ACCIDENT INVESTIGATION COMMISSION

FINAL REPORT

AIC 20 - 1002

MISSION AVIATION FELLOWSHIP

P2-MAI

Cessna 208 Caravan

Loss of control during landing at Miyanmin Airstrip

Papua New Guinea

14th February 2020

ABOUT THE AIC

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

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

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

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

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

ABOUT THE REPORT

At 17:05 local time (07:05 UTC), on 14 February 2020, Mission Aviation Fellowship notified the Papua New Guinea Accident Investigation Commission (AIC) by telephone of the accident involving a Cessna 208 Caravan aircraft, registered P2-MAI, owned and operated by Mission Aviation Fellowship PNG Limited. The AIC immediately commenced an investigation.

This *Final Report* was produced by the PNG AIC, PO Box 1709, Boroko 111, NCD, Papua New Guinea and the Commission has made it publicly available in accordance with ICAO Annex 13, Chapter 3, paragraph 6.5. It will be published on the PNG AIC website.

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

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

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

Hubert Namani, LLB
Chief Commissioner
30 December 2020

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GLOSSARY OF ABBREVIATION

AFM	:	Aircraft Flight Manual
AGL	:	Above ground level
AIC	:	Accident Investigation Commission
AMSL	:	Above mean sea level
AOC	:	Air operator certificate
MOC	:	Maintenance Organisation certificate
ATC	:	Air traffic control
ATS	:	Air traffic services
CAR	:	Civil Aviation Rule
C	:	Degree Celsius (Centigrade)
CASA PNG	:	Civil Aviation Safety Authority Papua New Guinea
CG	:	Centre of gravity
cm	:	Centimeter (s)
C of A	:	Certificate of Airworthiness
CPL	:	Commercial pilot licence
CRM	:	Crew resource management
C208	:	Cessna 208
CTM	:	Crew Training Manager
DFR	:	Daily Flight Record
ft	:	Foot (feet)
FOM	:	Flight Operations Manager
GPS	:	Global positioning system
h	:	Hour (s)
HF	:	High Frequency (3,000 to 30,000 kHz)
ICUS	:	In command under supervision
IIC	:	Investigator-in-Charge
IP	:	Instructor Pilot
kg	:	Kilogram(s)
kt	:	Knot (s)
L	:	Litre (s)
lb	:	Pound(s)
lb-ft	:	Pounds force foot
LDG	:	Landing
LOFT	:	Line-oriented flight training
LPS	:	Line Pilot Standardisation
m	:	Metre (s)
max	:	maximum
MAF PNG	:	Mission Aviation Fellowship Papua New Guinea
MAF-I	:	Mission Aviation Fellowship International
min	:	Minutes(s)
MLW	:	Maximum Landing Weight
MOC	:	Maintenance organization certificate
MTOW	:	Maximum take-off weight
NM	:	Nautical mile(s)

ICAO	:	International Civil Aviation Organization
IP	:	Instructor Pilot
No.	:	Number
NLG	:	Nose Landing Gear
OLS	:	Obstacle Limitation Surfaces
SOP	:	Standard Operating Procedure
PUI	:	Pilot Under Instruction
RAA	:	Rural Airstrip Agency
SAR	:	Search and Rescue
SOPs	:	Standard Operating Procedures
UTC	:	Coordinated Universal Time

INTRODUCTION

SYNOPSIS

On 14 February 2020, at 14:45 local time (04:45 UTC), a Cessna 208 Caravan aircraft, registered P2-MAI, owned and operated by Mission Aviation Fellowship (MAF) PNG Limited, experienced a landing roll accident after losing directional control of the aircraft at Miyanmin Airstrip, while conducting a non-scheduled passenger flight from Telefomin, Sandaun Province.

The aircraft departed Telefomin Airstrip for Miyanmin Airstrip with 11 persons on board: 2 pilots and 9 passengers.

According to evidence gathered, the aircraft touched down 36 m past the strip 11 (110°) threshold and initially rolled for about 175 m close to the centerline. It then veered left, over the next 70 metres, about 2 metres from the centerline. At this point, the aircraft lined up parallel to the centerline and travelled a further 70 m up strip. During this time, the aircraft's left main wheel entered very soft ground 10 m in from the left edge of the strip, and intermittently bogged the strip surface to a depth of 10 cm. The aircraft further veered left again, and continued to travel for about 42 m until the nose wheel also entered very soft ground 10 m from the left edge of the strip. At this point, the nose wheel together with the left main wheel (intermittently) bogged the strip surface to a depth of 30 cm as the aircraft travelled for at least 21 m before it did a final sharp left turn, causing the aircraft to tip onto its starboard side. The propeller blades struck the ground followed by the wingtip impacting the ground. The aircraft tipped forward and came to rest on the nosewheel.

During interview, the crew stated that a loud bang was heard, approximately 1-2 seconds before the aircraft came to a stop.

All the passengers and crew evacuated the aircraft without injuries.

1 FACTUAL INFORMATION

1.1 History of the flight

On 14 February 2020, at 14:45 local time (04:45 UTC[1]), a Cessna 208 Caravan single engine aircraft, registered P2-MAI, owned and operated by Mission Aviation Fellowship (MAF) PNG Limited, experienced a landing roll accident after directional control of the aircraft was lost at Miyanmin Airstrip, while conducting a non-scheduled passenger commercial air transport flight from Telefomin, Sandaun Province.

Figure 1: P2-MAI flight and accident location

The pilot flying was occupying the left seat and was Pilot Under Instruction (PUI). The Instructor Pilot (IP) was occupying the right seat and was supervising the PUI.

The recorded Global Positioning System (GPS)[2] data showed that the aircraft entered the Miyanmin area at around 14:40. The aircraft tracked towards the airstrip at about 1,200 ft Above ground level (AGL)[3] and crossed overhead for an inspection of the surface and wind conditions.

The flight crew stated that the area was clear of cloud when they arrived. They reported that when they arrived overhead, they did not observe signs of standing water or obstacles on the strip surface, the grass appeared cut, and the windsock showed that the wind at the surface was calm.

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 is UTC +10 hours.
2. The recorded GPS data was taken from the Garmin G1000 data file for P2-MAI flight from Telefomin to Miyanmin, 14 February 2020. The G1000 is an integrated flight instrument system typically composed of two display units, one serving as a primary flight display, and one as a multi-function display. Manufactured by Garmin, it serves as a replacement for most conventional flight instruments and avionics.
3. Above ground level (AGL). All heights hereon are on AGL and are referenced to the Miyanmin Airstrip threshold elevation of 2,500 ft taken from the Airstrip Guide, 2012.

According to the recorded GPS data, the aircraft entered the Miyanmin area at around 14:40. and crossed overhead for an inspection of the surface and wind conditions then joined downwind, descending from 1,200 ft above ground level (AGL) to 1,000 ft AGL before turning onto base. The aircraft began descending as it turned to line up on the final approach profile. The data showed that there was a tailwind component of 5-15 kt on base turn. The aircraft overshot the turn onto final approach,1.6 nm from the touchdown point at 900 ft. The aircraft subsequently turned left and tracked to establish on the centerline. The aircraft lined up on the centerline about 1.3 nm from the touchdown point, at a height of about 500 ft and continued the approach and landed at 14:45 with an airspeed of 73 kt (77 kt ground speed).

According to evidence gathered, the aircraft touched down 36 m beyond the strip 11 threshold and initially rolled for about 175 m close to the centerline. It then veered left, over the next 70 metres, about 2 metres from the centreline. At this point, the aircraft lined up parallel to the centerline and travelled a further 70 m up strip. During this time, the aircraft's left main wheel entered into a very soft ground area, 10 m in from the left edge of the strip, and intermittently bogged the strip surface to a depth of 10 cm. The aircraft further veered left again, and continued to travel for about 42 m until the nose wheel also entered very soft ground 10 m from the left edge of the strip. At this point, the nose wheel together with the left main wheel (intermittently) bogged the strip surface to a depth of 30 cm as the aircraft travelled for at least 21 m before it did a final sharp left turn causing the aircraft to tip onto its right side. The propeller blades struck the ground followed by the wingtip impacting the ground. The aircraft tipped forward and came to rest on the nosewheel.

During interview, the crew stated that a loud bang was heard, approximately 1-2 seconds before the aircraft came to a stop

All the passengers and crew evacuated the aircraft without injuries.

1.2 Injuries to persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	2	9	11	Not applicable
TOTAL	2	9	11	-

Table 1:Injuries to persons

1.3 Damage to aircraft

The aircraft sustained substantial damage to the nose landing gear (NLG), propeller blades and the outboard section of the right wing.

