ACCIDENT INVESTIGATION COMMISSION

PAPUA NEW GUINEA

FINAL REPORT
AIC 20 - 1004

MISSION AVIATION FELLOWSHIP

P2-MAF

Cessna 208 Caravan

Runway Overrun at Yenkisa Airstrip

Enga Province

Papua New Guinea

19 March 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 THIS REPORT

On 19 March 2020, at 13:54 local time (03:54 UTC), the AIC received a phone call from Mission Aviation Fellowship (MAF) PNG Limited notifying an accident involving one of their Cessna 208 Caravan aircraft, registered P2-MAF. The AIC immediately commenced an investigation. A team of investigators was dispatched to the accident site on 20 March 2020 to perform on-site activities.

This *Final Aircraft Accident Investigation Report* has been produced by the PNG AIC, and is publicly released by the Commission pursuant to *ICAO Annex 13, Chapter 6, paragraph 6.5*. This report is published on the AIC website: www.aic.gov.pg.

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

Hubert Namani, LLB

Chief Commissioner

09 March 2021

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GLOSSARY OF ABBREVIATIONS

°	:	Degrees
%	:	Percent
AAT	:	Advanced Airstrip Training
AC	:	Advisory Circular
AFM	:	Airplane Flight Manual
AGL	:	Above Ground Level
AIC	:	Accident Investigation Commission (PNG)
AMSL	:	Above mean sea level
AOA	:	Angle of Attack
AYKI	:	Yenkisa Airstrip location identifier
CASA PNG	:	Civil Aviation Safety Authority of Papua New Guinea
CAR	:	Civil Aviation Rules
DCA	:	Department of Civil Aviation
DFR	:	Daily flight record
E	:	East
ft	:	Feet
FOD	:	Foreign Object Damage
HF	:	High Frequency
Hrs	:	Hours
IAS	:	Indicated airspeed
ICAO	:	International Civil Aviation Organization
IP	:	Instructor Pilot
Kg	:	Kilogram(s)
kt	:	Knot(s) (nm/hours)
m	:	Metre(s)
MAF	:	Mission Aviation Fellowship (PNG)
MTOW	:	Maximum Take-off Weight
nm	:	Nautical mile(s)
OLS	:	Obstacle Limitation Surfaces
PNGASL	:	Papua New Guinea Air Services Limited
PNG CPL	:	Papua New Guinea commercial pilot license
psi	:	Pound per square inch
RAA	:	Rural Airstrip Agency
S	:	South
SET	:	Single Engine Turbine
SOP	:	Standard Operating Procedures
UTC	:	Universal Time Coordinate
VFR	:	Visual Flight Rules
Vref	:	Approach Speed

INTRODUCTION

SYNOPSIS

On 19 March 2020, at 13:10 local time (03:10 UTC), a Cessna 208 Caravan aircraft, registered P2-MAF, owned and operated by Mission Aviation Fellowship (MAF) PNG Limited, conducting a VFR non-scheduled passenger flight operation from Kompiam to Yenkisa, Enga Province, experienced a runway excursion accident during its landing roll at Yenkisa Airstrip. There were four persons on board; one pilot and three passengers. There were no reported injuries.

During final approach into the Yenkisa Airstrip, the pilot was affected by the visual illusion presented by the upslope strip. As a result, the pilot flew too low during the final approach.

The pilot stated that during the approach, as the aircraft got closer to strip 31, he realised that he was coming too close to a protruding tree along the approach path and determined that he was too low. He immediately shallowed the descent angle. Subsequent to clearing the tree, the pilot found himself high on approach, passing the strip 31 edge.

The pilot steepened the descent angle because he realized that he had overshot the strip 31 edge. During flare, the aircraft floated for some distance due to the excess energy from the steep descent.

The aircraft touched down about 200 m beyond the edge of strip 31. During the initial part of the landing roll, because the strip was wet, the aircraft subsequently skid forward. The pilot did not use reverse thrust during the landing roll.

The aircraft overran the airstrip, hit a mound of clay and rocks, subsequently tipping left into a gully.

1 FACTUAL INFORMATION

1.1 HISTORY OF THE FLIGHT

On 19 March 2020, at 13:10 local time (03:10 UTC[1]), a Cessna 208 Caravan aircraft, registered P2-MAF, owned and operated by Mission Aviation Fellowship (MAF) PNG Limited, was conducting a VFR non-scheduled passenger flight operation from Kompiam to Yenkisa, Enga Province, Papua New Guinea, when it experienced a runway excursion accident during its landing roll at Yenkisa strip 31.

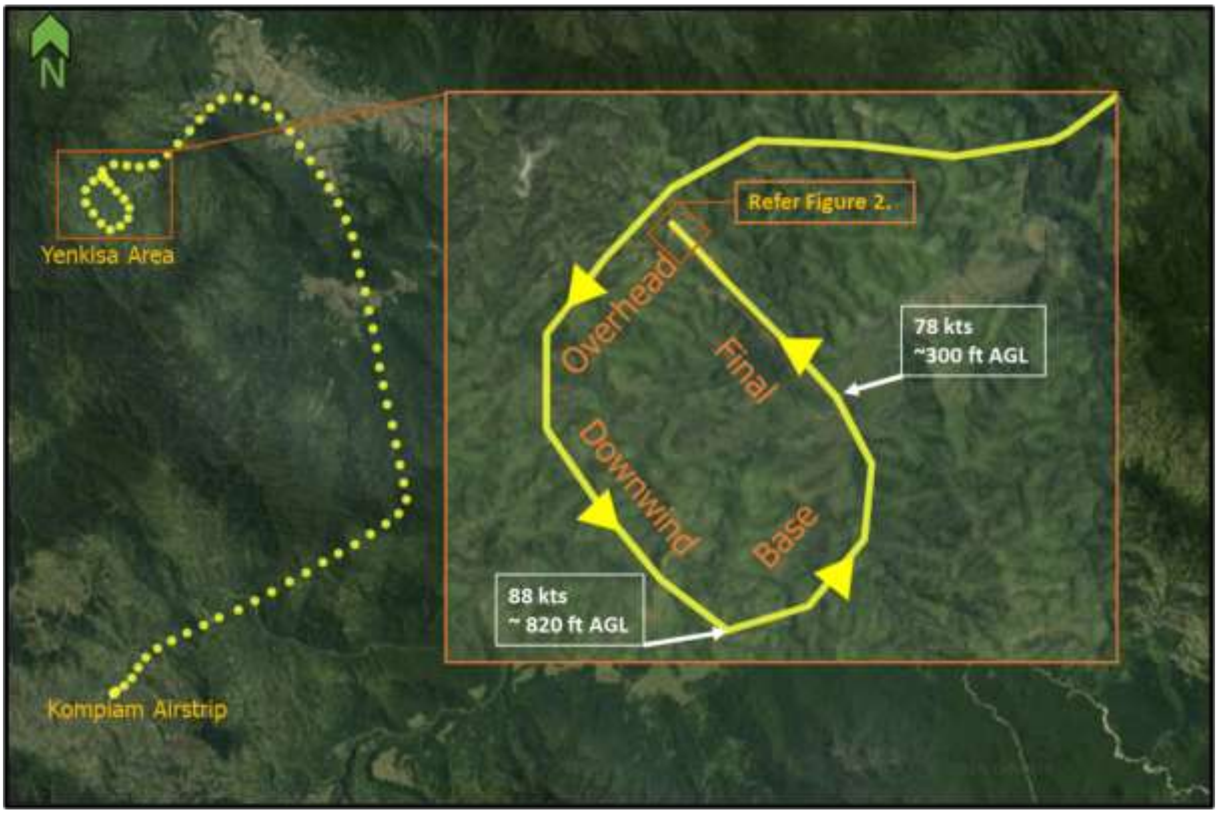


Figure 1: P2-MAF flight path and approach phases.

