



FINAL REPORT

AIC15-2019

**PAPUA NEW GUINEA
ACCIDENT INVESTIGATION COMMISSION
AIRCRAFT SERIOUS INCIDENT REPORT**

Travel Air and Airlines PNG

P2-TAH and P2-MCT

Fokker F27 Mk 050 and Bombardier DHC-8-103

Breakdown of separation

40 km east of Kerema

PAPUA NEW GUINEA

13 April 2015

The Papua New Guinea Accident Investigation Commission (AIC) was informed of a serious incident involving a Fokker F27 Mk 050 and a Bombardier DHC-8 on 13 April 2015. An investigation was immediately commenced by the AIC.

The AIC was informed of the serious incident by PNG Air Services Limited on 13 April 2015 and commenced an on-site investigation.

This Report, made publicly available on 10 October 2015 was produced by the AIC, PO Box 1709, Boroko 111, Papua New Guinea.

The report is based upon the investigation carried out by the AIC, in accordance with Annex 13 to the Convention on International Civil Aviation, Papua New Guinea (PNG) Act, and Civil Aviation Rules. New Guinea (PNG) Civil Aviation Act 2000 (As Amended), Civil Aviation Rules, and the Commissions of Inquiry Act 1951. It contains factual information, analysis of that information, findings and contributing factors, safety actions and recommendations.

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

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When the AIC makes recommendations as a result of its investigations or research, safety is its primary consideration. The AIC nevertheless recognises that the implementation of recommendations arising from its investigations will in some cases incur a cost to the industry.

Readers should note that the information in AIC reports and recommendations is provided to promote aviation safety. In no case is it intended to imply blame or liability.



David Inau, ML

Chief Executive Officer

PNG Accident Investigation Commission

10 October 2015

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INTRODUCTION

SYNOPSIS

On the morning of 13 April 2015, a Fokker F27 Mk 050 registered P2-TAH and a Bombardier DHC-8 registered P2-MCT both received traffic alert and collision-avoidance system (TCAS) advisory information and took evasive manoeuvring action to avoid each other at 19,000 ft approximately 40 km east of Kerema. The aircraft were carrying a combined total of 65 people. The aircraft were not on exactly reciprocal headings, in other words, they were not flying directly towards each other. Nevertheless, the occurrence represented a serious breakdown of the separation, which the different layers of the aviation system are designed to protect. The PNG Accident Investigation Commission (AIC) conducted a serious incident investigation.

MCT was cruising at 19,000 ft in accordance with its flight plan and air traffic control clearance. TAH was cleared to cruise at 18,000 ft in accordance with its flight plan, but was in fact at 19,000 ft, as a result of a series of errors. First, the copilot of TAH dialled 19,000 instead of 18,000 in the assigned altitude indicator on the instrument panel after he received the airways clearance while on the ground at Port Moresby. This was despite correctly reading back (to the controller) the clearance altitude 18,000 ft. Next, the pilot in command (PIC) of the TAH, who was outside the cockpit when the airways clearance was delivered, did not query the non-standard level of 19,000 ft for a westerly heading. After TAH departed Port Moresby, the PIC made radio transmissions to two different air traffic controllers in which he stated the aircraft was on climb to 19,000 ft. Neither controller detected the error.

The approach of the two aircraft towards one another at the same altitude was detected, by three different automated systems: one in each aircraft (the traffic alert and collision-avoidance system (TCAS)), and shortly after, one in the air traffic control system (the radar system's short term conflict alert (STCA)). As a result, evasive manoeuvring was carried out by the flight crews and the aircraft continued to their destinations without further incident.

The investigation determined that:

- The crew of TAH did not conduct an appropriate pre-departure briefing, which should have identified the altitude error prior to takeoff.
- The radar controllers did not effectively cross reference read-backs from the crew of TAH against flight strips and radar information with reference to assigned altitude and did not effectively monitor the flight progress. Despite a number of opportunities to address the error, the controllers did not notice that TAH was not flying at its assigned altitude.

On 22 April 2015, the aircraft operator of TAH issued *Standing Order No 2/15* to its pilots with the aim of preventing a similar occurrence.

PNG Air Services Ltd also took immediate safety action relating to training and checking the controllers in listening to pilot read-backs and monitoring radar tracks.

The AIC issued recommendations to PNG Air Services Ltd (ASL) to review its operational documentation with respect to terminology and requirements when issuing airways clearance instructions to aircraft, and controller to controller coordination of airways clearances. ASL advised the AIC that it rejected the need for safety action based on the deficiencies identified in the report and detailed in two of the AIC recommendations. While disagreeing with the AIC about the need to address a third identified safety deficiency, ASL committed to a review of the relevant documents, and to inform the AIC when the review has been completed. Details are in Section 4 of this Report.

1 FACTUAL INFORMATION

1.1 History of the flight

A breakdown of separation between a Fokker F27 Mk 050 (F50), registered P2-TAH (TAH) and operated by Travel Air, and a Bombardier DHC-8-100, registered P2-MCT (MCT) and operated by Airlines PNG, occurred at 00:30 UTC¹ on 13 April 2015 approximately 40 km east of Kerema (Gulf Province) at 19,000 ft (Figure 1). TAH was conducting a regular public transport (RPT) flight with 35 passengers and three crew (two pilots and one flight attendant) on board. MCT was conducting a charter flight with 24 passengers and three crew (two pilots and one flight attendant) on board. Both flights were operating under the instrument flight rules (IFR).

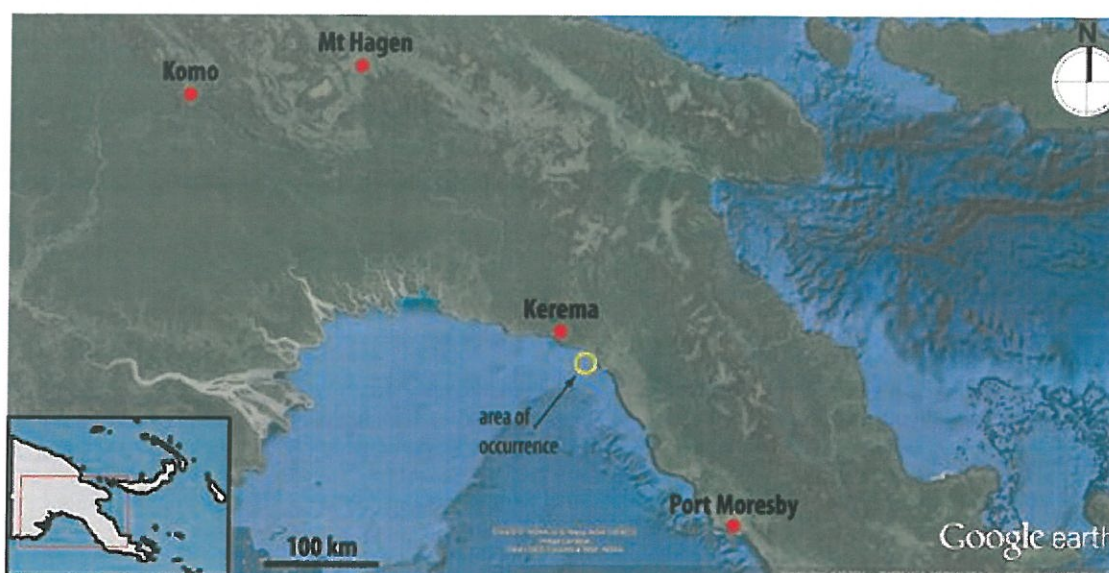


Figure 1: Map showing location of the occurrence

During pre-flight preparation for the flight from Port Moresby to Mt Hagen, the copilot of TAH received an airways clearance from Air Traffic Control (ATC) at Jacksons Airport, Port Moresby. The clearance given by the ATC surface movement controller was standard departure clearance [number] 64 that cleared TAH to track via the 298° radial from the Moresby VOR² to intercept the 315° radial (see Figure 6), and then to track direct to Kerema on climb to 18,000 ft.