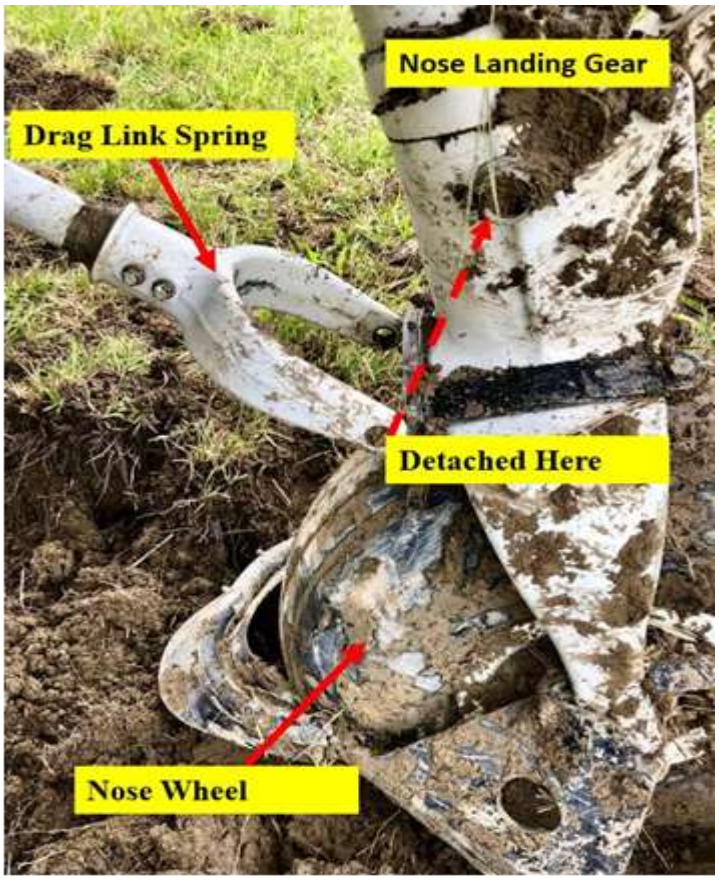


Figure 2:Damage to nose landing gear

Figure 3: Damage to propeller blades

Figure 4: Damage to right wing

1.4 Other damage

No damage to property or the environment was observed or reported.

1.5 Personnel information

1.5.1 Pilot Under Instruction (PUI)

Age	: 38 years
Gender	: Male
Nationality	: British
Type of license	: CPL (Aeroplane)
Type rating	: Single Engine Aeroplane (Land) <5700Kg MTOW, C208
Total flying time	: 3,208.67 h
Total hours on type (C208)	: 30.83 h
Total in command	: 2,978.92 h
Total last 90 days	: 11.42 h
Total on type last 90 days	: 11.42 h
Total last 7 days	: 7 h
Total on type last 7 days	: 7 h
Total hours last 24 hours	: 3.1 h
Medical Class	: One
Valid to	: 28/07/2020
Medical Limitation	: Corrective lenses worn

The PUI's training records reviewed by the AIC indicated that he had received the standard company training for the aircraft type. This included ground, simulator and flight training. The pilot also completed his Base Training and Base Check. The PUI had also completed his licence conversion and type rating check flight.

At the time of the accident, the PUI was undergoing Line-Oriented Flight Training (LOFT).

1.5.2 Instructor Pilot (IP)

Age	: 60 years
Gender	: Male
Nationality	: British
Type of license	: CPL (Aeroplane)
Type rating	: Single Engine Aeroplane (Land) <5700Kg MTOW, Multi Engine Aeroplane (Land) - DHC6
Total flying time	: 7,367.1 h
Total on type (C208)	: 1,722.2 h
Total time in command	: 5,766.7 h
Total last 90 days	: 98.7 h
Total in command last 90 days	: 98.7 h
Total hours last 7 days	: 19 h
Total on type last 7 days	: 19 h
Total on type last 24 hours	: 7 h
Total in command last 24 hours	: 7 h
Total Instruction	: 662 h
Medical class	: One
Valid to	: 28/07/2020
Medical limitation	: Distance Reading Correction

The IP had an Instrument of Authorisation (IOA) to carry out functions of a flight instructor in accordance with PNG Civil Aviation Rule (CAR) Part 61.305 (d) 'Category D Flight Instructor'. The IOA authorises the IP to conduct the following:

- Line Training-Captains
- Line Training-Training Captains
- Base Training-Training Captains

1.6 Aircraft Information

1.6.1 Aircraft data

Aircraft manufacturer	: Textron Aviation Inc
Model	: Cessna 208 Caravan
Serial number	: 20800613
Date of manufacture	: 24 August 2018
Number of Engines	: 1
Nationality	: Papua New Guinea
Registration	: P2-MAI
Name of the owner	: Mission Aviation Fellowship PNG Limited
Name of the operator	: Mission Aviation Fellowship PNG Limited

Certificate of Airworthiness Number	: 412
Certificate of Airworthiness issued	: 6 February 2019
Period of Validity	: Non-Terminating
Certificate of Registration Number	: 412
Certificate of Registration issued	: 14 January 2019
Period of Validity	: Perpetual
Total Airframe hours	: 566.4 h
Total Airframe cycles	: 1,069

1.6.2 Engine data

Engine type	: Turbo-propeller
Manufacturer	: Pratt and Whitney Canada
Model	: PT6A-114A
Serial number	: PCE-PC2271
Total Engine Hours	: 566.4 h

1.6.3 Propeller data

Manufacturer	: McCauley
Model	: 3GFR34C703-B
Serial number	: 951897
Total Propeller hours since overhaul	: 816.6 h

1.6.4 Weight and Balance

The weight and center of gravity of the aircraft for the flight was considered during the investigation.

P2-MAI has the *AeroAcoustics APE STOL* [4] *payload extender modification*. The Operator's SOP Manual, Section 6.1 (c) states that their C208 aircraft which have this modification have a maximum takeoff weight and landing weight of 3,793 kg.

The Daily Flight Record (DFR) showed that the aircraft departed from Telefomin with a take-off weight of 3,684 kg. The aircraft landed at Miyanmin Airstrip with a landing weight of 3,651 kg.

The investigation determined that the aircraft was within its weight and centre of gravity limits.

[4] *AeroAcoustics APE STOL greatly enhances the payload capability and operational flexibility of the Caravan. The improved performance results in the significant advantage of the APE STOL for Caravan operations.*

1.6.5 Fuel

According to the Daily Flight Record (DFR), the fuel that was onboard the aircraft after the accident was 571 L.

The pilot indicated that there were no engine abnormalities during the flight. This indicated that fuel was not a contributing factor to this accident.

1.6.6 Aircraft serviceability and Airworthiness

A review of the maintenance documentation of the aircraft provided by MAF to the AIC in the context of the investigation did not identify airworthiness related issues that could have caused or contributed to the occurrence.

The last maintenance record showed that the aircraft was serviceable for the flight on the day of the accident.

1.7 Meteorological information

1.7.1 Weather Forecast

The Area Forecast for the Tabubil area, in which Miyanmin Airstrip is located, was provided to the investigation by PNG National Weather Service. The forecast was valid from 09:00 to 21:00 on 14 February 2020 as follows:

Wind : 7,000 ft, 90˚/10 kt
10,000 ft, 80˚/10 kt

Visibility : 500 m with fog, 3,000 m with thunderstorms and rain and 4,000 m with showers and rain and/or rain and drizzles (four-hourly interval from 09:00 to 21:00 on 14 February 2020).

Cloud :

1,800 ft to 45,000 ft	- Isolated cumulonimbus[5] clouds
500 ft to 3,000 ft	- Broken stratus[6] clouds with intermittent precipitation
1,500 ft to 10,000 ft	- Scattered cumulous[7] clouds with broken showers
3,000 ft to 8,000 ft	- Scattered stratocumulus[8] clouds at base with broken rain and drizzle
10,000 ft to 18,000 ft	- Scattered altocumulus[9] clouds at base

1.7.2 Pilot Observed Weather

The crew indicated that when they arrived in the Miyanmin area, they observed that the area was clear of clouds and the wind was calm.

[5] Cumulonimbus is a dense, towering vertical cloud, forming from water vapor carried by powerful upward air currents. If observed during a storm, these clouds may be referred to as thunderheads. Cumulonimbus can form alone, in clusters, or along cold front squall lines.
[6] Stratus clouds are low-level clouds characterized by horizontal layering with a uniform base, as opposed to convective or cumuliform clouds that are formed by rising thermals. More specifically, the term *stratus* is used to describe flat, hazy, featureless clouds at low altitudes varying in colour from dark gray to nearly white.
[7] Cumulus clouds are puffy clouds that sometimes look like pieces of floating cotton. The base of each cloud is often flat and may be only 1000 meters (3300 feet) above the ground. The top of the cloud has rounded towers.
[8] Stratocumulus clouds are low-level clumps or patches of cloud varying in colour from bright white to dark grey. They are the most common clouds on earth recognised by their well-defined bases, with some parts often darker than others. They usually have gaps between them, but they can also be joined together.
[9] Altocumulus is a middle-altitude cloud genus that belongs mainly to the stratocumuli form physical category characterized by globular masses or rolls in layers or patches, the individual elements being larger and darker than those of cirrocumulus and smaller than those of stratocumulus.

1.8 Aids to navigation

Ground-based navigation aids, onboard navigation aids, aerodrome visual ground aids and their serviceability were not a factor in this occurrence.

1.9 Communications

All communications between the crew of P2-MAI and Madang Flight Service was on High Frequency (HF).
The recorded flight progress strip data (See Appendix A) revealed that the pilot reported over Miyanmin circuit area at 14:41, and made a ground call at 14:56.

1.10 Aerodrome Information

Miyanmin Airstrip is located in the Sandaun Province. It is a one-way landing strip with 11 (110˚) landing direction and 29 (290˚) take-off direction.

On 10 June 2020, the Miyanmin Airstrip was jointly surveyed by the Rural Airstrip Agency (RAA) and MAF PNG Limited.