According to the *V2 Track*[2] recorded data, the aircraft entered the Yenkisa area through the North Eastern valley and arrived overhead the airstrip at 13:06, at a height just above 1,200 ft AGL[3] (see Figure 1).

During interview, the pilot stated that while overhead the airstrip, he checked the area for wind direction and speed, and strip surface conditions. The windsock located 180 m from the strip 31 edge (see Figure 2) indicated very light North Easterly winds. The trees just before strip 31 edge indicated no movement which signified little to no wind at the landing area. There was also no sign to the pilot of standing water on the airstrip.

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 Tracking system that transmits a combination of parameters (such as location, time, altitude, speed, rate of climb, heading and distance) back to the website and mobile application for real-time viewing by end users.

3 Above Ground level (AGL). All altitude data obtained from *V2 Track* are referenced to the Yenkisa Airstrip threshold elevation of 3,496 ft as per Rural Airstrip Aviation's Airstrip assessment in 2019.

Figure 2: Overrun illustration of P2-MAF at Yenkisa Airstrip.

According to the recorded data, the aircraft tracked overhead and joined the downwind leg just under 1 nm from the airstrip and tracked 1.1 nm towards the South East, parallel to the airstrip (see Figure 1). At about 820 ft AGL, the aircraft then commenced a descending turn onto the base leg. At this point, the groundspeed as indicated by the recorded data was 88 kt. The aircraft then did a final turn and lined up on the final approach path at about 300 ft AGL, less than 1 nm from the strip 31 edge. The recorded data showed that the ground speed during the final approach was 78 kt.

The pilot stated that the airspeed during the base leg was 79 kt. He then reduced airspeed to 71 kt (Vref[4]) as he conducted the final turn and lined the aircraft on the final approach, at which point he selected 30° flaps.

The pilot pointed out that after the committal point[5], and towards the end of the final approach into strip 31, he determined that the aircraft was coming too close to a protruding tree located about 100 m from the edge of strip 31. He subsequently pulled back the control column and increased power to shallow the descent angle.

The pilot also stated that after clearing the tree, he was unable to re-establish the aircraft on the correct approach profile because by that time, he had already passed his aiming point. He explained that the aircraft subsequently passed the strip 31 edge, and right before touchdown, the aircraft experienced some float and carried further than he had anticipated. The touchdown point was about 200 m beyond the edge of strip 31.

4 Reference landing speed as defined by the aircraft flight manual.

5 The point in the final approach by which a pilot or crew is committed to continue the approach to land and beyond which there is no option to go round or conduct a missed approach.

The pilot stated that upon touchdown, he immediately pulled the power lever to the idle[6] position, and subsequently into the beta mode[7] and applied full braking. However, the aircraft skidded forward on the airstrip. Evidence of water on the airstrip surface was captured in an image by a witness during the aircraft's landing roll (see Figure 3).

Figure 3: Water on airstrip coming out from under the tyres of P2-MAF during landing roll. (Source: Witness)

The tyre tracks at the end of the strip showed that the right main wheel ran up a mound of clay and rocks as it left the defined strip boundary. This brought the aircraft onto its left side and the left wing subsequently tipped into a gully running across the edge of the strip (see Figure 4).

Figure 4: Final position of the aircraft post overrun. Cone markers placed post overrun.

At 13:10, once the aircraft came to a complete stop, the pilot immediately hit the emergency button on the *V2 Track*. He subsequently shut the engine down and then evacuated the aircraft along with the passengers through the right-side cockpit door.

6 Set as the slowest practical speed the engine will operate on ground.

7 Beta Mode is the engine operational mode in which propeller blade pitch is controlled by the power lever. The beta mode may be used during ground operations only. *(Source: Pilot's Operating Handbook)*.

1.2 INJURIES TO PERSONS

Injuries	*Crew*	*Passengers*	*Total in the aircraft*	*Others*
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
None	1	3	4	Not applicable
TOTAL	1	3	4	-

Table 1: Injuries to persons

1.3 DAMAGE TO AIRCRAFT

The aircraft sustained substantial damage. AIC on-site investigation identified substantial damage on the propeller blades and left wing, due to impact with the ground.
The damage to the propeller blades showed that the aircraft was travelling with power as it overran the strip (see Figure 5).

Figure 5: Propeller blades covered in ground showing evidence of contact with ground, resulting in bending.

The left-wing sustained substantial damage on the wing tip and aileron from ground contact as the aircraft tipped onto its left side into the gully.

Figure 6: Left wing impacted ground in gully.

1.4 OTHER DAMAGE

The environment sustained minimal damage.

1.5 PERSONNEL INFORMATION

1.5.1 Pilot

Gender	: Male
Age	: 39 (at the time of the accident)
Nationality	: British
Position	: Line Pilot
Licence type	: PNG CPL
Licence valid to	: Perpetual
Rating	: <5700 Kg MTOW; C208 (Single Engine Aeroplane)
Total Flying time	: 1626.6 hrs
Total on the C208	: ~668 hrs
Total in command	: ~1300 hrs
Total in command on type	: 509 hrs
Total in last 90 days	: 165.2 hrs

Total on type in the last 90 days	:	165.2
Total in command in the last 90 days	:	~160 hrs
Total last 7 days	:	16.7 hrs
Total on type in last 7 days	:	16.7 hrs
Total command in the last 7 days	:	16.7 hrs
Total last 24 hrs	:	1.6 hrs
Total on type in last 24 hrs	:	1.6 hrs
Total command in the last 24 hrs	:	1.6 hrs
Hours on duty prior to occurrence	:	6 hours
Hours off duty prior to duty period	:	39.5 hours
Duration of last rest period	:	8 hours
Date of last Check flight	:	24th January 2020
Type of check flight	:	Base Check[8]
Medical limitation	:	Nil

The pilot joined PNG MAF in November of 2018 and commenced a *Single Engine Turbine (SET)* pilot training programme on the Cessna 208 aircraft in March 2019.

According to the pilot's records, he was approved by the Crew Training Manager (CTM) to commence training flights into advanced aerodromes on 14 December 2019. According to the pilot's training records, he commenced his Advanced Airstrip Training (AAT) on 30 December 2019. The pilot conducted training flights with an Instructor Pilot (IP) into several advanced airstrips including Yenkisa.

On 3 January 2020, the pilot conducted his first training flight into Yenkisa. The IP's comments in the training records indicate that the first approach conducted by the pilot was not stabilised[9] due to a visual illusion[10] associated with the airstrip's configuration, particularly its slope. The pilot completed a landing and took-off again to perform a second approach and landing. However, during that second approach, the pilot was instructed by the IP to conduct a go around before landing. The reason reported by the IP was that the pilot flew the approach outside of the expected operational limits. A third approach was conducted and the landing was satisfactorily completed.

According to training records, on 22 January 2020, the use of maximum reverse thrust was introduced to the pilot. The IP stated in the training records that the pilot mentioned feeling reluctant to use maximum reverse thrust during landing. The IP also stated that they would continue working on the pilot's feeling towards the use of reverse thrust in the next day's flight.