The TAH flight plan also showed the cruising level to be 18,000 ft. The copilot read the clearance back correctly to ATC. However, although he had acknowledged 18,000 ft in his read-back³ he subsequently entered 19,000 ft in the assigned altitude indicator on the instrument panel. He did not notice this error.

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

2 VOR = very high frequency omni-directional radio range.

3 A procedure whereby the person receiving a message repeats all or part of the message to the originator to verify the information has been correctly received.

The pilot in command (PIC) of TAH was outside the cockpit when the airways clearance was received and so did not hear the clearance. He informed the AIC investigators he recalled that on entering the cockpit he had seen '19,000' entered in the altitude indicator and had considered it unusual, because westerly headings between 180°M and 359°M would be expected to be assigned an 'even number' cruising level. He said that he had assumed that ATC had assigned them a non-standard level in their clearance and did not discuss it with the copilot.

TAH departed Port Moresby at 00:04 and the PIC, who was the non-flying (support/monitoring) pilot, stated in his departure transmission to ATC (to the approach controller) that the aircraft was on climb to 19,000 ft. The approach controller did not detect the error, and in accordance with standard ATC procedures, notated a 'tick' on the flight progress strip next to the assigned altitude '180', corresponding to 18,000 ft (Figure 8). That was to indicate that the pilot had reported on climb to the correct altitude.

1.1.1 Excerpt of transcript of communications between TAH, MCT and Air Traffic Control

00:02:35 The area radar controller re-cleared TAH direct to Kerema, after which TAH was transferred to the arrivals (en-route radar) controller.

00:17:09 The crew of TAH broadcast 'Moresby radar good morning tru TAH passing 13,600 on climb to 19,000'.

00:17:14 The controller acknowledged saying 'TAH Moresby radar good morning area QNH 1010'.

Again the altitude error (19,000) stated by the crew of TAH was not detected by the radar controller, who placed a 'tick' next to '180' on the flight progress strip (Figure 9).

The crew of TAH subsequently informed the AIC that when TAH passed 18,000 ft on climb, a chime sounded in the cockpit indicating that the aircraft had 1,000 ft left to climb to the 19,000 ft altitude set by the copilot. Both pilots acknowledged '1,000 ft to go' but neither realised that the setting of '19,000 ft' altitude set in the assigned altitude indicator was incorrect.

00:26:12 MCT reported overhead Kerema at 19,000 ft enroute from Komo (Southern Highlands Province) to Port Moresby.

00:29:32 The crew of TAH broadcast 'Radar TAH ah we have traffic ahead on TCAS same altitude coming towards us'.

00:29:39 The controller responded 'TAH roger that's ah traffic is at 18,000'.

The controller again misread the radar label information for the opposite direction traffic i.e. MCT.

00:29:53 The crew of MCT broadcast 'Radar MCT we have traffic ah ahead at same level as us 19000'.

00:30:01 The radar controller instructed 'TAH turn right now immediate right turn.'

00:30:12 The radar controller instructed 'TAH make immediate right turn'.

00:30:20 The radar controller instructed 'MCT make immediate right turn'.

00:30:24 The crew of MCT asked the controller 'just confirm you want us to turn right?'

00:30:28 The radar controller replied 'affirm affirm'.

The crew of MCT also received a resolution advisory, and in response initiated a climb to 20,000 ft.

00:31:11 When the TCAS in MCT indicated that the conflict no longer existed, the crew requested a descent to 19,000 ft. This was not immediately approved.

00:32:17 The radar controller began questioning TAH to confirm that TAH was cleared at 18,000 ft.

The radar control journal entry for 13 April 2015 stated:

MCT INBOUND XM/PY @ 190. CLRD @ TIME 0025.

TAH OUTBOUND PY-MH CLRD LEVEL A180.

HOWEVER AT TIME 0033 ALARMS WENT ON AND WE OBSERVED
TAH CLIMBING TO 18 PASSING 180 CLIMBING TO 190.

MCT HAD THE TICKERS [sic TCAS] SO HE CLIMBED TO 200.

00:33:10 The crew of TAH asked the controller 'ah radar TAH just confirm we cleared at 18,000 not 19,000'.

00:33:31 The radar controller confirmed the assigned level with TAH saying 'TAH just confirm your cleared level. You were supposed to be, you were cleared at 18,000'.

00:33:39 The crew of TAH replied, 'TAH okay we copied 19,000 and we've been cruising at 19,000 from the word go'.

00:33:48 The crew of TAH asked the controller 'and you want us to go to 18,000 now?'

00:33:52 The radar controller replied 'TAH ah that's ok ah cruise at 18,000 that's your standard level and radar services terminated now standby for transfer.

00:34:01 The crew of TAH responded 'TAH roger that we leaving 19,000 for 18,000.

00:34:41 After the radar controller had resolved the conflicting altitude regarding TAH, MCT was cleared to 10,000 ft.

The transcript of communications between TAH, MCT and ATC is at Section 5, Appendix.

1.2 Injuries to persons

Table 1: Injuries to persons P2-TAH

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	3	35	-	Not applicable
TOTAL	3	35	-	-

Table 2: Injuries to persons P2-MCT

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	3	24	-	Not applicable
TOTAL	3	24	-	-

1.3 Damage to aircraft

No damage to either aircraft.

1.4 Other damage

No other damage.

1.5 Personnel information

1.5.1 Pilot-in-command of P2-TAH

Age	: 70 years
Gender	: male
Type of licence	: PNG ATPL No. P21742
Valid to	: perpetual (valid with medical)
Rating	: FK27-50
Total flying time	: 23,500 hours
Total on this type	: 12,000 hours
Total last 90 days	: 31.6 hours
Total on type last 90 days	: 31.6 hours
Total last 7 days	: 31.6 hours
Total on type last 7 days	: 31.6 hours
Total last 24 hours	: 8.0 hours
Total on the type last 24 hours	: 8.0 hours
Last recurrent training	: 10 April 2015
Last proficiency check	: 27 February 2015
Last line check	: 10 April 2015
Route recency	: 10 April 2015
Aerodrome recency	: 10 April 2015
Medical	: class one

1.5.2 Copilot of P2-TAH

Age	: 51 years
Gender	: male
Type of licence	: PNG CPL No. P21991
Valid to	: perpetual (valid with medical)
Rating	: FK27-50
Total flying time	: 2,585 hours
Total on this type	: 1,080 hours
Total last 90 days	: 182 hours

Total on type last 90 days : 182 hours
Total last 7 days : 0 hours
Total on type last 7 days : 0 hours
Medical class : class one
Valid to : 1 May 2015

1.5.3 Pilot in command of P2-MCT

Age : 50 years
Gender : male
Type of licence : PNG ATPL No. P20163
Valid to : perpetual (valid with medical)
Rating : DHC-8
Total flying time : 17,500 hours
Total on this type : 4,800 hours
Total last 30 days : 81.8 hours
Total last 7 days : 28.3 hours
Total on type last 7 days : 28.3 hours
Total last 24 hours : 3.4 hours
Total on type last 24 hours : 3.4 hours
Last proficiency check : 8 January 2014
Last line check : 15 January 2015
Medical : class one
Valid to : 8 February 2016

1.5.4 Copilot of P2-MCT

Age : 38 years
Gender : male
Type of licence : PNG CPL No. P21615
Valid to : perpetual (valid with medical)
Total flying time : 2,800 hours
Total on this type : 1,700 hours
Total last 30 days : 85.6 hours

Total last 7 days	:	25.2 hours
Total on type last 7 days	:	25.2 hours
Total last 24 hours	:	3.4 hours
Total on type last 24 hours	:	3.4 hours
Last proficiency check	:	17 December 2014
Last line check	:	22 August 2014
Medical	:	class one
Valid to	:	15 November 2015

1.5.5 Approach controller

The approach controller was a senior controller with approximately 20 years air traffic control experience. His ratings and endorsements were current at the time of the occurrence and his last performance check was on 11 February 2015. He held a Class 3 medical valid until 3 June 2015. On the 3 days prior to the occurrence and on the day of the occurrence itself, the controller had worked three shifts in the approach controller role and one shift as supervisor, so he was on the fourth shift of the operational shift cycle, as follows.