Airstrip name	: Miyanmin Airstrip
ICAO Code	: AYIY
IATA Code	: MPX
District and Province	: Telefomin, Sandaun Province
Airstrip type	: One-way
Latitude	: 4°54'11.00"S
Longitude	: 141°37'15.00"E
Strip Elevation (amsl)	: 2,500 ft
Strip length	: 642 m
Strip Width	: 25 m
Average Overall Slope	: 7.8 %
Surface cover	: Short grass
Surface hardness	: Medium
Soil type	: Fine-grain soil (silt, clay)
Soil moisture	: Wet
Surface roughness	: Smooth

1.10.1 Miyanmin Airstrip Survey Data

The last survey that was conducted for Miyanmin Airstrip was by MAF on 9 March 2011, which pre-dated the establishment of Rural Airstrip Agency (RAA).

On 10 June 2020, a new survey was conducted at Miyanmin Airstrip jointly by RAA and MAF PNG with reference to the *Advisory Circular* (AC) *139*-6 *Aerodrome design, Aeroplanes at or Below 5700 kg MCTOW* and MAF international standards. The results of the survey showed that the strip centerline was quite firm, but about 5 m outward from the centerline was very soft, down to a depth of about 20-30 cm.

The camber of transverse slope[10] measured during the survey was against MAF International Standards, which should be limited to a maximum of 3% (1.7˚) in order to minimise erosion.

[10]Camber is a geometric feature of pavement surfaces: the transverse slope with respect to the horizon. It provides a drainage gradient so that water will run off the surface to a drainage system such as a gutter or ditch.

A camber of transverse slope that is 3˚ or 4˚ from the centerline to the sides is classified by MAF as a risk. The camber of transverse slope in most areas surveyed was 0˚ to 2˚ of camber across the width of the strip.

The recent survey results show that the camber of transverse slope at Miyanmin Airstrip is 4˚, which is 2.3˚ more than the recommended 1.7˚. The survey also identified that the camber of 4˚ was within 5 m outward from the centerline and levels off to the drainage along the sides of the strip (*See Appendices 5.2 and 5.3).*

From the findings identified during the recent survey, a formal risk assessment was conducted by the Operator and the local community was advised to remove about 20-30 cm of the entire strip surface in order to get down to the firm sub-base (gravel underneath).

Miyanmin Airstrip remains closed for an indefinite period for MAF Operations (See Appendix 5.5 and 5.6).

1.11 Flight recorders

The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), neither were they required by PNG Civil Aviation Rules.

1.11.1 Other Electronic Data Recording Device

1.11.1.1 *Garmin G1000*

The aircraft was fitted with a Garmin G1000 integrated avionics system.

The G1000 is capable of recording the primary instrument display data and engine parameters at an interval of 1 second on a flight data log memory card.

The recorded data of the accident flight was downloaded from the memory by the Operator and provided to the AIC. Pertinent data from the recording was used to generate a graphical plot which consisted of the downwind, base, final and after touchdown (See Figure 5).

About 2 seconds after touch down, the torque parameter began to increase and subsequently developed a peak value of 591 lb-ft.

An increase in torque was an indication of the application of the reverse thrust. About the same time the torque was increasing, the heading began to fluctuate which was an indication of the aircraft commencing to lose directional control.

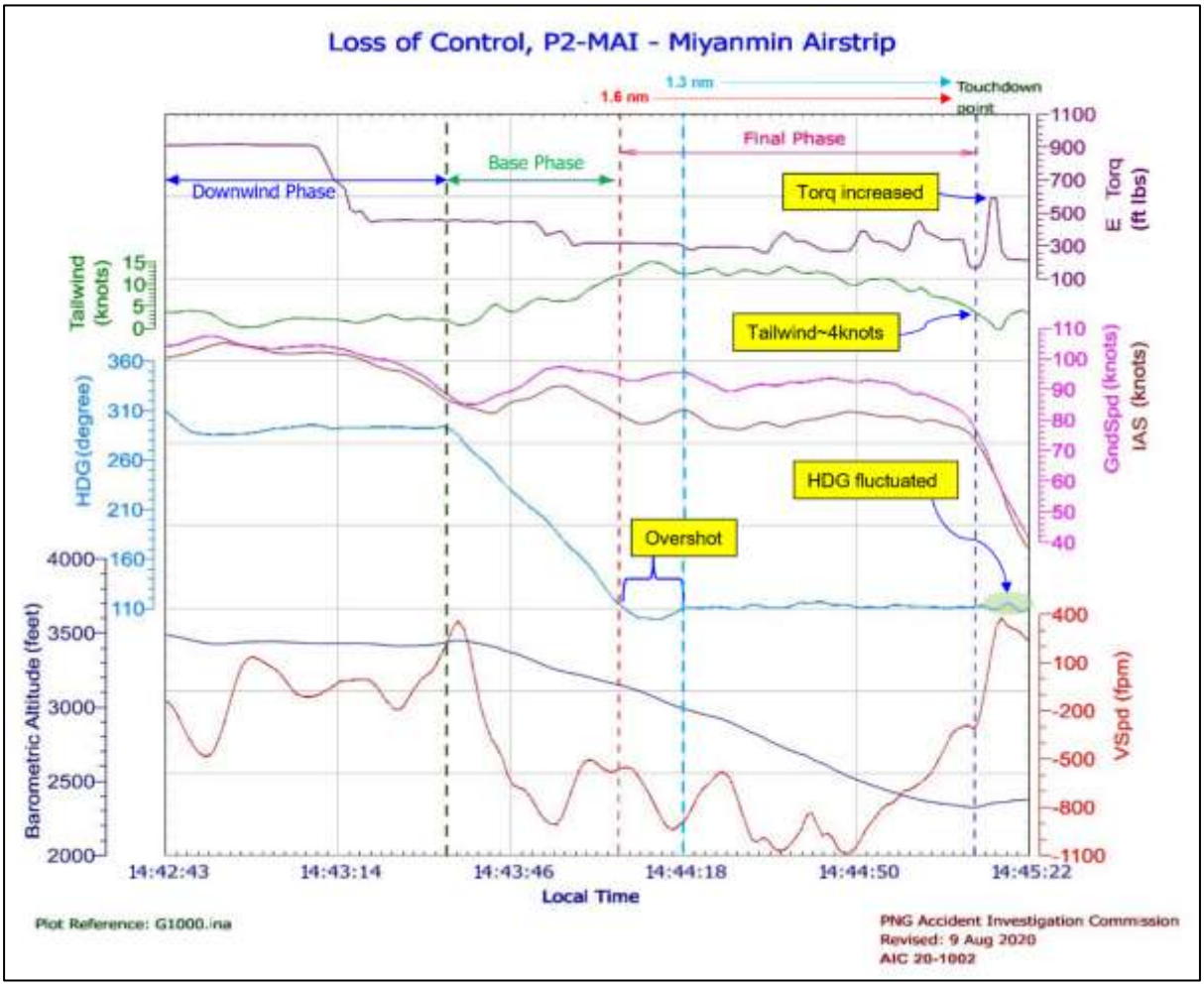


Figure 5: G1000 recorded parameters data plot of the accident flight.

1.12 Wreckage and impact information

The aircraft tyre markings diagrams (See Figures 6,7,8) were used to establish and describe the aircraft's landing roll at Miyanmin Airstrip.

The aircraft touched down 36 m beyond the threshold and initially rolled for about 175 m close to the centerline. The aircraft then veered 2 m left of the centerline, travelling a distance of 70 m up strip. At this point, the aircraft lined up parallel to the centerline and travelled a further 70 m up strip. During this time, the aircraft's left main wheel entered relatively soft surface and continued intermittently bogging to depths measured to be about 10 cm.

The tyre markings show that the aircraft veered left again, and continued rolling for about 42 m until the nose wheel also began entering the soft ground. At this point, the nose wheel also began burrowing the surface. The aircraft travelled another 21 m before entering a sharp left turn, causing it tip onto its right side.

The nose landing gear spring attachment bolts sheared off as the nose wheel bogged deep into the ground with momentum resulting in the drag link spring getting detached from the NLG (See Figure 2).

It was evident from the damage to the propeller blades that the propeller was being powered and that the blades were in the idle to beta range when they struck the surface, followed by the right wing impacting the ground.

All three propeller blades were bent towards the trailing edge of each blade (See Figure 3).

The damage on the propeller blades indicated that there was power at the time of impact.

The outboard section of the right wing impacted the ground and was bent upwards when the aircraft tipped to its starboard side (See Figure 4).