According to the training record for 23 January 2020, the IP commented that the pilot had the general tendency to drift away from the aiming point and indicated that this may have been due to visual illusions due to operating in steep strips. Additionally, the IP stated that the pilot was improving in the feeling

8 Base Check Base training is provided to ensure that the pilot is competent to operate the aircraft and/or equipment in all normal and emergency manoeuvres in accordance with the AFM and MAF PNG procedures. *(Source: MAF Operations Manual Part D – Pilot Training and Checking)*

9 Refer Section 1.18.2

10 Refer Section 1.18.3

and use of reverse thrust, especially during a landing conducted in Yenkisa in which, due to the excess energy of the aircraft during landing, reverse thrust was required and used effectively by the flight crew.

The IP overseeing the pilot's AAT stated in an interview with the AIC that during the course of the AAT, the pilot was observed to have improved his level of confidence on the use of reverse thrust, and illustrated competence in operating flights into the advanced airstrips. Therefore, the IP was confident in recommending the pilot for solo operations into Yenkisa and two other advanced airstrips on 23 January 2020.

The pilot's last flight with the IP was on 24 January 2020, where the records show that a base check was completed. The pilot operated restricted solo flights thereafter until the day of the accident.

According to the pilot's logbook, the first restricted solo flight into Yenkisa was on 6 February 2020, 14 days after being recommended to conduct restricted solo operations into advanced airstrips. Following that, the pilot conducted another five restricted solo flights into Yenkisa prior to the accident.

1.6 AIRCRAFT INFORMATION

1.6.1 Aircraft Data

Aircraft manufacturer	: Textron Aviation
Model	: Cessna 208
Serial number	: C20800198
Aircraft Type	: Fixed wing
Number of Engine	: 1
Year of manufacture	: 1990
Nationality and registration mark	: Papua New Guinea, P2-MAF
Name of the owner	: Mission Aviation Fellowship PNG Limited
Name of the operator	: Mission Aviation Fellowship PNG Limited
Certificate of Airworthiness	: 6 June 2008
Valid to	: Non-terminating
Certificate of Registration	: 28 May 2008
Total Hours Since New	: 14,347.1 hours
Total Cycles Since New	: 22,488 cycles
Total Hours Since Last Inspection	: 60.3 hours
Total Cycles Since Last Inspection	: 223,777 cycles

1.6.2 Engine Data

Engine Type	: Turbo propeller
Manufacturer	: Pratt & Whitney Canada
Type	: PT6A-114A
Serial Number	: PCE-PC0841

Total Engine Cycles : 698

1.6.3 Propeller Data

Manufacturer	: McCauley
Model	: 3GFR34C703-B
Serial Number	: 150221
Total Propeller Hours	: 2,492.3
Total Propeller Cycles	: 563
Hours since Overhaul	: 2,492.3

1.6.4 Aircraft Airworthiness and Serviceability

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 flight on the day of the accident.

1.6.5 Weight and Balance Data

According to the *Cessna 208 Aircraft Flight Manual* (AFM), the maximum take-off weight of the aircraft is 3,628.7 kg. The load manifest showed that the aircraft departed Kompiam for Yenkisa with a total weight of 2,967 kg.

The daily flight record indicated that the aircraft's centre of gravity was within its specified limits.

1.6.6 Fuel Information

According to the daily flight record, the fuel that was on-board the aircraft after the accident was 312 L.

The pilot did not indicate that there was any engine abnormality observed during the accident flight.

The investigation determined that fuel was not a factor in the accident.

1.7 METEOROLOGICAL INFORMATION

1.7.1 Weather Forecast

The Area Forecast for the Highlands region, in which Yenkisa Airstrip is located, was provided to the investigation by PNG National Weather Service. The forecast was valid from 09:00 to 21:00 on 19 March 2020 as follows:

Wind : at 7,000 ft winds are blowing at 100 degrees at 20 kt, at 10,000 ft winds are blowing at 80 degrees at 10 kt.

Visibility : 500m with fog, 3,000m with thunderstorms and rain and 4,000m with showers and rain and/or rain and drizzles (four-hourly interval from 09:00 to 21:00 on 19 March 2020)

Cloud : Isolated cumulonimbus clouds at base 1,800 ft to 45,000 ft, Broken stratus clouds at base 500 ft to 3,000 ft with intermittent precipitation, Scattered cumulous clouds at 1,500 ft base to 10,000 ft with broken showers, Scattered stratocumulus clouds at base 3,000 ft to 8,000 ft with broken rain and drizzle, Broken altocumulus clouds at base 10,000 ft to 18,000 ft.

1.7.2 Reported Weather

On the morning of the day of the accident, while in Mount Hagen, the pilot received information about weather conditions at Yenkisa from Yenkisa local agents and other MAF pilots.

Initial information provided to the pilot by local agents in Yenkisa was that it had been raining since midnight until 06:00 that morning, but the airstrip was dry by 09:00.

Additionally, MAF pilots who flew past Yenkisa that morning reported that there was cloud build up in the Yenkisa area.

Local agents later reported that weather conditions had improved at Yenkisa; ranges were clear, sunlight was coming through with blue sky and no wind.

With the latest information received from the local agents, the pilot decided to depart Mount Hagen for the planned round-trip.

1.7.3 Actual Weather

1.7.3.1 *Pilot observed weather*

According to the pilot's statement, upon arrival during his first flight into Yenkisa that day, weather within the valley was rainy and local conditions were not suitable for a VFR approach and landing, hence he decided to return to Kompiam.

The pilot also indicated that before returning to Kompiam he conducted three orbits around the Yenkisa area taking pictures of the weather he was observing.

The image taken from the North East of Yenkisa Airstrip shows an overcast of low-lying grey stratus clouds (see Figure 7).

Figure 7: Cloud cover observed by the pilot at Yenkisa. (Source: Pilot)

The image taken from the west of Yenkisa Airstrip shows a build-up of broken cumulonimbus clouds up to an altitude, as estimated by the pilot, of about 10,000 ft AMSL (see Figure 8).

After returning to Kompiam, the pilot stated that he conducted another flight destined for Yenkisa about 1.5 hours later. The weather at Yenkisa during that flight, according to the pilot, had improved. Whilst flying overhead the airstrip, the pilot reported little to no wind indicated by the breadfruit trees near the edge of strip 31. This was later confirmed when the pilot walked the strip post-accident and established that there was no wind indication from the breadfruit trees near the edge of strip 31 at ground-level. However, the pilot stated that due to the cloud cover, there was not much sunlight penetrating through, which defeated the chances of him identifying any reflectivity of standing water on the strip whilst flying overhead.

Figure 8: Yenkisa area covered by a build-up of broken cumulonimbus clouds. (Source: Pilot)

1.7.3.2 *Satellite*

The satellite image[11] provided by PNG National Weather Service concurred with the Area Forecast by illustrating traces of broken stratus clouds with isolated cumulonimbus at the Yenkisa area.

11 Source: Live data produced by the JAXA Global Weather Watch program and was in effect at 13:10 to 13:19 on 19 March 2020.