- 10 April 2015 1200 to 1900 (as supervisor)
- 11 April 2015 1200 to 1900 (as approach controller)
- 12 April 2015 1200 to 1900 (as approach controller)
- 13 April 2015 0500 to 1200 (as approach controller)

The controller had not reported any fatigue- or health-related issues immediately before the occurrence, and he was not taking any medication.

1.5.6 Arrivals controller

The arrivals controller (area radar controller) had approximately 2 years' experience in the position. Her ratings and endorsements were current at the time of the occurrence and her last performance check was on 6 March 2015. She held a Class 3 medical valid until 3 July 2015. The controller was on the fifth shift of the operational shift cycle, as follows.

- 9 April 2015 0500 to 1200
- 10 April 2015 1200 to 1900
- 11 April 2015 1200 to 1900
- 12 April 2015 0500 to 1200
- 13 April 2015 0500 to 1200

The controller had not reported any fatigue- or health-related issues immediately before the occurrence, and she was not taking any medication.

1.6 Aircraft information

1.6.1 Aircraft data P2-TAH

Aircraft manufacturer	: Fokker
Model	: F27 Mk 050
Serial number	: 20122
Date of manufacture	: June 1988
Nationality and registration mark	: P2-TAH
Name of the owner	: Aero Century
Name of the operator	: Travel Air
Certificate of Airworthiness	: issued 14 October 2011
Valid to	: non-terminating
Certificate of Registration	: 11 October 2011
Valid to	: non-terminating
Total hours since new	: 40,893 hours
Total cycles since new	: 44,685 cycles



Figure 2: Fokker F27 Mk 050 P2-TAH

1.6.2 Aircraft data P2-MCT

Aircraft manufacturer	: Bombardier Inc
Model	: DHC-8-103
Serial number	: 135
Date of manufacture	: 1 January 1989
Nationality and registration mark	: P2-MCT
Name of the owner	: AS Air Lease One Ireland Ltd
Name of the operator	: Airlines PNG
Certificate of airworthiness	: issued 1 March 2012
Valid to	: non-terminating
Certificate of registration	: issued 1 March 2012
Valid to	: non-terminating
Total hours since new	: 54,925 hours
Total cycles since new	: 60,494 cycles
Total hours since last inspection	: 109.9 hours since A check
Total cycles since last inspection	: 81 cycles since A check



Figure 3: Bombardier DHC-8-100 P2-MCT

1.6.3 Engine Data

The engines were not relevant to this serious incident

1.6.4 Propeller Data

The propellers were not relevant to this serious incident

1.6.5 Assigned altitude indicator

The assigned altitude indicator in TAH required alternating current (AC) power. TAH does not have an auxiliary power unit (APU), and a ground power unit (GPU) is not available for use by Travel Air at Port Moresby. Therefore at least one engine must be operating and the generator on line to obtain AC power before an altitude can be set in the assigned altitude indicator.



Figure 4: TAH assigned altitude indicator

1.6.6 Traffic alert and collision-avoidance system (TCAS)

Traffic alert and collision-avoidance systems (TCAS) are designed to reduce the incidence of mid-air collisions between aircraft. TCAS monitors the airspace around an aircraft for other aircraft equipped with corresponding active transponders, independent of air traffic control, and warns pilots of the presence of other transponder-equipped aircraft which may present a thread of mid-air collision.

Both TAH and MCT were equipped with TCAS.

1.6.6.1 *TCAS fitted to TAH*

Manufacturer	: Bendix/King
Model	: TPU 67A TCAS-11
Serial number	: 10780
Part number	: 066-01146

1.6.6.2 TCAS fitted to MCT

Manufacturer	: Rockwell Collins
Model	: TTR 921 TCAS-11
Serial number	: not known
Part number	: 822-1293-002

1.7 Meteorological information

The pilots of TAH described the weather in the area of the occurrence at their cruising level at the time of the occurrence as 'VMC' (visual meteorological conditions).

The pilots of MCT described the weather in the area of the occurrence at their cruising level at the time of the occurrence as a 'clear day and saw the F50 at the 1 o'clock position' relative to their aircraft.

The prevailing meteorological conditions were not a factor in the occurrence

1.8 Aids to navigation

Ground-based navigation aids and on-board navigation aids and their serviceability were not a factor in this occurrence.

1.9 Communications

All communications between ATS and the crew were recorded by ground based automatic voice recording equipment for the duration of the flight. The quality of the aircraft's recorded transmissions was good.

The transcript of communications between TAH, MCT and ATC is at Part 5, Appendix.

When communicating onwards clearances to TAH throughout the flight leading up to the serious incident, the controllers did not refer to the assigned altitude of 18,000 ft.

1.10 Aerodrome information

Aerodrome information was not relevant to this occurrence.

1.11 Flight recorders

Both aircraft were fitted with a flight data recorder and a cockpit voice recorder. Neither recorder was used in this investigation.

1.12 Wreckage and impact information

Not relevant to this investigation. Neither aircraft were damaged.

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

Not relevant to this investigation.

1.15 Survival aspects

Not relevant to this investigation

1.16 Tests and research

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

1.17 Organisational and management information

1.17.1 PNG Air Services Ltd

Headquarters
PO Box 273 Boroko,
Port Moresby
Papua New Guinea

1.17.2 ATC operating procedures and personnel work stations at PNG ASL

The surface movement controller position is situated in the Control Tower at Jacksons Airport. One of the Surface Movement Controller's duties is to issue standard departure clearances to aircraft on the ground preparing for departure. Standard practice is that, on receipt of an aircraft's flight plan, the flight progress strip is prepared and annotated with the flight planned level and route.

For operations at or below 20,000 ft, planned flight levels are always standard altitudes according to direction of flight, i.e. from 000°M to 179°M any odd flight altitudes, and from 180°M to 359°M any even altitudes. When a pilot requests an airways clearance, a clearance in accordance with the flight plan and flight progress strip is issued.

Both the Approach and Arrivals operating positions (work stations) comprise air situation displays that display secondary surveillance radar-derived aircraft tracks. The aircraft tracks contain the following key information: aircraft identification/callsign, groundspeed, cleared flight level, and Mode C transponder (actual) level of the aircraft. Both operating positions use paper flight progress strips for annotating/recording aircraft movement details.

The flight progress strips for TAH in both the approach and arrivals controller positions had been annotated correctly with the cleared flight level 180. Standard procedure is that, at the time of airways clearance delivery/coordination, an arrow is marked on the flight progress strip adjacent to the cleared flight level. When a pilot first makes contact with an air traffic controller, the controller places a tick immediately to the right of the cleared flight level to signify correct pilot 'read-back' of the cleared flight level.