Figure 6: Overview of landing roll track-Full length *(Source MAF PNG)*

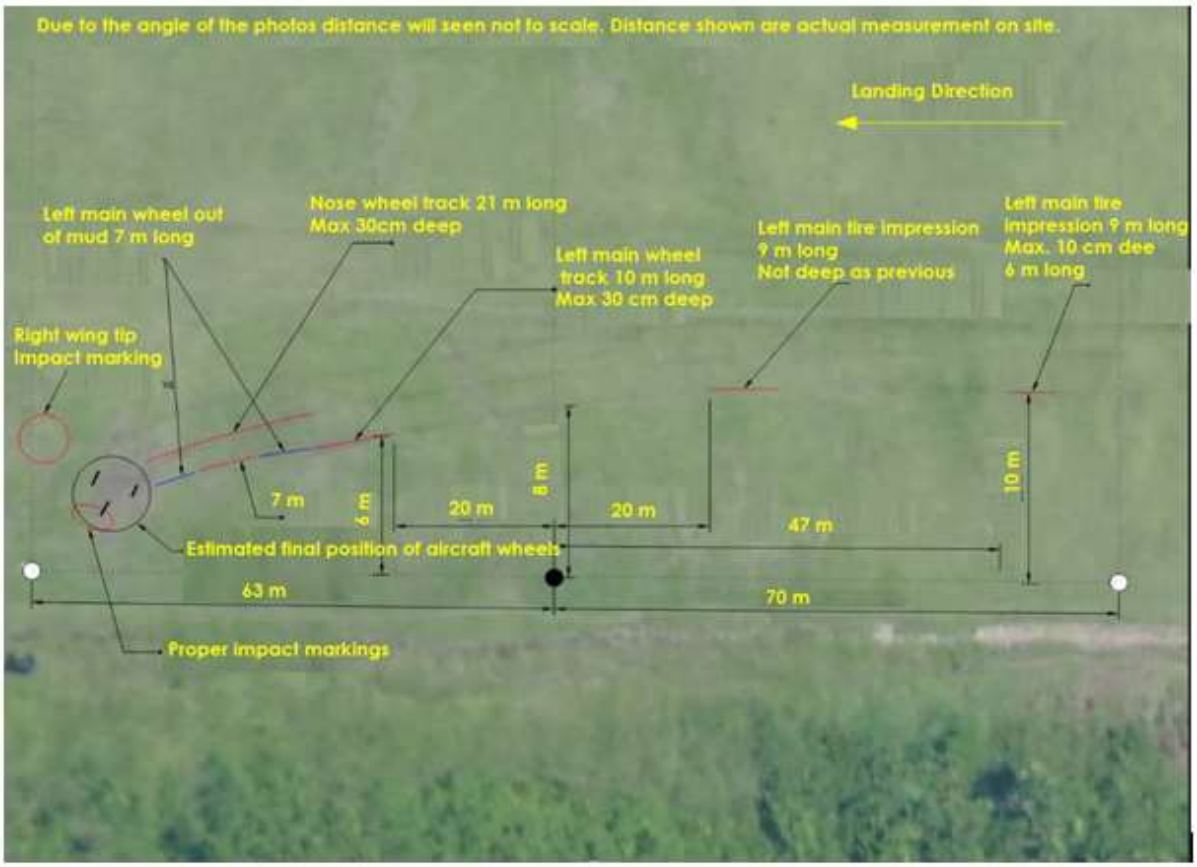


Figure 7: Overview of landing roll track-Mid length *(Source MAF PNG)*

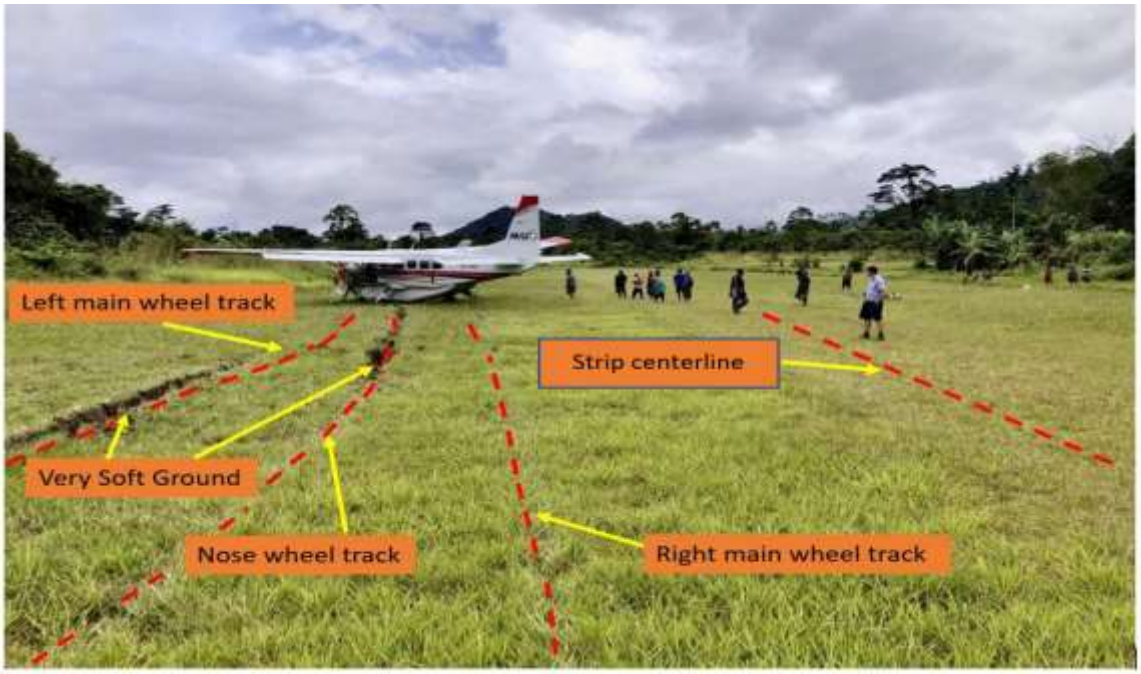


Figure 8: Tyre and impact markings on the runway

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

After the aircraft came to its final resting position, the IP shut down the engine and exited the aircraft to open the main passenger door to allow the passengers to disembark.

According to the crew statements, after the passengers and crew had disembarked the aircraft, the IP turned on the aircraft battery power and sent a message to the Operator using the onboard V2 Track messaging system. The IP then sent a text message via phone to the Manager Flight Operations (MFO) requesting someone to come up on the Radio, which they did. The IP subsequently called the Operator on the aircraft's HF radio.

Air Traffic Services (ATS) advised AIC that there were no journal entries for P2-MAI as the Operator had advised ATS that the aircraft was unserviceable, but did not notify that the aircraft had experienced an accident.

1.16 Tests and research

There was no test and research conducted in this investigation.

1.17 Organisational and management information

1.17.1 Operator

Mission Aviation Fellowship is a trading name for MAF PNG Limited, which is a subsidiary of Mission Aviation Fellowship International. The Company Headquarters is in Mount Hagen.

MAF PNG Limited holds an Air Operator's Certificate (AOC) 119/003 issued under CAR 119 for commercial air operations in accordance with PNG CAR Part 125 and Part 135.

The Operator also holds a Maintenance Organisation Certificate (MOC) 145/003 and Part 141 Aviation Training Certificate 141/005.

1.17.2 Pilot Training and Checking Manual

The *MAF Pilot Training and Checking Manual* describes the six different phases (specific to SET type) of pilot *Flight Training Courses* under section *4.1. Country, Area, Route and Aerodrome Training*. These phases in order of progression are as follows:

1. Operations Orientation

2. Right Hand Seat Area, Route and Aerodrome Familiarisation

3. Base Training

4. Line Oriented Flight Training

5. Supervised Experience

6. Restricted Solo Operations

According to the *MAF Pilot Training and Checking Manual*, the LOFT is part of the training programme carried out during normal operations and is designed to develop the pilot's competence and confidence in safely managing the aircraft, its passengers, and all associated operational requirements. This includes specific aspects central to the respective crew role assigned to the pilot. The PUI was undergoing phase 4 of the training at the time of the accident.

A secondary aim of the LOFT training is to begin area, route and aerodrome training. Emphasis is given to enhancing the pilot's non-technical skills and developing effective Threat and Error Management (TEM) practices.

According to the training records, the PUI's LOFT commenced on 11 February 2020 and he was on his fourth day, undergoing route and aerodrome training with the IP when the accident occurred.

1.17.3 Standard Operating Procedures (SOP)

1.17.1.1 Use of reverse thrust

According to *MAF SOP – C208*, Section *2.21.3 Short Field Landing, Note 1*. (see Appendix C, 5.3) states:

Reverse thrust is permitted for all landings, but should be used only for airstrips where a minimum landing distance is required. Use of reverse thrust on wet or slippery runways

may result in directional control difficulties. If reverse thrust is used, it should be deselected once ground speed reduces below 25 kt, to avoid engine FOD.

During the investigation it was established that the pilot used reverse thrust on landing for practice and familiarisation, in the context of training, although it was not required.

1.17.4 Operational Hazard Identification and Reporting System

According to the Operator's Operations Manual, Part C, MAF Airstrip charts are produced by an MAF owned software that uses a synchronised online database. The software is installed as an application on the electronic flight bags (EFB)[11] which are carried at all times while pilots are flying. Where an airstrip has changes to its conditions, the Flight Operations Manager (FOM) will make amendments to the database which will be immediately available to pilots when they synchronise the software on their EFBs. MAF Pilots are required to synchronise their EFB's before their first flight every day to ensure that they have the current MAF Airstrip Charts.

Temporary amendments to airstrip operations are made by Company Internal NOTAMs[12] and by PNG Air Services NOTAMs.

The Operations Manual, Part C, also states that all MAF pilots have the authority to submit NOTAMs to the FOM for inclusion in the internal NOTAM list. Internal NOTAMs are issued by the FOM to provide Company pilots with safety information not normally provided by regulatory authority NOTAMs.

