	Initiated by (signature)	Lic. No.	Date

8. Details of Defect	Initiated by (signature)	Lic. No.	Date

A signature in this column for completion of maintenance, shall constitute a certification that the maintenance recorded has been carried out in accordance with the requirements of Papua New Guinea Civil Aviation Rule Part 43 and in respect of that maintenance the aircraft is released to service

Issue 6 03/12/2018

Appendix 5.6. P2-BBM, Technical Log, Traxxall Work Order Number, WP 028 – Technical Log-Part 2

P2-BBM S/N: BBM42

P2-BBM — **TECHNICAL LOG** — PART 2

DEFERRED DISCREPANCY / DEFECT LOG (DDL)

NOTE: Only deferred items from Part 4 are to be entered in this section.

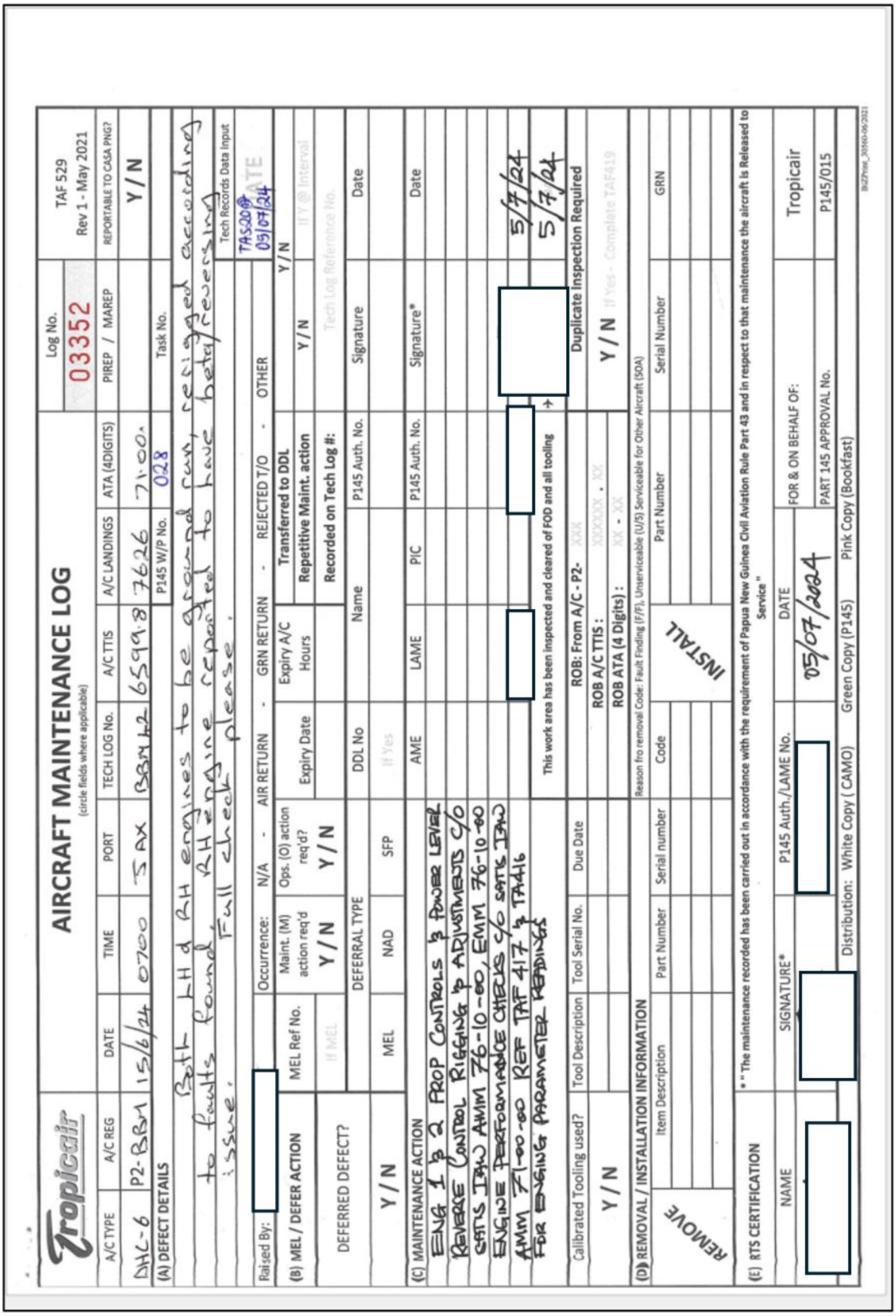
DDL Ref #	ML Ref #	DESCRIPTION	RECTIFY BEFORE (Hrs / Date)	CLEARED BY (Sign & Lic#)	DATE CLEARED
1 ✓	03394 & TL #26	RHS MAIN WHEEL SHIMMY STILL EXISTS. MLG ATTACHMENT BUSHINGS FOUND WORN TO LIMITS.	COMPANY CONVENIENCE		30SEP24
2 ✓	TL#33	DO NOT FILL OR USE TIPTANKS. PARTS ON ORDER. (LEAKING L/H TIP TANK FUEL PRESSURE SWITCH).	WHEN PART ARRIVES.		01.10.24
3					
4					
5					
6					
7					
8					
9					
10					