At the approach work station, there is one flight progress strip created for each aircraft/flight, which the controller annotates as the flight progresses. At the arrivals work station, there are a number of flight progress strips generated for each aircraft/flight to enable the establishment and presentation of a procedural (non-radar) display in addition to the radar air situation display.

1.17.3 PNG Air Services Ltd (ASL) operational documents

1.17.3.1 Non-standardised terminology in ASL operational documents

The investigation found that with respect to airways clearances, the terminology used in the *Aeronautical Information Publication (AIP)* and the *Manual of Air Traffic Services (MATS)* are not standardised. Specifically *AIP* uses assigned and *MATS* uses authorised.

1.17.3.2 Aeronautical Information Publication ENR 1.1-2

The PNG *Aeronautical Information Publication ENR 1.1-2 Section 2.12.2* states

'An airways clearance normally contain the following items

...

d) assigned level

The use of the word normally is not considered to have the strength of a requirement.

1.17.3.3 ASL Manual of Air Traffic Services (MATS)

The *COORD* section of *MATS* is not clear about the requirement for controllers to communicate assigned levels (for aircraft) when communicating between air traffic control units.

Between 00:02:16 and 00:02:32 the approach controller and the en-route radar controller discussed the re-routing of TAH direct to Kerema. An assigned level was not discussed.

MATS RAC-3-2, section 3.5, dated 25 July 2015, states:

When a route clearance is amended before cruising level is reached, the new route and level to be flown shall be specified.

At 00:02:35 the area radar controller re-cleared TAH direct to Kerema, saying:

TAH recleared direct Kerema.

TAH had not reached cruising level and the controller did not comply with *MATS RAC-3-2 section 3.5*.

1.17.4 Status of ATC facilities

At the time of the occurrence all ATC operational surveillance/communication facilities at PNG ASL were operating normally. There were no reported issues or anomalies

1.17.5 Travel Air PNG Ltd

Travel Air PNG Ltd
Po Box 163
Diwai Post
Madang
Madang Province
Papua New Guinea

Travel air operated four Fokker F27 Mk 050 aircraft throughout Papua New Guinea on scheduled and non-scheduled air services.

Two items of note with respect to the unfolding occurrence.

1. Travel Air Fokker F27 Mk 050 Standard Operating Procedures require that an airways clearance must only be obtained in the presence of both pilots.
2. An item on the 'BEFORE TAKE-OFF CHECKLIST' states:

T. O DATA AND DEPARTURE BRIEFING REVIEWED.

1.17.6 TAH flight plan

TAH was flight planned AYPY (Port Moresby) to AYMH (Mt Hagen) as follows.

```
LYA0494 120534  
FF AYMDYSYX AYMHTZTX AYPMYJYX AYPMYSYX AYPMYSYZ AYPMZRZX AYPMZTZX  
120534 YBBBZEZX  
(FPL-P2TAH-IS  
-F50/M-SDFGHIZ/C  
-AYPY2330  
-N0250A180 DCT SFI SAP KM PRV  
-AYMH0113 AYMD  
-NAV/GPSRNAV DOF/150412 REG/P2TAH EET/SFI0012 SAP0024 KM0035 PRV0052  
OPR/TRAVELAIR PER/C RMK/TCAS EQUIPPED 4P602)
```

Figure 5: TAH flight plan

The following is a summary of the ATC coded flight plan for TAH.

AYPY (Port Moresby) to AYMH (Mt. Hagen).

Flight plan – P2 TAH, Instrument Flight Rules (IFR).

Fokker 50

Estimated departure time Port Moresby 23:30 UTC (09:30 L)

Cruising altitude of 18,000 ft tracking direct to Starfish, Snapper, Kerema, and Purari River way points.

Estimated arrival time Mt. Hagen 01:13 UTC (11:13 Local time) carrying Madang as alternate aerodrome.

The investigation noted that the data entered by the Flight Data Operator from the TAH submitted flight plan incorrectly listed Kerema as KM (See Figure 4 above).

1.17.7 MCT flight plan

MCT was flight planned AYXM (Komo) to AYPY (Port Moresby) as follows.

```
LYA0794 100724
FF AYPMYJYX AYPMYSYX AYPMYSYZ AYPMZRXZ AYPMZTZX
100724 YBBBZEXX
(FPL-P2MCT-IS
-DH8A/M-SDFGHRZ/S
-AYXM2320
-N0250A170 DCT AYXM MOR KRM KUB PY DCT
-AYPY0128
-PBN/A1S1 NAV/GPSRNAV DOF/150410 REG/P2MCT EET/WBU0029 KRM0056
IOK0107 OPR/AIRLINESPNG PER/B RMK/TCAS)
```

Figure 6: MCT flight plan

The following is a summary of the ATC coded flight plan for TAH.

AYXM (Komo) to AYPY (Port Moresby).

Flight plan – P2-MCT, Instrument Flight Rules (IFR)

Dash 8

Estimated departure time Komo 23:20 UTC (09:20 Local time)

Cruising altitude of 17,000 feet (original plan) tracking to Moro, Kerema, Kubuna waypoints.

Estimated time of arrival Port Moresby 01:29 UTC (11:29 Local time).

1.17.8 TAH and MCT estimated flight tracks

As shown on the following extract from the radio navigation chart (RNC) (Figure 7), MCT was observed on radar to be tracking according to its airways clearance AXXM (Komo) – MOR (Moro) – (KRM) Kerema – KUB (Kubuna), thence direct AYPY (Port Moresby).

Initially, TAH was issued with a clearance AYPY – SFI (Starfish) – SAP (Snapper) – KRM (Kerema) – PRV (Purari River) – AYMH (Mt Hagen). On departure from Port Moresby, TAH was re-cleared (from a position estimated to be on the runway centreline approximately 2 to 3 nm from the departure point) to track direct to Kerema.

The chart also depicts the estimated positions of each aircraft at the time of the occurrence, based on times of passing Kerema (KRM) and Snapper (SAP) and estimated aircraft groundspeeds.