According to the Operator, all of these reporting systems have been used in the past to raise awareness, but few pilots use them despite the systems becoming very simple and accessible.

The Operator further stated that after the accident, one of the company pilots had mentioned that he had experienced a bogging incident on the left side of the strip at Miyanmin during one of his flights in 2018. MAF did not have any records of the bogging event on record to indicate that it was reported.

1.18 Additional information

1.18.1 Ground roll distance

The *Cessna 208 AFM Performance Chart* for *Landing Distance* for *Short Field* with *cargo pod installed* was used to estimate the required landing roll of the aircraft at Miyanmin Airstrip during the accident flight (See Appendix E).

The chart notes that:

- *Increase distances 10% for each 11 knots headwind. For operations with tailwinds up 10 knots, increase distances by 10% for each 2.5 knots.*
- *For operation on a dry, grass runway, increase distances by 40% of the ground roll figure.*
- *Use of maximum reverse thrust after touchdown reduces ground roll by approximately 10%.*

[11] The EFB is provided to assist the pilot and crew with their operational duties it shall not be used as primary means of displaying flight data and is not designed as a certified navigational tool e.g. as a replacement for on board GPS systems. The EFB may be used to display maps and charts to aid and enhance situational awareness, to consult company or manufacturer documentation and to enable instrument approach procedures to be flown.

[12] A **notice to airmen** (**NOTAM**) is a notice filed with an aviation authority to alert aircraft pilots of potential hazards along a flight route or at a location that could affect the safety of the flight.

Using the standard provisions of the chart, an estimated landing roll of 375.63 m was established. Miyanmin Airstrip has a length of 642 m.

1.18.2 Reverse Thrust

Thrust reversal, also called reverse thrust, is the temporary diversion of an aircraft engine's thrust so that it acts against the forward travel of the aircraft, providing deceleration. Propeller-driven aircraft generate reverse thrust by changing the angle of their controllable-pitch propellers so that the propellers direct their thrust forward. This reverse thrust feature becomes available with the development of controllable-pitch propellers, which change the angle of the propeller blades to make efficient use of engine power over a wide range of conditions. Reverse thrust is created when the propeller pitch angle is reduced from fine to negative. This is called the beta position.

When reverse thrust is applied, the propeller blade pitch angle moves from its normal forward position to the opposite side.

The beta range of operation consists of power lever positions from flight idle to maximum reverse. When the blade angle passes the maximum flat position, negative pitch is established which means reverse thrust is being applied.

Unlike fixed shaft or constant speed engines, when the split shaft PT6 engine power lever is moved aft, past the negative 5° propeller blade angle position, the pitch change starts to be accompanied by a progressive engine RPM increase. The maximum engine RPM 85% is reached when blade angle reaches around negative 11°.

For the C208 with the PT6 engine, the clockwise rotation of the engine and propeller would cause a counter-clockwise roll tendency of the aircraft.

1.19 Useful or effective investigation

The investigation was conducted in accordance with the *PNG Civil Aviation Act 2000 (As Amended)* and in accordance with the *Standards and Recommended Practices of Annex 13* to the *Convention on International Civil Aviation.*

2 ANALYSIS

2.1 General

The analysis of this report will discuss the relevant issues and circumstances resulting in the P2-MAI aircraft landing roll accident at Miyanmin Airstrip, Sandaun Province.

The investigation determined that there were no issues with the aircraft and all systems were generally operating normally. The analysis will therefore focus on the following issues but not necessarily under separate headings.

- Flight Operations
- Organisational

2.2 Flight operations

The investigation determined that the length of the Miyanmin airstrip was sufficient to cater for the aircraft's landing roll distance without the need to apply reverse thrust. However, the investigation found that the PUI was undergoing training and used reverse thrust for practice and familiarisation.

The PUI was also relatively new to the C208 aircraft. His inability to get the aircraft back onto centerline may have been due to a number of factors: PUI's limited experience level on the aircraft type, low proficiency level in the use of reverse thrust during landing rolls, soft strip surface and soil condition, misapplication of reverse thrust and ineffectiveness of the rudder.

On the ground, when RPM increased due to the application of engine power to use reverse thrust, the counter-clockwise tendency resulting from the torque generated due to the increase in engine/propeller energy, created load on the left mainwheel and equally unloaded on the right main wheel. This difference in frictional force created by the main wheels causes the aircraft to yaw left.

Considering the PUI statement, the action of applying rudder to counteract the effect of left yaw due to the torque effect of using reverse thrust and attempt to regain the centreline was not effective as the left main wheel was bogging intermittently during the landing roll in the soft ground. The investigation found the actions conducted by the PUI were not conducted in a timely manner to assist him in remaining on the centerline during the landing roll, and were ineffective to regain it when it was lost.

Nor the PUI or the IP were aware of the softened surface on the left of the strip. For this reason, no special briefing or anticipation to the potential effects of reverse thrust were considered by the flight crew, which explains why the IP did not take over control of the aircraft from the PUI when the aircraft deviated.

2.3 Organisational

2.3.1 Operational Hazard Identification and Reporting System

The flight crew did not identify any hazard related to the surface conditions of the airstrip, during the first landing of that day at Miyanmin, nor when the PUI flew overhead the strip, before the landing in which the accident occurred.

Furthermore, hazards associated to Miyanmin strip surface conditions were never identified and reported through the Operator's internal hazard reporting systems. Therefore, the airstrip chart used by the Operator for Miyanmin airstrip did not consider such conditions, which contributed to the lack of awareness of the crew in the context of the accident.

The Operator stated that only a few company pilots use the hazard/occurrence reporting systems to record identified hazards and occurrences. This indicates that the Safety Promotion activities that should be conducted in the context of the Safety Management System of the Operator were not effective enough to develop a strong safety reporting culture of the pilots.

3 CONCLUSIONS

3.1 Findings

3.1.1 Aircraft

a) The aircraft had a valid *Certificate of Airworthiness.*

b) The aircraft was certified as being airworthy when dispatched for the flight.

c) The mass and the centre of gravity of the aircraft were not factors in this accident.

d) There was no evidence of any defect or malfunction in the aircraft that could have contributed to the accident.

3.1.2 Crew

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

b) The crew were not aware of the Miyanmin Airstrip surface and soil conditions on the sides of the strip centerline.

3.1.3 Flight operations

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

b) Communication between the flight crew and relevant ATC units was on HF.

c) During base to final approach the pilot encountered tailwind of 5-12 knots.

d) The aircraft overshot the turn onto final approach,1.6 nm from the touchdown point at 900 ft AGL.

e) The PUI applied reverse thrust on landing and aircraft veered left of the centerline due to the effect of torque.

f) As the aircraft veered off, it entered into a softened area of the strip surface.

g) The pilot applied right rudder in an attempt to counteract the effect of torque and regain the centerline, without achieving it.

h) The aircraft got bogged in soft soil, causing the nose landing gear to collapse and the propellers and right wing to impact the ground.

3.1.4 Operator

a) At the time of the accident, the Miyanmin airstrip did not conform with MAFI and AC 139-6 standards.

b) The Operator had no record of hazards related to the surface conditions of Miyanmin airstrip, before the accident.

3.1.5 Rural Airstrip Agency (RAA)

a) The survey conducted by RAA and MAF PNG on Miyanmin Airstrip, identified a soft top layer (20 -30 cm) about 5 m outward from the centerline.

3.1.6 Flight recorders

a) The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR); neither was it required by regulation.

b) The aircraft was fitted with a Garmin G1000 integrated avionics system and V2 Tracking system.

3.1.7 Medical

a) There was no evidence that incapacitation or physiological factors affected the flight crew performance.

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

3.1.8 Survivability

a) The evacuation of passengers was conducted by the IP.

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

c) The IP called the Operator to advise them of the accident.

d) The Operator advised CASA PNG and AIC of the accident.

3.2 Causes [Contributing factors]

On landing, the PUI applied reverse thrust and the aircraft veered left of the centerline. Rudder was applied to get the aircraft back onto centreline, however, the rudder was not effective to counter the effect of reverse thrust as the left wheel entered in a softened area of the strip surface, which resulted in the aircraft being unable to regain the centerline as the landing roll progressed.

The PUI did not effectively manage the effect of torque to maintain centerline during the landing roll.

The PUI's limited experience level on the aircraft type, low proficiency level in the use of reverse thrust during landing rolls, soft strip surface and soil condition were contributing factors of the accident.

3.3 Other factors

The investigation found non-contributory safety deficiencies. These are addressed in the Factual and Safety recommendations.

4 RECOMMENDATIONS

4.1 Recommendations

As a result of the investigation into the accident involving a Cessna 208 Caravan aircraft registered P2-MAI at Miyanmin Airstrip, Sandaun Province, Papua New Guinea on the 14 February 2020, the PNG Accident Investigation Commission issued the following recommendations to address concerns identified in this report.

4.1.1 Recommendation number AIC 20-R28/20-1002 to MAF PNG Limited

Date issued: 29 September 2020

Pilot Safety Reporting culture

The PNG Accident Investigation Commission recommends that MAF PNG Limited, should review the Safety Promotion component of its Safety Management System, to ensure effective actions are taken to improve pilot's safety reporting culture.

Action requested

The AIC requests that MAF PNG Limited note recommendation AIC 20-R28/20-1002, and provide a response to the AIC within 90 days, but no later than 28 December 2020, and explain including evidence how MAF PNG has addressed the safety deficiency identified in the safety recommendation.