TL CLOSED @ 17/09/24 TR320

A signature in this column for completion of maintenance shall constitute a certification that the work recorded has been carried out in accordance with the relevant requirements of the Papua New Guinea Civil Aviation Rules and in respect of that work, the aircraft is fit for release to service

Issue 6 03/12/2018

Appendix 5.7. P2-BBM, Technical Log, Traxxall Work Order Number, WP 028 – Aircraft Maintenance Log No. 03352.



Tropicair

AIRCRAFT MAINTENANCE LOG

(circle fields where applicable)

Log No. 03352

TAF 529
Rev 1 - May 2021

A/C TYPE	A/C REG	DATE	TIME	PORT	TECH LOG No.	A/C TTIS	A/C LANDINGS	ATA (4DIGITS)	PIREP / MAREP	REPORTABLE TO CASA PNG?
DHC-6	P2-BBM	15/6/24	0700	JAX	BBM 42	6599.8	7626	71.00.		Y / N

(A) DEFECT DETAILS — P145 W/P No. 028 — Task No.

Both LH & RH engines to be ground run, rerigged according to faults found, RH engine reported to have beta/reversing issue. Full check please.

Tech Records Data Input: TAS2009 05/07/24

Raised By: [redacted]

Occurrence: N/A - AIR RETURN - GRN RETURN - REJECTED T/O - OTHER

(B) MEL / DEFER ACTION	MEL Ref No.	Maint. (M) action req'd	Ops. (O) action req'd?	Expiry Date	Expiry A/C Hours	Transferred to DDL	Y / N
DEFERRED DEFECT?	If MEL	Y / N	Y / N			Repetitive Maint. action	Y / N — If Y @ Interval
						Recorded on Tech Log #:	Tech Log Reference No.
	DEFERRAL TYPE			DDL No	Name	P145 Auth. No.	Signature / Date
Y / N	MEL	NAD	SFP	If Yes			

(C) MAINTENANCE ACTION

ENG 1 & 2 PROP CONTROLS & POWER LEVEL REVERSE CONTROL RIGGING & ADJUSTMENTS C/O SAT'S IAW AMM 76-10-00, EMM 76-10-00 ENGINE PERFORMANCE CHECKS C/O SAT'S IAW AMM 71-00-00 REF TAF 417 & TA416 FOR ENGINE PARAMETER READINGS

AME	LAME	PIC	P145 Auth. No.	Signature*	Date
	[redacted]		[redacted]	[redacted]	5/7/24
					5/7/24

This work area has been inspected and cleared of FOD and all tooling

Calibrated Tooling used?	Tool Description	Tool Serial No.	Due Date
Y / N			

ROB: From A/C - P2- XXX
ROB A/C TTIS : XXXXXX . XX
ROB ATA (4 Digits) : XX - XX

Duplicate Inspection Required: Y / N If Yes - Complete TAF419

(D) REMOVAL / INSTALLATION INFORMATION

Reason fro removal Code: Fault Finding (F/F), Unserviceable (U/S) Serviceable for Other Aircraft (SOA)

REMOVE	Item Description	Part Number	Serial number	Code	INSTALL	Part Number	Serial Number	GRN

(E) RTS CERTIFICATION

* " The maintenance recorded has been carried out in accordance with the requirement of Papua New Guinea Civil Aviation Rule Part 43 and in respect to that maintenance the aircraft is Released to Service "

NAME	SIGNATURE*	P145 Auth./LAME No.	DATE	FOR & ON BEHALF OF:	Tropicair
[redacted]	[redacted]	[redacted]	05/07/2024	PART 145 APPROVAL No.	P145/015

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