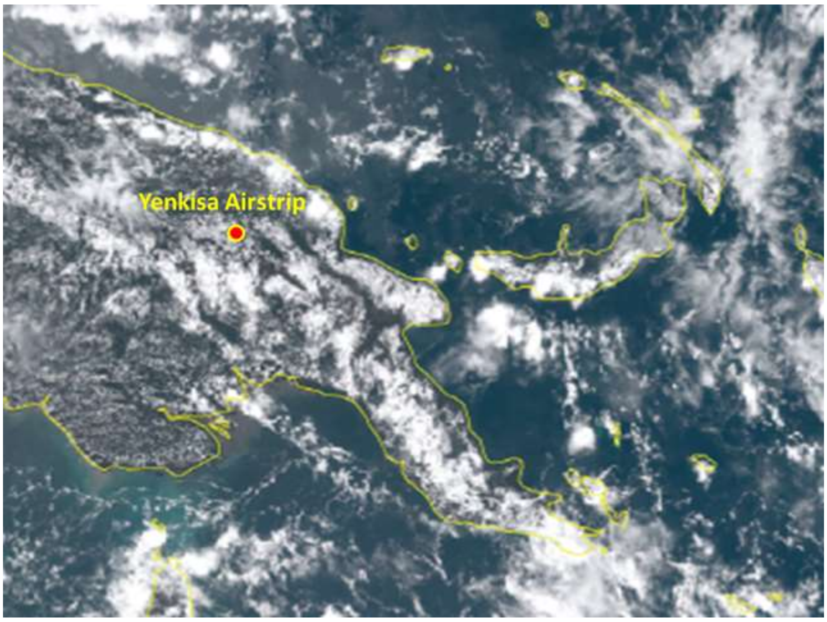


Figure 9: Satellite image of cloud cover over Papua New Guinea on 19th March 2020, at 13:10.

1.8 AIDS TO NAVIGATION

Ground-based navigation aids, on-board navigation aids, and aerodrome visual ground aids and their serviceability were not a factor in this accident.

1.9 COMMUNICATIONS

Communications between the pilot of P2-MAF and Madang Flight Service was recorded by automatic voice recording equipment. The communication was mainly on the high frequency (HF) channel, however, PNG Air Services Limited (PNGASL) was unable to provide the recorded audio to the investigation.

According to the flight progress strip, P2-MAF departed Kompiam at 12:53 for Yenkisa and was operating not above 8,000 ft. At 13:03, the pilot reported circuit area Yenkisa, and at 13:10, the pilot reported that he was on the ground.

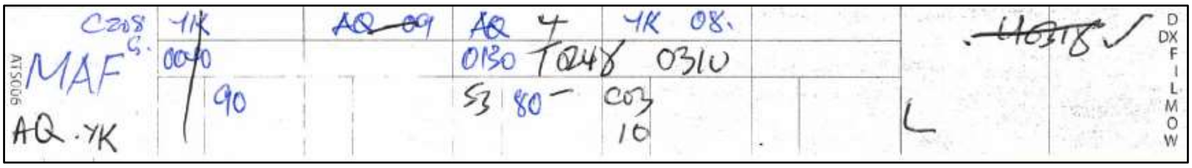


Figure 10: P2-MAF progress flight strip.

1.10 AERODROME INFORMATION

Yenkisa Airstrip (alternately spelt as Yangis) is located in the Highlands Region of Papua New Guinea, Enga Province. It is a one-way landing strip with 13 (130°) take-off direction, and 31 (310°) landing direction. Yenkisa Airstrip is maintained by the Rural Airstrip Agency (RAA).

Airstrip Identification	: AYYK
Airstrip Name	: Yenkisa Airstrip
Airstrip Location	: Yenkisa, Enga Province
Type of Traffic Permitted	: VFR
Latitude	: 05° 06′ 29.10″ S
Longitude	: 143° 54′ 57.60″ E
Elevation (AGL)	: 3,496 ft
Length of strip	: 580 m
Width of strip	: 40 m
Runway length	: 470 m
Runway slope	: 8.7% up to North West direction
Surface	: short grass on fine-grain soil

1.10.1 MAF Classification of Yenkisa Airstrip

According to the *MAF Operations Manual Part C,* Section *3.1 Aerodrome Authorisations,* MAF groups aerodromes into five classes depending on surface, slope length and other factors – Class A, Class B, Class C, Class Advanced C (or C+) and Class D (see Appendix A, 5.1). Class A aerodromes/airstrips are a group of longer, generally better surfaced aerodromes/airstrips that generally provide less operational complexities than the Class C group of aerodromes/airstrips, which are shorter, and more sloped, or have a softer surface. Class B aerodromes/airstrips fall between A and C. Class D is applied to aerodromes/airstrips which have characteristics such that programme pilot experience and Advanced Aerodrome Training are applied prior to solo operations. Class C+ aerodrome/airstrips fall between Class C and D, and are split into training levels.

According to MAF, Yenkisa Airstrip is classified as an advanced airstrip and meets the criteria for a class C+ airstrip. In its *Pilot Training and Checking Manual*, MAF has Yenkisa Airstrip as a nominated advanced airstrip for the AAT program due to its 8.7% slope which can cause visual illusions, including its one-way landing and take-off direction that render confined/abnormal circuit operations.

MAF stated that none of their pilots operating flights into Yenkisa strip 31 have submitted hazard reports regarding hazards identified along the approach path.

1.10.2 Obstacle Limitation Surface

According to the PNG Civil Aviation Rules (CAR) *Part 139, Appendix D – Obstacle Restriction and Removal,* Yenkisa Airstrip must establish the following obstacle limitation surfaces (OLS):

(1) conical surface;

(2) inner horizontal surface;

(3) approach surface; and

(4) transitional surface

RAA had last carried out a survey of Yenkisa Airstrip in May 2019 with reference to Advisory Circular (AC) *139-6* which involved the assessment of the four different airstrip OLS. Section *3.2 Take-off Climb/ Approach Surface,* paragraph *3.2.1* states that each runway should have a take-off, climb and approach surface which should:

a) *Rise from the end of the runway strip; and*

b) *Be obstacle free above a gradient of 1:20 (5%); and*

c) *Extend horizontally 600 m from the inner edge; and*

d) *Have sides that are splayed outwards at the rate of 1:20 (5%); and*

e) *Not turn before 300 m from the inner edge, if a turn is necessary.*

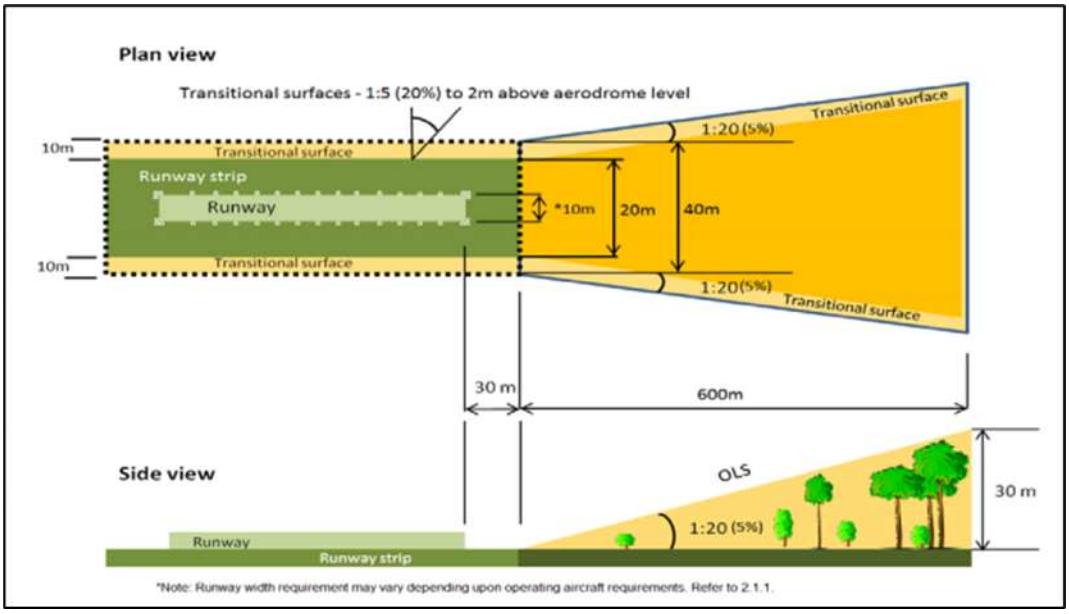


Figure 11: Obstacle limitation surfaces. (Source: AC 139-6)

The survey carried out by RAA involved measuring the Approach surface[12] OLS using a combination of a laser rangefinder to measure a horizontal 160m clearway before the edge of strip 31, and an inclinometer used at an angle of 2.86° from the end of strip 31 to measure the 1:20 (5%) gradient slope. Obstacles seen to be penetrating the measured OLS were trees just before the 31 strip edge.