4.1.2 Recommendation number AIC 20-R29/20-1002 to MAF PNG Limited

Date issued: 29 September 2020

Reverse thrust.

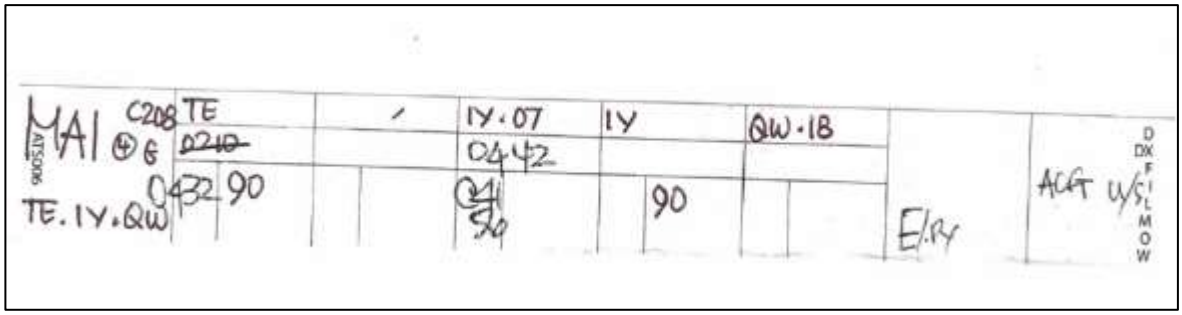
The PNG Accident Investigation Commission (AIC) recommends that MAF PNG Limited should ensure training programs include specific procedures for the use of reverse thrust, aligned with the framework of MAF SOP – C208, Section 2.21.3 Short Field Landing, Note 1.

Action requested

The AIC requests that MAF PNG Limited note recommendation AIC 20-R29/20-1002, and provide a response to the AIC within 90 days, but no later than 28 December 2020, and explain including evidence how MAF PNG has addressed the safety deficiency identified in the safety recommendation.

5 APPENDICES

5.1 Appendix A: FIS Flight Strip for the accident flight



5.2 Appendix B: RAA Miyanmin Survey Report

Airstrip name:	Miyanmin				
ICAO code:	AYIY		Date Surveyed:	10/6/2020	
Province:	West Sepik		Airstrip type:	☒ one-way ☐ two-way	
Take-off direction:	291				
Co-ordinates *(at parking bay)*:	S 04° 54.243′		Runway width:	10	m
	E 141° 37.392′		Runway strip width:	25	m
Elevation *(at parking bay)*:	2597	ft	Runway length:	642	m
Elevation *(at threshold)*:	2438	ft	Average overall slope:	7.8	%

Obstacle Limitation Surfaces (OLS)					
Transitional side surface (both sides) (AC139-6)					
20% side slope, clear for 2m above the runway strip:	☒ Yes ☐ No/Non-serviceable[1]				
Additional Transitional side surface comments:					
Take-off/ Approach Surface (AC139-6)			For two-way airstrips only (AC139-6)		
5% up from the horizontal, 5% side splay (left & right), clear for 600m horizontally:	☒ Yes ☐ No/Non-serviceable[1]		5% up from the horizontal, 5% side splay (left & right), clear for 600m horizontally:	☐ Yes ☐ No/Non-serviceable[1]	
Additional 160m clearway			For two-way airstrips only		
At same grade as airstrip, clear for 160m, includes transitional side surface:	☐ Yes ☒ No		At same grade as airstrip, clear for 160m, including transitional side surface:	☐ Yes ☐ No	
160m from threshold, 5% up, 5% side splay (L&R), clear for 600m:	☐ Yes ☒ No		160m from threshold, 5% up, 5% side splay (L&R), clear for 600m:	☐ Yes ☐ No	
Critical obstacles (Take-off/Approach Surface and Clearway)					
Description:	Distance to obstacle (m):	Angle (%) above horizontal:	Description:	Distance to obstacle (m):	Angle (%) above horizontal:
Small leaf RHS	99	1.7			
Bushes fore	30	-1.7			
Tall banana tree	64	3.4			
Additional OLS or clearway comments:	Also a Buai palm (130m at 1.7%), small banana tree (90m at -1.7%), and Large green bush (63m at -1.7%)				

SURFACE AND SUBSURFACE STRENGTH ASSESSMENT

Airstrip:	Miyanmin
Date of Testing:	10/6/20
Number of Tests Completed:	50 tests. 27 tests in the regular spacing, and an additional 23 tests at two different areas associated with the P2-MAI accident.
Test Locations:	• 24 tests along the centreline and in the runway strips. Tests in the runway strips were completed at 8m offset from the centre. • 3 tests within the parking bay • 9 tests within Area 1; on the left side of the airstrip between 370m and 390m. P2-MAI was on the left of centre at this location and left ruts. • 14 tests within area 2; on the left side of the airstrip between 420m and 470m. This is where P2-MAI stopped. All the test locations and test results are shown on Figures 1 and 2.
Soil Type:	Fine-grained soils overlying gravel
Surface Strength comment:	The surface 100mm generally comprises fine-grained soil with good grass cover. In areas it is soft as evidenced by the presence of ruts from aircraft wheels, and in general it got softer further from the centreline. There were ruts up to 150mm deep in the centre between 580m and 600m, and more ruts at the P2-MAI accident site on the left side; these have been backfilled with gravel since. At the time of the survey the surface strength was assessed as medium with soft patches.
Subsurface Comment:	All test locations reached refusal before the 1.2m test depth, likely on the underlying gravel. - Out of the 50 tests the minimum refusal depth was 0.2m (10 test results); the maximum 0.9m (1 test result); and the median refusal depth 0.45m. 23 out of 27 test results of the tests completed in the regular spacing at 60m intervals and in the parking bay were adequate. 3 test results (at locations 0m right side, 540m left side, and one in the parking bay) were weak, and 1 test location (420m left side) was inadequate. All tests within the centre are adequate. The test results within Area 1 are generally adequate, however, the line furthest from the centre line have two tests weak test results (T3 and T6) and one test inadequate (T9). All tests refused with 0.8m depth, and typically before 0.4m.

5.3 Appendix C: MAF PNG Miyanmin Airstrip Survey Report

MAF PNG Airstrip Survey Report Form *(ver 1.11 200525)*

Survey Report / Field Sheet (Page 1)

Basic Airstrip Information					
Airstrip Name:	Miyanmin	**Season** *Wet/Dry:*	Dry	**Area QNH (mb):**	1011
Airstrip ID:	AYIY	**Date Last Surveyed:**	09 Mar 2011	**Organisation:**	MAF
Province:	West Sepik	**Date of this Survey:**	10 Jun 2020	**Organisation:**	MAF
Airstrip Type *One way/Two way*	One way	**Surveyed By** *Name:*	Andy Symmonds		

Airstrip Coordinates	Latitude (S) *Use Decimal Mins*			Longitude (E) *Use Decimal Mins*			Elevation *GPS:*
	Degrees	Minutes	(Dec Deg)	Degrees	Minutes	(Dec Deg)	Feet
Coordinates *Lowest elevation:*	04	54.0960	04.901600	141	37.0840	########	2438
Coordinates *Highest Elevation:*	04	54.2450	04.904083	141	37.3970	########	2602
Coordinates *Parking Bay:*	04	54.2430	04.904050	141	37.3920	########	2597

Takeoff RWY **Bearing** *GPS:*	291	Takeoff RWY **Heading** *Aircraft compass:*	
Landing threshold *Lowest Elevation:*	11	Parking Bay **Elevation** (ft) *Aircraft Altimeter:*	

Calculated Airstrip Information			
Calculated Length (m) *from GPS Lat/Long:*	642	Measured Length (m) *from laser distances:*	647
Calculated Slope (%) *from GPS altitudes:*	7.8	Measured Slope (%) *from laser distances:*	5.8

Calculated Airstrip Information			
Calculated Length (m) *from GPS Lat/Long:*	642	Measured Length (m) *from laser distances:*	647
Calculated Slope (%) *from GPS altitudes:*	7.8	Measured Slope (%) *from laser distances:*	5.8

Airstrip Information to compare to the Standards			
Average RWY Width (m) *Calculated:*	10	Minimum RWY Width (m) *Measured:*	10
Average RWY Strip Width (m) *Calculated:*	33	Minimum RWY Strip Width (m) *Measured:*	25
Average Fly Over Area Width (m) *Calculated:*	61	Minimum Fly Over Area Width (m) *Measured:*	51
Average Transverse Slope (%) *Calculated:*	1.6	Maximum Transverse Slope (%) *Calculated:*	2.6

Comments on Runway Surface *Compare to standard:*

Mostly firm, some soft areas

Comments on Runway Strip Surface *Compare to standard:*

Some very soft areas. Generally softer than runway centerline

Comments on Obstacles in Fly Over Area *Compare to standard:*

NIL

RAA Requirement: Does the *Transitional Side Surface* meet the standard? *Airstrip edges at 20% slope clear for 10m* — **Yes**