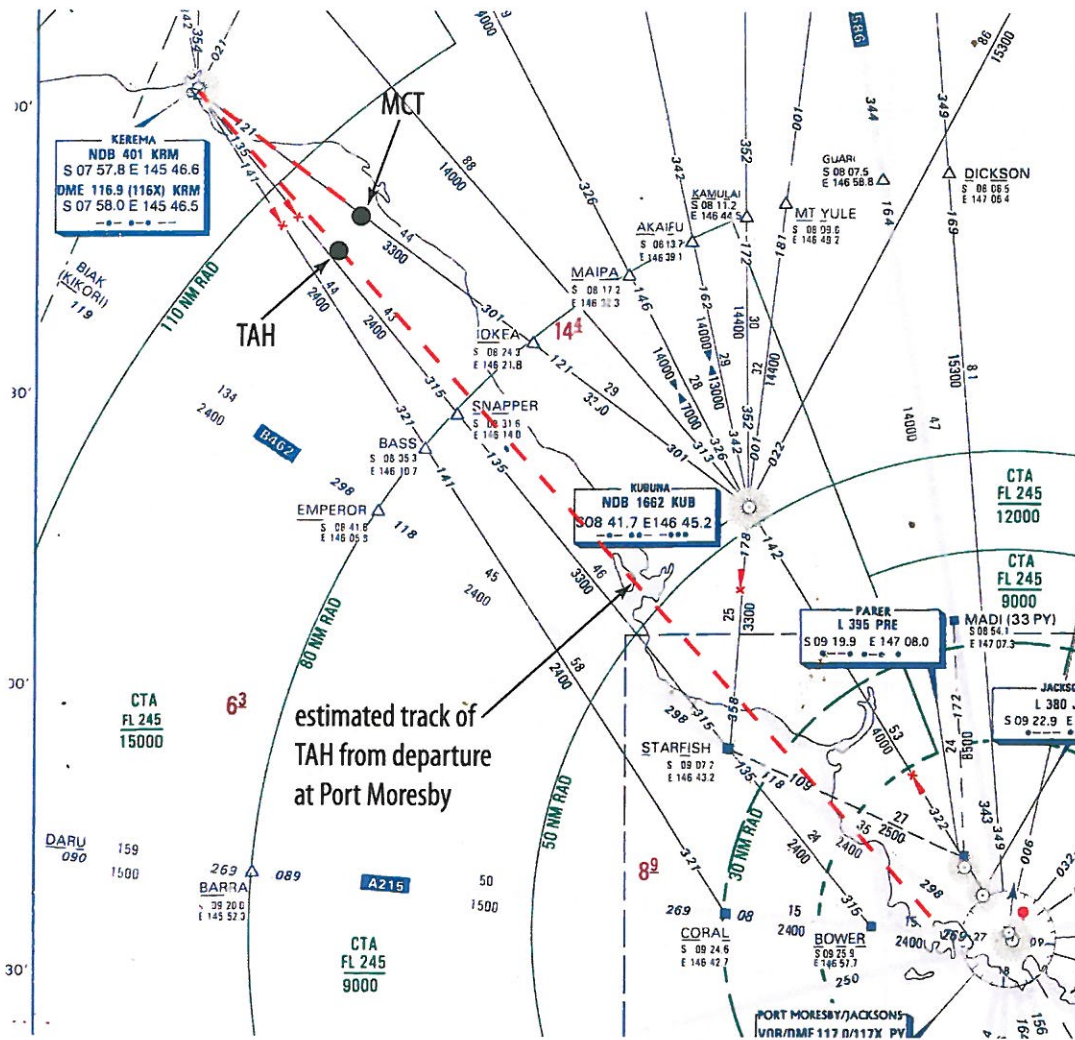


Figure 7: Radio navigation chart extract showing estimated flight track of TAH and estimated positions of the two aircraft at the time of the occurrence

1.17.9 ATC flight progress strips for TAH

Both controllers placed a ‘tick’ on the respective flight progress strips adjacent to the correct cleared altitude (‘180’ representing 18,000 ft). Placing a ‘tick’ in this position is the ATC procedure which indicates that the flight crew of an aircraft have reported being on climb to the correct altitude.

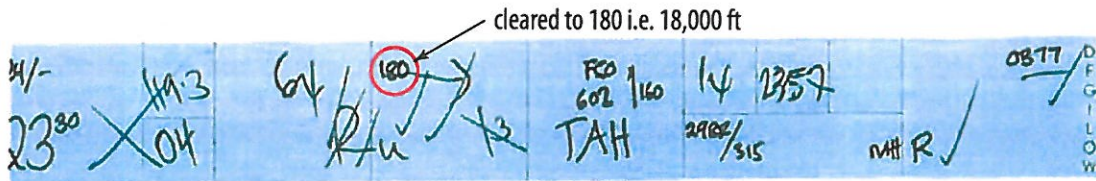


Figure 8: ATC flight progress strip for TAH - Approach

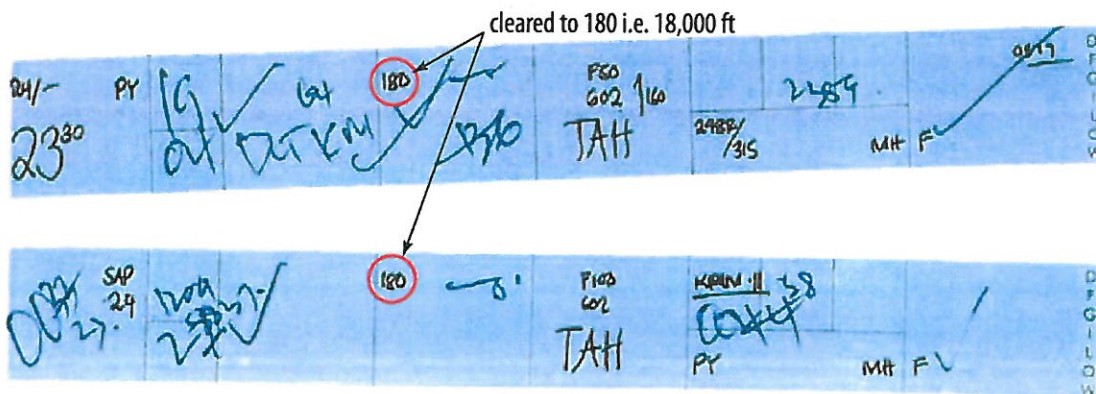


Figure 9: ATC flight progress strip for TAH – En-route radar

1.18 Useful or effective investigation techniques

The investigation was conducted in accordance with Papua New Guinea Legislation, and the PNG Accident Investigation Commission policies and procedures, and in accordance with the Standards and Recommended practices of Annex 13 to the Chicago Convention.

2 ANALYSIS

The copilot of the Fokker F27 Mk 050 aircraft, P2-TAH reported that during the pre-flight preparation for the flight from Port Moresby to Mt Hagen, he received an airways clearance that cleared TAH to climb to the flight planned level of 18,000 ft.

He said that he acknowledged 18,000 ft in his read-back and subsequently dialled 19,000 ft in the altitude indicator on the instrument panel. He did not notice this error. The pilot in command (PIC) stated that he was not in the cockpit at the time the copilot received the airways clearance.

During the first departure communication with the air traffic controller (approach controller) the PIC informed the controller that the aircraft was on climb to 19,000 ft, i.e. the level set in the altitude indicator.

The approach controller did not detect the error, and in accordance with standard ATC procedures, annotated a 'tick' on the flight progress strip next to the assigned altitude '180' (corresponding to 18,000 ft) indicating that the pilot had reported on climb to the correct altitude. Subsequently the area radar controller re-cleared TAH direct to Kerema, after which TAH was transferred to the arrivals (en-route radar) controller and the PIC reported that they were on climb to 19,000 ft. Again, the error was not detected by the arrivals controller who also placed a 'tick' next to '180' on the flight progress strip.

At about that time, P2-MCT passed overhead Kerema at 19,000 ft enroute from Komo (Southern Highlands Province) to Port Moresby.

The traffic alert and collision-avoidance systems (TCAS) in both aircraft alerted the flight crews to the opposite direction traffic. The crew of TAH were concerned, and alerted the controller. The controller again misread the radar information for the opposite direction traffic and told TAH that the traffic was at 18,000 ft when in fact MCT was at 19,000 ft.

The ATC journal log for the day stated that the short term conflict alert sounded at 00:33, which was after the air crews alerted the controller of the TCAS advisory. The controller instructed both aircraft to turn right, which would have meant that they turned towards each other. However, the crew of MCT questioned the instruction and told the controller that they were clear of the opposing traffic and had climbed to 20,000 ft. Both crews had taken evasive manoeuvring action in accordance with the advisories generated by their respective TCAS.

The AIC determined that a factor in the incorrect setting of the assigned altitude indicator was the absence of the PIC from the cockpit of TAH while the clearance was being delivered. This meant the PIC did not hear the assigned altitude and was therefore unable to cross-check the copilot's setting of the assigned altitude indicator.

The PIC reported that on noticing the unplanned level of 19,000 ft in the altitude indicator he did not question it with the copilot. Additionally, if the PIC and copilot had conducted appropriate pre-departure briefing, the altitude indicator error may have been detected prior to takeoff.