Locals within the community were subsequently advised by RAA to clear the trees that posed as an obstruction along the approach OLS. RAA informed AIC that the Yenkisa local airstrip maintenance officer[13] reported that the trees were cut, but was unable to provide supporting evidence to the investigation.

According to RAA records, a subsequent airstrip inspection was carried out at Yenkisa Airstrip on 21 February 2020. The inspection rendered the airstrip as "OK". However, RAA stated that the inspection was conducted by a mechanic who was not equipped with the specific survey tools.

The investigation identified that the obstructing trees were never cut since the survey, and on the day of the accident, the trees were still penetrating the approach OLS.

1.11 FLIGHT RECORDERS

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

12 An inclined plane or combination of planes preceding the threshold. *(Source: CASAPNG CAR Part 139)*

13 An individual who works with RAA and the community to help maintain a rural airstrip. They are selected/nominated by the local community and then trained by RAA.

1.11.1 Flight Tracking

The *V2 Track* system provides position reports every 15 seconds when in range of a mobile phone network, and also with every 30 degree of heading change. If the aircraft is out of mobile phone network range, it will revert to position reporting every two minutes via satellite. It records and transmits parameters such as time, altitude, rate of climb, track, latitude and longitude, and total distance.

MAF had installed *V2 Track* on the aircraft. The data was provided to the investigation and used to outline the aircraft flight path (see Figure 1).

1.12 WRECKAGE AND IMPACT INFORMATION

The tyre tracks on the strip showed that the aircraft landed about 200 m beyond the strip 31 edge, and travelled upslope until it left the defined strip grassland at which point the right main wheel ran up a mound of clay and rocks. This caused the aircraft's weight to shift onto the left main wheel.

The nose wheel and left main wheel tyre marks beyond the strip boundary show that both wheels had dug into soft clay ground, and the nose wheel subsequently tilted to the left side as the left main wheel fell onto its left side. This was during the time the right main wheel suspended into air. Tyre imprints are illustrated in Figure 12 below.

Figure 12: A- Overrun impression of right main wheel on end of airstrip; B- Nose wheel dug; C- Left main wheel.

As the aircraft tilted to the left as a result of the right main wheel impact with the mound of clay, the left wing subsequently tilted left into a gully where it impacted the ground as it came to rest (see Figure 7).

The bending observed on each blade indicated that the engine was running with low power as the propeller blades contacted the ground (see Figure 5).

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

No medical or pathological investigations were conducted as a result of this occurrence.

1.14 FIRE

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

1.15 SURVIVAL ASPECTS

When the aircraft came to a complete stop, the pilot pressed the Emergency button on the *V2 Track* device. The notification was received by both the MAF Director and Flight Operations Manager on their phones.

The Emergency Locator Transmitter (ELT) did not activate because not enough horizontal momentum was exerted on it during the runway excursion.

The pilot later called Madang Flight Services on the HF radio to notify that the aircraft had landed. However, he did not mention that the aircraft experienced an accident. The pilot and passengers exited the aircraft through the right cockpit door (co-pilot's side). Neither the pilot nor passengers sustained any injuries while exiting the aircraft.

No evidence of seats and seat belts failure was found during the investigation.

1.16 Tests and Research

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

1.17 ORGANISATIONAL AND MANAGEMENT INFORMATION

1.17.1 Mission Aviation Fellowship PNG Ltd (MAF)

MAF is an international non-government organisation (NGO) which provides services to remote communities. The MAF PNG headquarters is based at the Kagamuga Airport in Mount Hagen and has been operating to some of the most remote airstrips throughout Papua New Guinea for almost 70 years.

1.17.1.1 *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* (CARA Training). Refer Appendix C, 5.3. 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

The pilot had already progressed in his training program to the Restricted Solo Operations phase at the time of the accident. According to the *MAF Pilot Training and Checking Manual*, the aim of the Restricted Solo Operations is to provide the pilot with a time period to develop confidence with additional margins in place.

The *MAF Pilot Training and Checking Manual* also states that during Restricted Solo Operations, pilots shall complete *Advanced Airstrip Training*. The Restricted Solo Operations period will continue after *Advanced Airstrip Training* until the pilot has completed the *Advanced Airstrip Check*.

According to section *4.3.1 Advanced Airstrip Training (PTC145)* of the *MAF Pilot Training and Checking Manual*, it states that:

> *Advanced Airstrip Training is normally commenced when pilots achieve 150 benchmark hours of solo programme experience for an initial type, and 50 benchmark hours for a subsequent type.*
>
> *Following successful completion of the course, the PUI shall be released to a further period of consolidation…This period continues normally until 250 solo programme benchmark hours for an initial type, and 100 benchmark hours for a subsequent type.*

The manual further states that the CARA training program will conclude when the restricted solo operations period is considered complete by the CTM, upon successful completion of the AAT and its subsequent *Advanced Airstrip Check*. The pilot will commence unrestricted solo operations thereon with the use of unrestricted performance charts.

According to the pilot's logbook, he had conducted his initial restricted solo operation on 18 July 2020, and until the commencement of the AAT, he had logged 279.3 hours of restricted solo operations.

According to the training records, the pilot had conducted his AAT with an IP between 30 December 2019 and 23 January 2020. On 23 January 2020, the pilot was recommended to conduct restricted solo operations into advanced airstrips. Between 23 January and the day of the accident, 19 March 2020, the pilot conducted restricted solo flights (170 landings) into a number of airstrips and had accumulated 114.3 hours, of which 5.3 hours and 12 landings were for flights into advanced airstrips. From the total hours and landings for advanced airstrips, there were 3.5 hours and 7 landings for Yenkisa, inclusive of the accident flight.

1.17.1.2 *Standard Operating Procedures (SOP)*

1.17.1.2.1 Approach Speeds

The pilot stated during interview that at the commencement of the final approach, he flew at an airspeed of 71 knots. According to *MAF SOP – C208*, section *2.21.1 Approach Speeds* (see Appendix B, 5.2) states:

g. In order to be able to have enough energy to convert a normal approach into a climbing flare onto steeper strips, approach speed should be increased by adding one knot (IAS) per 1% slope above 5% slope.

According to the *Speed Reference Table* included in section *2.21.1 Approach Speeds* of the *MAF SOP*, the corresponding Vref for the operating weight of the aircraft at the time was 67 kt. Yenkisa Airstrip has a slope of 8.7%, therefore, 4 kt should be added onto the Vref. This is to allow for the aircraft to travel upslope the strip during landing roll, hence the nominated Vref of 71 kt.

During investigation interview, the pilot stated that upon the turn from base onto the final approach, his airspeed indicator was showing an airspeed of 71 kt. However, the pilot explained that he did not monitor the airspeed during the course of the final approach onto landing, and was unaware if the aircraft was flying at the appropriate Vref speed.

1.17.1.2.2 Use of reverse thrust

According to *MAF SOP – C208*, Section *2.21.3 Short Field Landing, Note 1*. (see Appendix D, 5.4) 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 reverse thrust was available to the pilot during landing, however, the pilot decided not to apply it.