Take-off RW29 (Level or Downhill)					
RAA Obstacle Free Gradient *5% for 600m from RWY threshold*					
Is it free of obstacles?	Yes				
MAF Clearway *150m at same slope as airstrip*					
Is it free of obstacles?	No				
MAF Obstacle Free Gradient *5% for 600m from end of clearway*					
Is it free of obstacles?	No				
Indicate Critical Obstacles *Distance (m) & Inclination (deg) from Threshold:*					
Obstacle 1	Small leaf RHS	Distance	99	Inclination:	1.0
Obstacle 2	Bushes fore	Distance	30	Inclination:	-1.0
Obstacle 3	Buai Palm	Distance	130	Inclination:	1.0
Obstacle 4	Small banana	Distance	90	Inclination:	-1.0
Obstacle 5	Tall banana	Distance	64	Inclination:	2.0
Obstacle 6	L green bush	Distance	63	Inclination:	-1.0
Reduction to Effective Airstrip Length (m) *Calculated:*	151				
Comments Regarding Obstacles					

Include for Two Way Airstrip: Take-off RW11 (Level or Uphill)					
RAA Obstacle Free Gradient *5% for 600m from RWY threshold*					
Is it free of obstacles?					
MAF Clearway *150m at same slope as airstrip*					
Is it free of obstacles?					
MAF Obstacle Free Gradient *5% for 600m from end of clearway*					
Is it free of obstacles?					
Indicate Critical Obstacles *Distance (m) & Inclination (deg) from Threshold:*					
Obstacle 1		Distance		Inclination:	
Obstacle 2		Distance		Inclination:	
Obstacle 3		Distance		Inclination:	
Obstacle 4		Distance		Inclination:	
Obstacle 5		Distance		Inclination:	
Obstacle 6		Distance		Inclination:	
Reduction to Effective Airstrip Length (m) *Calculated:*	0				
Comments Regarding Obstacles					

MAF PNG Airstrip Survey Report Form *(ver 1.11 200525)*

Survey Report / Field Sheet (Page 2)

Additional Requirements (For RAA and MAF) *See survey procedure and survey specification for guidance on what to fill in:*

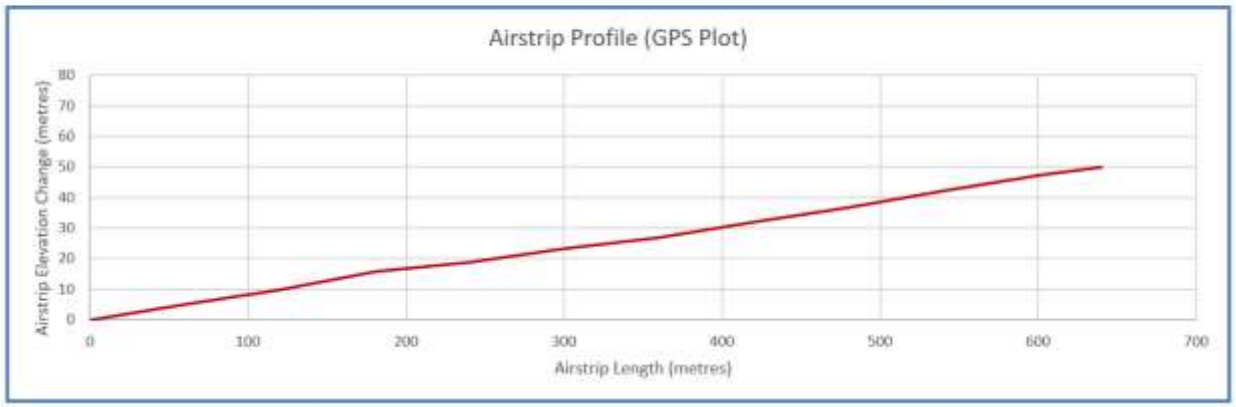
Surface Cover:	Short grass
Surface Hardness:	Medium
Surface Roughness:	Smooth
Windsock Present?	Yes
Windsock Setout:	Complying
Windsock Condition:	Adequate

Soil Type:	Fine grain soil (silt, clay)
Soil Moisture:	Saturated / Non-serviceable
Drains:	Good
Marker Cones Present?	Yes
More Cones Required?	Yes
Number Required:	1

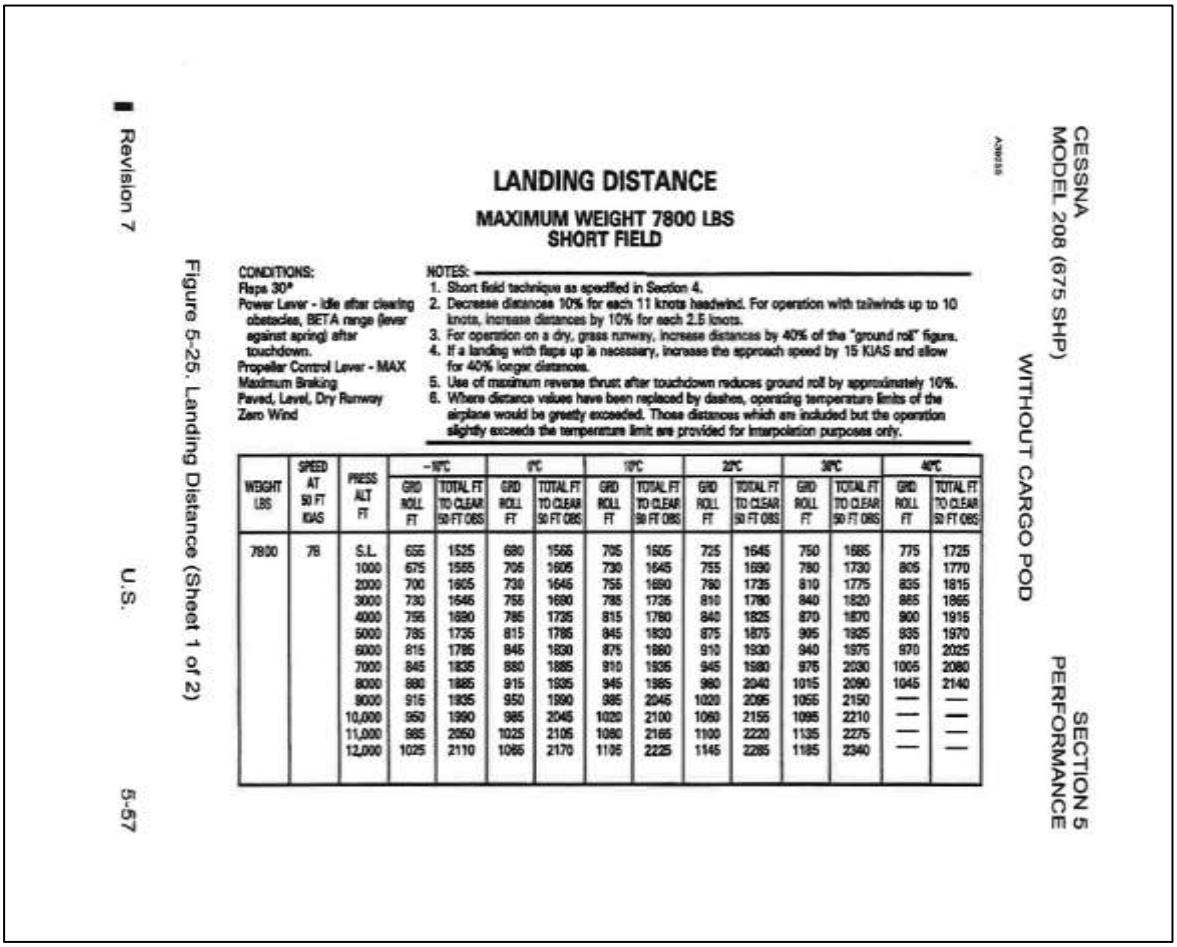
Main Airstrip Survey Measurements

	Airstrip Measurements *GPS*		**Airstrip Measurements** *Range Finder*		**Widths (m)** *Approximate*			**Width/Camber** *(to drains/cone markers)*			
Station	Elevation (ft)	Total Distance (m)	Distance (m)	Inclination (Deg)	Runway	Runway Strip	Fly Over Area	Width Left (m)	Camber Left (Deg)	Width Right (m)	Camber Right (Deg)
1	2438	0	0	0.0	10	26	64	13	0.0	13	0.0
2	2454	60	62	-3.0	10	34	88	16	-1.0	18	-1.0
3	2470	120	59	-3.0	10	35	55	18	-1.0	17	0.0
4	2490	181	62	-3.0	10	35	58	17	-2.0	18	0.0
5	2500	240	58	-3.0	10	36	51	18	0.0	18	0.0
6	2514	300	62	-3.0	10	25	53	18	-2.0	17	0.0
7	2526	360	60	-3.0	10	34	53	17	-2.0	17	0.0
8	2543	420	61	-3.0	10	35	56	17	0.0	18	0.0
9	2559	480	60	-4.0	10	35	64	17	-2.0	18	1.0
10	2576	540	61	-4.0	10	36	57	17	-2.0	19	1.0
11	2593	600	62	-4.0	10	34	64	17	-1.0	17	0.0
12	2602	640	40	-4.0	10	35	67	18	-2.0	17	1.0
13											