The investigation found that the copilot did not comply with the company standard operating procedures (SOP), by requesting and receiving an airways clearance from air traffic control while the PIC was not in the cockpit⁴. The PIC statement that he saw 19,000 ft in the assigned altitude indicator when he entered the cockpit about 10 min after the copilot obtained the airways clearance could not be reconciled against the other evidence. The altitude entry into the assigned altitude indicator could only have been made after at least one engine had been started and the generator placed on line in order to have AC power.

By not being present to hear the airways clearance when it was delivered, the PIC did not comply with the company's SOPs that required both pilots to be present in the cockpit to receive the clearance. This lay behind his acceptance of the non-standard altitude that the copilot had set in the assigned altitude indicator.

The air traffic controllers' appear to have anticipated hearing 18,000 ft when contacted by TAH. It is apparent they did not cross check with their flight strips when communicating with the crew of TAH before noting correct readback of the assigned altitude with a tick annotation on the flight strip. This served to exacerbate the altitude error created by the crew of TAH.

When communicating the onwards clearance to TAH at 00:02:35 the approach controller did not refer to the assigned altitude of 18,000 ft, thereby being deprived of an additional means of ensuring that the aircraft was at the assigned altitude. The radar controllers should also have noted the altitude labels against the aircraft radar positions.

In instructing TAH and MCT to immediately turn right to avoid the conflict, it was evident that the radar controller had lost situational awareness with respect to the two aircraft.

The investigation determined that the aircraft and air traffic control automated safety systems worked as designed, one in each aircraft (the traffic collision avoidance system (TCAS)) and one in the air traffic control system (the radar system's short term conflict alert (STCA)).

3 CONCLUSIONS

3.1 Findings

1. AIRCRAFT

- a) Both aircraft were certified, equipped and maintained in accordance with existing regulations and approved procedures.
- b) The aircraft were certified as being airworthy when dispatched for the flight.
- c) There was no evidence of any defect or malfunction in the aircraft that could have contributed to the serious incident.

2. CREW / PILOTS

- a) The pilots of both aircraft were licensed and qualified for the flight in accordance with existing regulations.
- b) The copilot did not comply with the company standard operating procedures (SOPs), by requesting and receiving an airways clearance from air traffic control while the PIC was not in the cockpit.
- c) The pilots' pre-departure briefing did not detect the assigned altitude error; the briefing was not effective.

3. FLIGHT OPERATIONS

- a) The flight was conducted by the crew of P2-MCT was conducted in accordance with the procedures in the company Operations Manual.
- b) The crew of P2-TAH did not comply with standard operating procedures with respect to the pre-takeoff briefing.
- c) The flight crew carried out normal radio communications with the relevant ATC units.
- d) The crew of TAH did not operate in compliance with their air traffic control clearance.

4. AIR TRAFFIC SERVICES

- a) The radar controllers were properly licensed, experienced, medically fit, and correctly rated to provide the service.
- b) The air traffic controllers' workload was assessed as being of normal complexity.
- c) The controllers did not effectively monitor the progress of TAH and did not notice that TAH was not flying at the assigned altitude.
- d) The controller incorrectly instructed both crews to turn right immediately to avoid traffic; the instruction if followed would have brought the aircraft into conflict.

5. MEDICAL

- a) There was no evidence that psychological or physiological factors affected the performance of the crew of TAH.
- b) There was no evidence that psychological or physiological factors affected the performance of the controllers.

3.2 Causes [contributing factors]

The copilot of P2-TAH did not correctly enter the assigned clearance altitude into the altitude indicator on receipt of the airways clearance prior to start up. The pilot in command was not in the cockpit at the time.

The crew of P2-TAH did not conduct an appropriate pre-departure briefing, which should have identified the altitude error.

The radar controllers did not effectively cross reference read-backs from the crew of TAH against flight strips and radar information with reference to assigned altitude and did not effectively monitor the flight progress. Despite a number of opportunities to address the error, the controllers did not notice that TAH was not flying at the assigned altitude.

4 SAFETY ACTIONS AND RECOMMENDATIONS

4.1 Safety Actions

4.1.1 Travel Air

On 22 April 2015 the General Manager Flight Operations issued the following *Standing Order* to Travel Air pilots.

Airways clearance procedures

..... all pilots are hereby reminded of the requirements of CAR Part 91.419, IFR Cruising Altitude or Flight Level.

a) Subject to paragraph (c), a pilot-in-command of an aircraft operating within the Port Moresby FIR under IFR in level cruising flight must, unless otherwise authorised by ATC, maintain the following altitude or flight levels.

(1) When operating at or below 20,000 ft AMSL

(i) on a magnetic track of 000 clockwise to 179, and odd-thousand foot altitude AMSL; or

(ii) on a magnetic track of 180 clockwise to 359, any even-thousand foot altitude AMSL; and

(2) When operating at or above flight level 210 up to flight level 290

(i) on a magnetic track of 000 clockwise to 179, any odd flight level; or

(ii) on a magnetic track of 180 clockwise to 359, any even flight level.

Procedure

To prevent any further occurrence of "near miss" incidents, the following must be followed forthwith.

1. ATC Clearance must only be requested with both pilots seated in their flight deck stations and both listening to the delivery of clearance.

2. Reading back of clearance number and altitude or flight level will only be done after both pilots confirm correctness. Any assigned altitude or flight level which contravenes requirements of CAR Part 91.419 must be queried for correctness.

3. The PIC is to set the assigned or flight plan altitude flight level in the Altitude Indicator and the FO to confirm correctness.

4. Changes of altitude or flight level during flight must only be done after making request and approved by ATC or, if OCTA, intention is broadcast and there is no conflicting traffic.

4.1.1.1 Further Travel Air safety actions

On 4 October 2015, the Travel Air, Manager, Quality and Safety informed the AIC that the AIC's conclusions in its final report were all noted.

The identified contributory factors in the Draft Investigation Report is also noted. Safety actions and recommendations taken on board including adherence to Standing Order issued by the MFO [Manager Flight Operations]. The pilot in command no longer operates with Travel Air, the F/O [copilot] involved [has] undergone retraining on Crew Resource Management, Re-take of the PNG Air Laws and Line Checked as well.

4.1.2 PNG Air Services Limited

On 24 April 2015, PNG Air Services Ltd (PNG ASL) informed the PNG Accident Investigation Commission of safety action taken by PNG ASL and/or underway aimed at preventing a similar occurrence. A summary of the safety action is in paragraphs 4.2.1 to 4.2.3.

4.1.2.1 Controller counselling, training, and checking

The incident was immediately reported within PNG ASL by both controllers. As a result both controllers were stood down by PNG ASL pending an investigation. The approach controller was considered to have played a minor role, was counselled in regard to pilot read-backs, and returned to duty.

The arrivals controller was counselled and assigned 2 days simulator training listening to pilot read-backs and monitoring radar tracks. It was noted by the simulator instructor that all simulated incorrect read-backs were picked up by the controller. The controller underwent a performance check on the Arrivals position on the third day and was found to be competent and returned to duty.

4.1.2.2 Refresher training

Prior to the occurrence, refresher training for all controllers was already being conducted at PNG ASL. Since the occurrence, greater emphasis focus is being placed on controllers being aware of, and actively listening for, incorrect read-backs, in addition to actively observing Mode C levels on radar tracks particularly as they approach cleared altitude/flight level.

4.1.2.3 Reconfiguration of the arrivals work station

In order to reduce the possibility for distraction because of a controller having to annotate a number of flight progress strips while engaged in other activities, simulator and safety related work is underway to reconfigure the arrivals work station and transition to a single flight progress strip for each aircraft display. This is already the case at the approach work position.