1.17.2 Rural Airstrip Agency of PNG Limited (RAA)

In accordance with the RAA website, the organisation is a non-profit subsidiary of MAF established for the primary purpose of facilitating and conducting maintenance and restoration of rural airstrips in Papua New Guinea.

According to the information provided by RAA to the AIC during the investigation, RAA considers the Civil Aviation AC 139-6 when conducting maintenance and restoration of rural airstrips. The AC provides guidance of non-certificated aerodromes (airstrips), and explanatory material to assist in showing compliance to CAR Part 139.

The AIC determined that although RAA proposed to the local agent to cut the trees that were identified as a hazard along the approach OLS during the last survey of Yenkisa Airstrip, RAA did not ensure proper risk management. Therefore, RAA was not aware that at the time of the accident no effective action had been taken to cut the trees protruding the OLS.

1.18 ADDITIONAL INFORMATION

1.18.1 Stabilised approach

Flight Safety Foundation, in its FSF ALAR Briefing Note 7.1 provides the recommended elements of a Stabilised Approach, as follows:

All flights must be stabilized by 1,000 ft above airport elevation in instrument meteorological conditions (IMC) and by 500 ft above airport elevation in visual meteorological conditions (VMC). An approach is stabilised when all of the following criteria are met:

1. *The aircraft is on the correct flight path;*
2. *Only small changes in heading/pitch are necessary to maintain the correct flight path;*
3. *The aircraft speed is not more than VREF + 20kt indicated airspeed and not less than VREF;*
4. *The aircraft is in the correct landing configuration;*
5. *Sink rate is no greater than 1000 fpm; if an approach requires a sink rate greater than 1000 fpm a special briefing should be conducted;*
6. *Power setting is appropriate for the aircraft configuration and is not below the minimum power for the approach as defined by the operating manual;*
7. *All briefings and checklists have been conducted;*
8. *Specific types of approach are stabilized if they also fulfil the following: instrument landing system (ILS) approaches must be flown within one dot of the glide-slope and localizer; a Category II or III ILS approach must be flown within the expanded localizer band; during a circling approach wings should be level on final when the aircraft reaches 300 ft above airport elevation; and,*
9. *Unique approach conditions or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.*

An approach that becomes unstabilized below 1000 ft above airport elevation in IMC or 500 ft above airport elevation in VMC requires an immediate go-around.

A stabilised approach is achieved when a pilot establishes the aircraft on the final approach profile, maintaining a constant descent angle towards a fixed aiming point on the runway.

1.18.2 Visual illusions

According to the *Federal Aviation Administration of the United States* in its *Pilot's Handbook of Aeronautical Knowledge* (PHAK), *Chapter 17. Aeromedical Factors, pg. 17-11*:

An upsloping runway, upsloping terrain, or both can create an illusion that the aircraft is at a higher altitude than it actually is. The pilot who does not recognize this illusion will fly a lower approach. Downsloping runways and downsloping approach terrain can have the opposite effect.

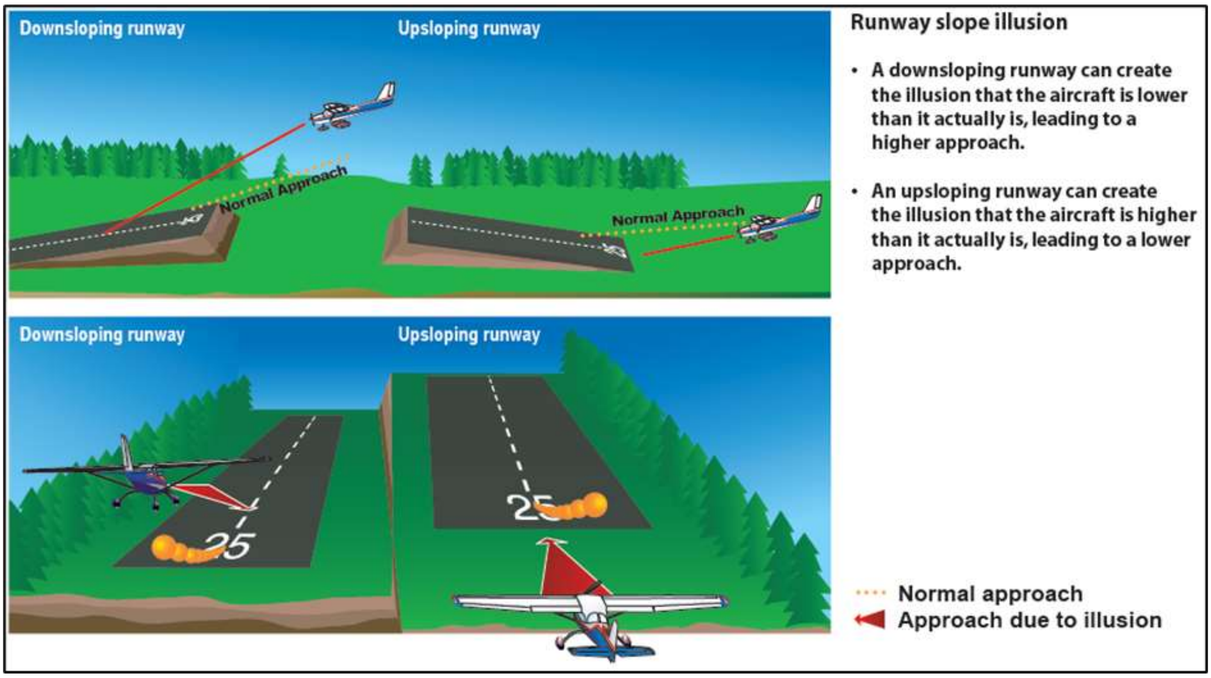


Figure 13: Upslope and downslope visual illusions. (Source: FAA PHAK, Figure 17-7)

1.18.3 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 Yenkisa Airstrip during the accident flight (see Appendix E, 5.5).

As a result of the calculations, an estimated landing roll of 218 m was established.

The chart also establishes that the use of maximum reverse thrust after touchdown reduces ground roll by approximately 10%.

The *Cessna 208 AFM Performance Chart* does not cater for the upslope orientation of Yenkisa Airstrip, nor does it consider a wet surface.

1.18.4 Previous MAF PNG Occurrence

The pilot stated in an interview that, in his view, a recent occurrence involving other MAF personnel and aircraft was due to the use of reverse thrust. The pilot later stated that this may have conditioned his initial reluctancy to use reverse thrust during the landing at Yenkisa in which the accident took place.

The previous occurrence to which the pilot was referring happened on 14 February 2020 at Miyanmin Airstrip, and an investigation was conducted by the AIC (number AIC 20-1002). Information about that investigation is available at AIC website https://www.aic.gov.pg/investigation/359

1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES

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 Airstrip

2.1.1 Approach Obstruction Limitation Surface (OLS)

Due to the lack of effective action as a result of RAA survey, with regard to cutting the trees that were penetrating the approach OLS for Yenkisa strip 31, and the lack of hazard reports from MAF pilots operating into Yenkisa Airstrip related to protruding trees or obstacles in the approach path, the trees remained as obstacles and the pilot was unaware of them before the approach that resulted in the accident. Moreover, he was only able to identify these obstacles during the final approach, at a point in which he was not able to perform a go-around.

2.1.2 Airstrip surface conditions

According to the meteorological information gathered, Yenkisa area experienced rain on the night before the day of the accident, and about 1.5 hours prior to the commencement of the accident flight. Therefore, at the time of landing, the airstrip was wet. Even when the pilot flew earlier that day into Yenkisa area and identified rain clouds, he did not identify that the strip surface was wet while he was flying overhead the airstrip prior to the approach and subsequent landing.