MAF PNG Airstrip Survey Report Form *(ver 1.11 200525)*



5.4 Appendix D: Cessna 208 AFM Performance Chart for Landing Distance for Short Field with cargo pod installed



CESSNA
MODEL 208 (675 SHP)
WITHOUT CARGO POD

SECTION 5
PERFORMANCE

A39S5

LANDING DISTANCE

MAXIMUM WEIGHT 7800 LBS
SHORT FIELD

CONDITIONS:
Flaps 30°
Power Lever - Idle after clearing obstacles, BETA range (lever against spring) after touchdown.
Propeller Control Lever - MAX
Maximum Braking
Paved, Level, Dry Runway
Zero Wind

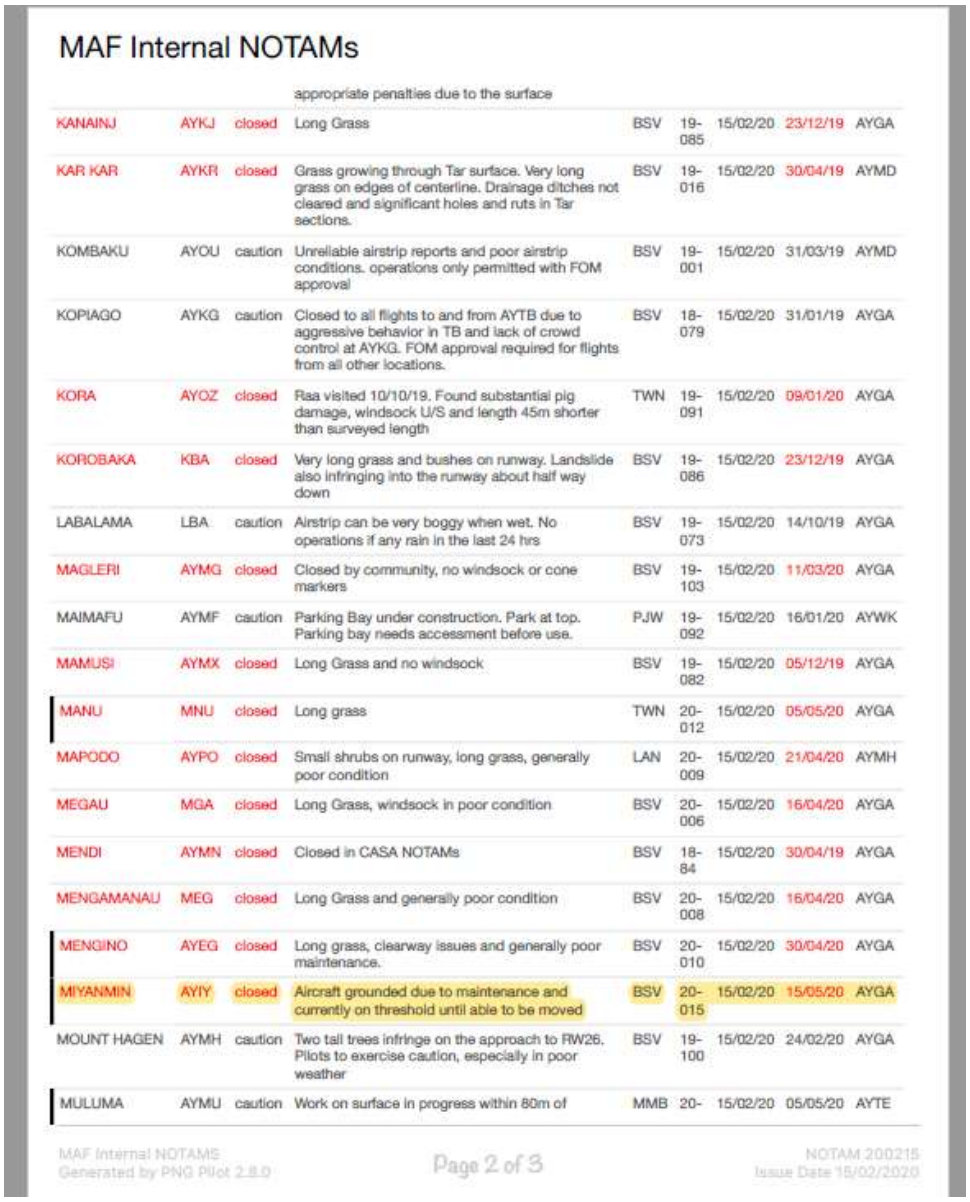
NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 11 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2.5 knots.
3. For operation on a dry, grass runway, increase distances by 40% of the "ground roll" figure.
4. If a landing with flaps up is necessary, increase the approach speed by 15 KIAS and allow for 40% longer distances.
5. Use of maximum reverse thrust after touchdown reduces ground roll by approximately 10%.
6. Where distance values have been replaced by dashes, operating temperature limits of the airplane would be greatly exceeded. Those distances which are included but the operation slightly exceeds the temperature limit are provided for interpolation purposes only.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	-10°C		0°C		10°C		20°C		30°C		40°C	
			GRD ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRD ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRD ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRD ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRD ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRD ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
7800	78	S.L.	655	1525	680	1565	705	1605	725	1645	750	1685	775	1725
		1000	675	1565	705	1605	730	1645	755	1690	780	1730	805	1770
		2000	700	1605	730	1645	755	1690	780	1735	810	1775	835	1815
		3000	730	1645	755	1690	785	1735	810	1780	840	1820	865	1865
		4000	755	1690	785	1735	815	1780	840	1825	870	1870	900	1915
		5000	785	1735	815	1785	845	1830	875	1875	905	1925	935	1970
		6000	815	1785	845	1830	875	1880	910	1930	940	1975	970	2025
		7000	845	1835	880	1885	910	1935	945	1980	975	2030	1005	2080
		8000	880	1885	915	1935	945	1985	980	2040	1015	2090	1045	2140
		9000	915	1935	950	1990	985	2045	1020	2095	1055	2150	—	—
		10,000	950	1990	985	2045	1020	2100	1060	2155	1095	2210	—	—
		11,000	985	2050	1025	2105	1060	2165	1100	2220	1135	2275	—	—
		12,000	1025	2110	1065	2170	1105	2225	1145	2285	1185	2340		

Figure 5-25. Landing Distance (Sheet 1 of 2)

■ Revision 7 U.S. 5-57

5.5 MAF PNG Internal NOTAM



MAF Internal NOTAMs

			appropriate penalties due to the surface					
KANAINJ	AYKJ	closed	Long Grass	BSV	19-085	15/02/20	23/12/19	AYGA
KAR KAR	AYKR	closed	Grass growing through Tar surface. Very long grass on edges of centerline. Drainage ditches not cleared and significant holes and ruts in Tar sections.	BSV	19-016	15/02/20	30/04/19	AYMD
KOMBAKU	AYOU	caution	Unreliable airstrip reports and poor airstrip conditions. operations only permitted with FOM approval	BSV	19-001	15/02/20	31/03/19	AYMD
KOPIAGO	AYKG	caution	Closed to all flights to and from AYTB due to aggressive behavior in TB and lack of crowd control at AYKG. FOM approval required for flights from all other locations.	BSV	18-079	15/02/20	31/01/19	AYGA
KORA	AYOZ	closed	Raa visited 10/10/19. Found substantial pig damage, windsock U/S and length 45m shorter than surveyed length	TWN	19-091	15/02/20	09/01/20	AYGA
KOROBAKA	KBA	closed	Very long grass and bushes on runway. Landslide also infringing into the runway about half way down	BSV	19-086	15/02/20	23/12/19	AYGA
LABALAMA	LBA	caution	Airstrip can be very boggy when wet. No operations if any rain in the last 24 hrs	BSV	19-073	15/02/20	14/10/19	AYGA
MAGLERI	AYMG	closed	Closed by community, no windsock or cone markers	BSV	19-103	15/02/20	11/03/20	AYGA
MAIMAFU	AYMF	caution	Parking Bay under construction. Park at top. Parking bay needs accessment before use.	PJW	19-092	15/02/20	16/01/20	AYWK
MAMUSI	AYMX	closed	Long Grass and no windsock	BSV	19-082	15/02/20	05/12/19	AYGA
MANU	MNU	closed	Long grass	TWN	20-012	15/02/20	05/05/20	AYGA
MAPODO	AYPO	closed	Small shrubs on runway, long grass, generally poor condition	LAN	20-009	15/02/20	21/04/20	AYMH
MEGAU	MGA	closed	Long Grass, windsock in poor condition	BSV	20-006	15/02/20	16/04/20	AYGA
MENDI	AYMN	closed	Closed in CASA NOTAMs	BSV	18-84	15/02/20	30/04/19	AYGA
MENGAMANAU	MEG	closed	Long Grass and generally poor condition	BSV	20-008	15/02/20	16/04/20	AYGA
MENGINO	AYEG	closed	Long grass, clearway issues and generally poor maintenance.	BSV	20-010	15/02/20	30/04/20	AYGA
MIYANMIN	AYIY	closed	Aircraft grounded due to maintenance and currently on threshold until able to be moved	BSV	20-015	15/02/20	15/05/20	AYGA
MOUNT HAGEN	AYMH	caution	Two tall trees infringe on the approach to RW26. Pilots to exercise caution, especially in poor weather	BSV	19-100	15/02/20	24/02/20	AYGA
MULUMA	AYMU	caution	Work on surface in progress within 80m of	MMB	20-	15/02/20	05/05/20	AYTE

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5.6 MAF PNG Airstrip diagram for Miyanmin showing airstrip still closed.