4.2 Safety recommendations

4.2.1 Recommendation number AIC 15-R10/15-2019 to PNG Air Services Ltd

The PNG Accident Investigation Commission recommends that PNG Air Services Ltd should amend the PNG *Aeronautical Information Publication ENR 1.1-2 Section 2.12.2* by replacing

‘An airways clearance normally contain the following items

...

d) assigned level

with

‘An airways clearance **shall** contain the following items

...

d) assigned level

in **all** onwards clearance instructions issued to aircraft.

4.2.1.1 PNG Air Services Ltd response

Signed response dated 17 August 2015.

In regard to the recommendation number AIC 15-R10/15-2019, it would be incorrect to state ‘An airways clearance shall contain the following items’ as a clearance may not necessarily include all the elements a) through g), listed at the AIP reference. I submit that the current wording at the AIP reference is appropriate as it conveys the correct meaning and I note that the wording is almost identical to the Australian AIP. ie: that document states ‘normally’ and not ‘shall’. Therefore I propose to not act on this recommendation.

4.2.1.2 PNG Accident Investigation Commission (AIC) assessment of PNG Air Services Ltd (ASL) response

The AIC has assessed the ASL response as **unsatisfactory not accepted**. Subsequent to receiving the written response from ASL, the AIC met with ASL on 2 September 2015 to discuss the safety concern. ASL maintained its position as stated in its written response.

The AIC strongly holds the view that particularly in the area of aviation safety, Papua New Guinea should be a leader and not a follower. Therefore the fact that the PNG AIP mirrors the wording of the Australian AIP does not justify the ASL decision not to clarify and amend the PNG AIP to improve aviation safety.

The AIC has determined that the safety deficiency identified in the recommendation *AIC 15-R10/15-2019* will continue to put persons, property or the environment at risk. Due to PNG ASL stating and demonstrating that ASL will take no safety action to reduce or eliminate the identified safety deficiency, the AIC has assigned the following status.

Status of the AIC Recommendation AIC 15-R10/15-2019:

CLOSED not accepted

4.2.2 Recommendation number AIC 15-R12/15-2019 to PNG Air Services Ltd

The PNG Accident Investigation Commission recommends that PNG Air Services Ltd should ensure it uses standardised terminology throughout *the Aeronautical Information Publication* and the *Manual of Air Traffic Services* with respect to the use of the terms authorised and assigned, when referring to airways clearances.

4.2.2.1 PNG Air Services Ltd response

Signed response dated 17 August 2015.

In regard to the recommendation number AIC 15-R12/15-2019 noted for attention by PNG Air Services Limited, it must be remembered that AIP instructions /information is specifically directed at pilots/operators and MATS is specifically directed at ATS personnel. Therefore the wording between the two references in regard to the same topic may differ in regard to the party issuing the instruction/request and the party receiving the instruction/request. Therefore, it may be inappropriate to simply align the wording in the two documents to either 'approved' or 'assigned'. Notwithstanding, I will direct my staff to carefully review both documents in order to confirm that the wording is appropriate in every section and there is no chance of it conveying the wrong message. I will advise further on this once this review has been completed.

4.2.2.2 Discussion between AIC and PNG ASL on 2 September 2015

Subsequent to receiving the written response, the AIC met with ASL to discuss the safety concern articulated in the AIC recommendation AIC 15-R12/15-2019. During the discussion ASL agreed that while MATS is specifically directed at ATS personnel, AIP is required to be understood by both pilots and controllers, and all air ground communications by controllers are to be conducted in accordance with MATS and AIP.

4.2.2.3 PNG Accident Investigation Commission (AIC) assessment of PNG Air Services Ltd (ASL) response

The AIC has assessed the ASL response as a **satisfactory intent** by ASL. However, based on the written response and the discussions with ASL, the AIC has assessed the action planned by ASL and has determined that for the present, the action has not been sufficiently advanced to reduce the risks to aviation safety in PNG. The AIC will monitor the progress of the implementation of the planned actions and will reassess the deficiency on an annual basis or when otherwise warranted.

Status of the AIC Recommendation: Active

4.2.3 Recommendation number AIC 15-R13/15-2019 to PNG Air Services Ltd

The PNG Accident Investigation Commission recommends that PNG Air Services Ltd should ensure that in the *COORD* section of the *Manual of Air Traffic Services* the requirement to communicate assigned levels (for aircraft) are communicated between air traffic control units.

4.2.3.1 PNG Air Services Ltd response

Signed response dated 17 August 2015.

In regard to recommendation number AIC 15-R13/15-2019 noted for attention by PNG Air Services Limited, I acknowledge that there appears to have been a failure by the controller to properly apply procedures. This has already been addressed within the ATS Group but I will direct my staff to ensure that the instruction is reiterated in an appropriate manner. I do not agree that the COORD section in MATS is inadequate in regard to instructions relating to the coordination of levels between ATS positions or units. Throughout the section, there are numerous references to this requirement and I believe that they adequately cover the need to communicate aircraft levels in all circumstances.

4.2.3.2 PNG Accident Investigation Commission (AIC) assessment of PNG Air Services Ltd (ASL) response

The AIC has assessed the ASL response as **unsatisfactory not accepted**. Subsequent to receiving the written response, the AIC met with ASL on 2 September 2015 to discuss the safety concern. ASL maintained its position as stated in its written response.

The AIC has determined that the safety deficiency identified in the recommendation AIC 15-R13/15-2019 will continue to put persons, property or the environment at risk. Due to PNG ASL demonstrating that no action will be taken to reduce or eliminate the identified safety deficiency, the AIC has assigned the following status.

Status of the AIC Recommendation AIC 15-R13/15-2019:

CLOSED not accepted

5 APPENDIX

5.1 PNG Air Services Limited ATS transcript

The following three pages are drawn from the Air Services Ltd transcript of communications between P2-TAH, P2-MCT, and air traffic services between 23:23:26 and 00:34:41. Communications with other aircraft and other transmissions that are not essential to the analysis of this serious incident have not been included.

6. Tape Transcript

TIME	FROM	TO	TRANSCRIPT	REMARKS
1.			RADIO COMMS P2TAH & JACKSONS GROUND (SMC)	
23:23:26	TAH	GND	JAX GROUND TAH FOR MOUNT HAGEN REQ ATC CNCE	
23:24:03	TAH	GND	JAX GROUND GOOD MORNING TRU TAH FOR MOUNT HAGEN REQ ATC CNCE	
23:24:20	GND	TAH	TAH ATC CNCE 64 CRUISE 18000 SQUACK 0377	
23:24:29	TAH	GND	TAH CNCE 64 CRZ 18000 SQK 0377 TAH THANK YOU	
23:55:24	TAH	GND	JAX GND TAH GOOD MORNING TRU TAH BAY 10 FOR MOUNT HAGEN POB 38 INFORMATION FOXTROT REQ TAXI	
2.			SMC COORD WITH ADC/APPROACH	
23:55:59	APP	SMC	64 18000 0377 GO AHEAD	APP going ahead rather than waiting for SMC to advice of taxi
23:56:03	SMC	APP	TAXI TAH FOR MT HAGEN	
23:56:07	APP	SMC	And COPIED CLEARANCE	
23:56:08	SMC	APP	AND READ-BACK CORRECT	
3.			RADIO COMMS SMC AND P2TAH	
23:55:39	GND	TAXI	TAH TAXI FOR 14L HOLD SHORT FLIGHT PATH 14RIGHT TIME 57	
23:55:45	TAH	GND	14L AND HOLD SHORT 14RIGHT TAG CORRECTION TAH	
23:56:45	GND	TAH	TAH CARAVAN ON SHORT FINAL 14RIGHT BEHIND CROSS 14RIGHT BEHIND	
23:56:53	TAH	GND	CROSS BEHIND THE CARAVAN CROSS 14RIGHT FLIGHT PATH 14RIGHT	
4.			COORDINATION ADC & APPROACH FOR RELEASE TAH	
23:58:43	APP	TWR	TAH RIGHT TURN UNRESTRICTED	
23:58:45	ADC	APP	RIGHT TURN ROGER	
5.			RADIO COMMS TOWER (ADC) & P2TAH	
23:59:27	TAH	ADC	JAX TWR GUD MORNING TRU TAH READY	
23:59:31	ADC	TAH	TAH ROGER MAKE A RIGHT TURN RADAR AIRBORNE CLEAR FOR TAKE-OFF	
23:59:36	TAH	ADC	MAKE A RIGHT TURN RADAR AIRBORNE CLEAR FOR TKOF TAH	
6.			RADIO COMMS P2TAH AND JACKSONS APPROACH	
00:01:38	TAH	APP	JAX RADAR TAH AIRBORNE AH TURNING RIGHT PASSING 1000 ON CLIMB 19000	Pilot advised climbing to 19000, ATC cleared level 18000 – Approach did not pick up error.