2.2 Flight operations

2.2.1 Crew qualification and proficiency

The pilot had command experience and was qualified on the Cessna Caravan 208 aircraft.

The investigation identified that the pilot had logged a total of 393.6 hours during his restricted solo operations phase, until the day of the accident, surpassing the required benchmark hours to qualify for the *Advanced Airstrip Check*. The investigation further identified that following the AAT, the pilot had completed 114.3 hours and 170 landings in restricted solo flights; 5.3 hours and 12 landings were logged for advanced airstrips, of which 3.5 hours and 7 landings were logged for Yenkisa Airstrip.

It was identified during the investigation that the aim of the Operator, by setting benchmark hours for the consolidation phase before the Advanced Airstrip Check, was for the pilots to gain confidence and experience in operating into advanced airstrips after the completion of the AAT. Moreover, in this case about 5% of the flight hours of the pilot during the consolidation phase was effectively into advanced airstrips.

However, the investigation also determined that the *MAF Training and Checking Manual* did not have provisions for systematically monitoring pilots' performance during the consolidation phase, to ensure that proficiency was maintained up to the required standards of operation into advanced airstrips. As a result, the investigation was unable to determine if the performance of the pilot commenced to decrease during the consolidation phase to a point in which it could have contributed to the accident.

2.2.2 Operation of the aircraft

The information gathered during the investigation showed that the pilot identified the presence of a protruding tree interfering with the trajectory of the aircraft into Yenkisa strip 31. During the investigation, no record was found regarding hazard identification in the approach path into Yenkisa. According to the training records, the pilot did not identify the trees during the AAT. Moreover, no other MAF pilot identified these protruding trees in the approach OLS before the accident. Furthermore, RAA during a previous survey identified the presence of trees were penetrating the approach OLS.

The AIC determined that the final approach was conducted in a low angle of approach, likely due to the effects of a visual illusion by the upslope of the airstrip in which context a tree became relevant for the pilot during the approach.

When the pilot became aware of the tree after passing the committal point established by MAF for operation into Yenkisa, he focused his attention on clearing the tree, applying power and pulling the control column to decrease the descent angle. The pilot did not pay attention to the airspeed and lost sight of the aiming point. Only after clearing the tree, he identified that the approach trajectory had changed, leading the aircraft beyond the aiming point. Subsequently, he tried to regain the aiming point by increasing the descent angle, but was unsuccessful.

By increasing the descent angle in the unsuccessful attempt to regain the normal approach profile, the aircraft was loaded with potential energy. This was not timely identified by the pilot, probably due to his lack of effective management of the airspeed. The investigation found that the effects of the additional energy of the aircraft were not recognised by the pilot until the time of performing the flare, when the aircraft travelled further than anticipated until the actual touchdown.

The evidence gathered during the investigation showed that at least two of the criterions for a *stabilized approach* were not maintained by the pilot during the final approach, as follows:

a. The final approach was not conducted in the right trajectory. The aircraft flew below the normal approach path; and

b. The required significant pitch changes did not succeed in bringing the aircraft back on the required trajectory.

According to the *Cessna 208 Landing Performance Chart*, under the normal conditions described in that chart, the aircraft would require an approximate ground roll distance of 218 m. The investigation established that at the actual touchdown point there were 380 m of strip available for the landing roll, which was deemed to be sufficient to bring the aircraft to a stop in the upslope airstrip.

Additionally, at the time of the occurrence there was standing water on the strip surface that the pilot was unable to identify while overhead, therefore, he did not anticipate landing on a wet surface.

The pilot used full braking action from the touchdown and on, which could have locked the main landing wheels causing the aircraft to skid on the wet airstrip, hence dramatically increasing the landing roll.

The investigation determined that the use of reverse thrust would have assisted the pilot in reducing the landing distance. However, the pilot opted not to use reverse thrust as he did not feel comfortable with it, most likely as a result of his understanding about the circumstances surrounding the recent occurrence involving other MAF aircraft.

Moreover, according to the damage sustained by the propeller blades, the investigation determined that the aircraft overran the airstrip with power which could have also contributed to the increase in the landing distance.

3 CONCLUSIONS

3.1 FINDINGS

1. AIRCRAFT

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

b) The aircraft had a valid Certificate of Airworthiness.

c) The mass and the centre of gravity of the aircraft were within the certified limits.

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

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

f) Propeller blade damage and bend was consistent with the engine producing power at the time of impact.

2. PILOT

a) The pilot was properly licensed and adequately rested to operate the flight.

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

c) The investigation could not determine if pilot's proficiency was a contributing factor to the occurrence.

d) While overhead the airstrip, the pilot was unable to identify standing water on the strip surface and therefore, could not anticipate landing on a wet surface.

e) The pilot did not properly manage the aircraft during the final approach and landing roll.

f) The pilot did not feel comfortable with the use of reverse thrust.

3. FLIGHT OPERATIONS

a. The pilot carried out normal radio communications with Madang Flight Service.

b. During the final approach, the pilot was affected by a visual illusion due to the 8.7% upslope of Yenkisa airstrip.

c. The final approach was not stabilised.

d. The presence of trees penetrating the approach OLS was identified by the pilot after passing the committal point defined by MAF.

e. During the final approach the pilot was focused in clearing the obstacles, losing the aiming point.

f. During the approach, the pilot did not maintain effective control of the parameters of the aircraft.

g. During the flare, the aircraft travelled further than the expected touchdown point.

h. During landing, main landing gear wheels would have been locked causing the aircraft to skid.

i. The pilot decided not to use reverse thrust during landing.

j. The aircraft skidded off the end of the airstrip.

4. OPERATOR

a. MAF did not identify the trees along the approach path into Yenkisa Airstrip as a hazard prior to the accident.

b. MAF did not have the means to effectively monitor proficiency during the consolidation phase of the Advanced Airstrip Training.

5. AIR TRAFFIC SERVICES

a. The pilot maintained normal communication with Madang Flight Service.

6. AIRSTRIP

a. There was standing water on the strip surface.

b. There were trees protruding the approach OLS into Yenkisa Airstrip, close to the edge of strip 31.

c. No effective action had been taken to cut the trees protruding the approach OLS for Yenkisa Airstrip following the survey conducted by RAA in which the obstacles were identified, until the day of the accident.

7. FLIGHT RECORDERS

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

8. MEDICAL

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

9. SURVIVABILITY

a. The accident was survivable.

3.2 CAUSES [CONTRIBUTING FACTORS]

There were trees protruding the approach OLS into Yenkisa Airstrip, close to the edge of strip 31.

No effective action had been taken before the accident, to cut the trees protruding the approach OLS for Yenkisa Airstrip, following the survey conducted by RAA in which the obstacles were identified.

At the time of the accident, the pilot did not properly manage the aircraft during the final approach and landing roll.

During the final approach, the pilot was affected by a visual illusion due to the 8.7% upslope of Yenkisa Airstrip.

The presence of trees penetrating the approach OLS was identified by the pilot after passing the committal point defined by MAF.

The pilot was focused in clearing the obstacle, losing the aiming point.

The final approach was not stabilised.

During the flare, the aircraft travelled further than the expected touchdown point.

During landing, main landing gear wheels were most likely locked causing the aircraft to skid.

The pilot decided not to use reverse thrust during landing.

3.3 OTHER FACTORS

This section is used for safety deficiencies or concerns that are identified during the course of the investigation that while not causal to the accident, nevertheless, should be addressed with the aim of accident prevention.

The investigation found a number of non-contributory safety deficiencies. These are addressed in Part 1 *Factual information* and Part 4 *Safety actions and recommendations*.