Tape Transcript (Continued)

00:01:46	APP	TAH	TAH JAX RADAR MORNING IDENTIFIED	
00:01:49	TAH	APP	TAH	
7.			INTERCOM APP & AREA RADAR (RED)	
00:02:16	APP	RED	TAH 04	
00:02:17	RED	APP	04 ROGER	
00:02:19	APP	RED	AH DIRECT KRM OR?	APPROACH initiating direct Kerema
00:02:26	RED	APP	GO	
00:02:29	APP	RED	AH TAH HAVE YOU ANY RESTRICTIONS DIRECT KRM	
00:02:30	RED	APP	CONCUR DIRECT KEREMA AND ONE ESTIMATE	AREA (R) approves direct track
00:02:32	APP	RED	OKAY STANDBY	
00:02:35	APP	TAH	TAH RECLEARED DIRECT KEREMA	(coughing at background whilst APP was on air.
00:02:38	TAH	APP	TAH DIRECT TO KEREMA	
8.			RADIO COMMS WITH ENROUTE RADAR	
00:17:09	TAH	RED	MORESBY RADAR GOOD MORNING TRU TAH PASSING 13,600 ON CLIMB TO 19,000	Area Radar did not pick up pilot error on level on climb to.
00:17:14	RED	TAH	TAH MORESBY RADAR GOOD MORNING AREA QNH 1010	
00:17:19	TAH	RED	1010 TAH	
00:24:02	RED	FIS 3	GO AHEAD AND ONE FOR YOU	RED ANSWERS TO FIS 3's call.
00:24:02	FIS 3	RED	AH REQ.CNCE MCT	
00:24:04	RED	FIS 3	CNCE ENTER CTA TRACK KEREMA IOKEA KUBUNA PY ENTER AT 19,000 CODE 045.	P2-MCT ATC cleared level 19000ft. (ATC coded clearance – K121 not used??
00:24:12	FIS 3	RED	KEREMA IOKEA KUBUNA MORESBY AT 19,000 SAY AGAIN CODE	
00:24:15	RED	FIS 3	0456	
00:24:17	FIS 3	RED	0456 ROGER CALLS YOU AT KEREMA	
00:24:19	RED	FIS 3	ROGER	
00:26:12	MCT	RED	MORESBY RADAR GOOD MORNING MCT MAINTAINING 19,000 KEREMA AT TIME 26 AND IOKEA AT TIME 37	MCT reports on Area Radar 119.3 maintaining 19,000
00:26:24	RED	MCT	MCT MORESBY RADAR IDENTIFIED	
00:26:29	MCT	RED	MCT	
9.			COMMS JUST PRIOR TO NEAR-MISS	
00:29:32	TAH	RED	RADAR TAH AH WE HAVE TRAFFIC AHEAD ON TCAS SAME ALTITUDE COMING TOWARDS US	
00:29:39	RED	TAH	TAH ROGER THAT'S AH.... TRAFFIC IS AT 18,000	ATC unsure??
00:29:53	MCT	RED	RADAR MCT WE HAVE TRAFFIC AH AHEAD AT SAME LEVEL AS US 19,000	

Tape Transcript (Continued)

00:30:01	RED	TAH	TAH TURN RIGHT NOW IMMEDIATE RIGHT TURN	ATC unsure of TCAS RA maneuvers
00:30:12	RED	TAH	TAH MAKE IMMEDIATE RIGHT TURN	
00:30:16	TAH	RED		TAH ACKNOWLEDGES BUT UNREADABLE
00:30:20	RED	MCT	MCT MAKE IMMEDIATE RIGHT TURN	
00:30:24	MCT	RED	JUST CONFIRM YOU WANT US RIGHT TURN	
00:30:28	RED	MCT	AFFIRM, AFFIRM	
00:31:11	MCT	RED	MCT IS NOW CLEAR OF CONFLICT WE ARE AT 20,000	ATC NO RESPONSE
00:31:29	MCT	RED	RADAR MCT CLEAR OF CONFLICT AT 20,000	
00:31:33	RED	MCT	MCT	
00:31:41	MCT	RED	AND AH REQ AH DESCEND BACK TO 19000	
00:31:49	RED	MCT	MCT AND YOU WERE CLEARED AT 19,000	
00:31:54	MCT	RED	AFFIRM, AFFIRM AH DUE TRAFFIC WE HAD TCAS CLIMB SO WE HAD TO CLIMB UP TO 20,000	
00:32:04	MCT	RED	(SO WE CAN DESCEND) AND REQ WILL DESCEND NOW TO 19000	NO RESPONSE FROM ATC
00:32:17	RED	TAH	TAH AH CONFIRM YOU WERE CLEARED AT 18,000	
			AFFIRMATIVE??? TAH	BARELY READABLE ON THE REPLY.
00:33:10	TAH	RED	AH RADAR TAH JUST CONFIRM WE WERE CLEARED AT 18,000 NOT 19,000	
00:33:26	RED	TAH	TAH RADAR (OVERRIDING TAH'S 2 ND CALL TO RED	
00:33:31	RED	TAH	TAH JUST CONFIRM YOUR CLEARED LEVEL. YOU WERE SUPPOSED TO BE YOU WERE CLEARED AT 18,000	
00:33:39	TAH	RED	TAH OKAY WE COPIED 19,000 AND WE'VE BEEN CRUISING 19,000 FROM THE WORD GO.	
00:33:48	TAH	RED	AND AH U WANT US TO GO TO 18,000 NOW	
00:33:52	RED	TAH	TAH AH THAT'S OKAY AH CRZ AH 18,000 THAT'S YOUR STANDARD LEVEL AND RADAR SERVICES TERMINATED NOW STANDBY FOR TRANSFER	
00:34:01	TAH	RED	TAH ROGER THAT WE LEAVING 19,000 FOR 18,000	
00:34:26	MCT	RED	RADAR MCT REQUEST DESCEND TO CRUISE 19,000 DUE TO TCAS ALERT WE CLIMBED TO 20,000	
00:34:34	RED	MCT	MCT THANK YOU AH YOU WHEN READY DESCEND TO 10,000 QNH 1012	
00:34:41	MCT	RED	WHEN READY 10,000 1012 MCT	