4 SAFETY ACTIONS AND RECOMMENDATIONS

4.1 SAFETY ACTION

Mission Aviation Fellowship PNG Ltd (MAF), safety action

On 7 April 2020 the AIC received a safety action statement from MAF that included safety actions taken by the Operator as a result of an internal analysis of the occurrence. These safety actions are classified as *completed*, *in progress* or *pending*, falling into four specific categories:

1. Pilots / Qualifications / Checking & Training.
2. Airstrip Standards.
3. Programme Management / Operational Tempo.
4. Corporate Safety Culture.
A Task Force has been created for "Returning PNG to Flying."

In order to identify the required safety actions to be taken under each category, MAF firstly authorised:

1) Full stand down of all flight operations, effective 20 March for an indeterminate amount of time.

On 8 April 2020, the AIC received an update from MAF on the progress of safety actions:

The safety actions are the general areas / tasks that we have not yet placed into SMART[14] CAPA[15]s. These safety actions will be further refined and some will be split into multiple specific CAPAs. We were awaiting approval from the MAF Board which came Monday (6 April 2020) night. This next week we will develop the SMART CAPAs and then they will be taken from our Taskforce group to our Safety Management System.

As of 4 February 2021, the AIC received an update from of the safety action items that have been **completed** by MAF, with supporting evidence:

1) Airstrip Standards have been reviewed through a comprehensive desk-top review of all 213 airstrips to which MAF currently operates. The airstrips were each assessed, given a Risk Rating and assigned respective corrective actions (if deemed appropriate) to be taken.

2) Two out of the four safety actions under Corporate Safety Culture have been completed upon the circulation of a memo to all MAF staff:
i) In-country Programme Safety Officer was appointed.
ii) In-country Flight Safety Officer was appointed.

3) Pilots / Qualifications / Checking & Training:
i) A survey of all pilots to determine their concerns/observations relative to airstrips, their induction to programme, Standard Operating Procedures, etc.
ii) MAF management assessment team reviewing each pilot's records of training, history in country, and concerns known by management in terms of 10 KSSA[16]s.

14 Specific, Measurable, Achievable, Realistic and Timely. Actions used to guide goal setting.
15 Correcting and Preventative Action. consists of improvements to an organization's processes taken to eliminate causes of non-conformities or other undesirable situations.
16 KSSA: Knowledge, Skills (technical), Skills (non-technical), Attitudes.

iii) Individual return-to-flying process to be determined for each pilot.

4) Airstrip Standards:
i) 17 airstrips require desktop review.
ii) MAF will subsequently have a staged resumption of operations to airstrips that are deemed suitable as per respective risk assessments, or that have had corrective actions taken. Flight operations will be resumed to MAF-approved strips prior to all 213 strips being made serviceable.

5) Programme Management / Operational Tempo (in progress):
i) Flight Operations Manager and Crew Training Manager roles to be re-assessed in terms of pilot rostering. Priority to be given to their management roles, not to operational flying.
ii) Flight Operations Manager and Crew Training Manager roles to be re-assessed in terms of pilot rostering. Priority to be given to their management roles, not to operational flying.
iii) Re-evaluation of roles of Operations Director and Flight Operations Manager roles. To ensure appropriate management oversight.
iv) Significant management focus to be placed on the potential to compromise a safety standard because of a strong service orientation.

6) *Corporate Safety Culture:*
i) Programme Safety Manager and Regional Safety Manager, in conjunction with programme management, to produce a comprehensive baseline risk assessment for Cessna 208 operations in PNG.
ii) Quality and Safety Officers to have successfully passed CASA Fit and Proper Person / Senior Person (FFP/SP) interviews by end of year.

The following safety actions under the area of *Airstrip Standards* and are still “in progress” as of 4 February 2021 are:

i) 171 onsite inspections required followed by Risk Assessment and Corrective Actions. ***In progress.***
ii) MAF will subsequently have a staged resumption of operations to airstrips that are deemed suitable as per respective risk assessments, or that have had corrective actions taken. Flight operations will be resumed to MAF-approved strips prior to all 213 strips being made serviceable. ***In progress.***

On 10 November 2020, MAF responded to PNG AIC with regard to the initial deficiency that was identified in the Safety Recommendation AIC 20-R18/20-1004, stating:

While we were operating in accordance with our training manual, it has been recognized as valid that improvements could be made to our surveillance and assurance of pilot proficiency. MAF PNG desires more specific currency parameters for pilots operating into Advanced Airstrips, i.e. category C+ and D to ensure a minimum level of currency.

To achieve that, an additional requirement is being added to the MAF PNG Operations Manual Part A (OM-A) section 2.10

2.10 Airstrip currency
To maintain the required level of proficiency to ensure safe operations into and out of advanced airstrips i.e. airstrips categorised as C+ or D, company pilots shall complete one take-off and landing every 30 days. If advanced airstrip currency is not maintained, the pilot shall contact either the FOM or CTM who will determine what activity is required to regain currency.

On 20 November 2020, MAF PNG provided to the AIC a status of the incorporation of section *2.10 Airstrip currency* into the *MAF PNG Operations Manual Part A,* as still being in process.

4.2 RECOMMENDATIONS

4.2.1 Recommendation AIC 20-R15/20-1004 to CASA PNG

On 12 August 2020, the PNG AIC issued the following recommendation:
The PNG Accident Investigation Commission (AIC) recommends that the Civil Aviation Safety Authority (CASA PNG) should ensure that airstrips are maintained in accordance with the provisions of rules and regulations including but not limited to CAR Part 139 and AC 139-6 to the extent applicable.

Action requested
The AIC requests that CASA PNG note recommendation AIC 20-R15/20-1004, and provide a response to the AIC within 90 days, but no later than 11/10/2020, and explain including with evidence how CASA PNG has addressed the safety deficiency identified in Safety Recommendation AIC 20-R15/20-1004.

Status of the AIC Recommendation: Open

4.2.2 Recommendation AIC 20-R16/20-1004 to Rural Airstrips Agency

On 12 August 2020, the PNG AIC issued the following recommendation:
The PNG Accident Investigation Commission (AIC) recommends that the Rural Airstrips Agency (RAA) should establish a set of procedures to properly identify hazards and manage risks associated to their operational activities considering to the highest possible extent, the principles of the Safety Management System provided by the International Civil Aviation Organization and those included in CAR Part 100.

Action requested
The AIC requests that RAA note recommendation AIC 20-R16/20-1004, and provide a response to the AIC within 90 days, but no later than 11/10/2020, and explain including with evidence how RAA has addressed the safety deficiency identified in Safety Recommendation AIC 20-R16/20-1004.

4.2.2.1 *RAA Safety Action*

On 4 December 2020, RAA responded to PNG AIC with a safety action plan that the RAA Management plan on taking to address serious aviation related safety incidents that involve the rural airstrips that are managed by the RAA.
RAA later responded on 15 December 2020 providing evidence of its approach in building its safety, health, environment and quality (SHEQ) Management System around CAR Part 100. This includes the identification of hazards and management of related risks associated with RAA's operational activities within RAA operations. RAA also stated that:
RAA will in future capture aviation related incidents differently from operations related workplace incidents and have it monitored through safety management systems, its recommended actions to ensure closure as part of its improvement processes in the way RAA does its business and operations.

PNG Accident Investigation Commission assessment of Rural Airstrip Agency response
On 9 March 2021, the AIC reviewed the safety action plan proposed by RAA to the AIC. According to AIC assessment, the approach that RAA is taking in building its SHEQ Management System in compliance with CAR Part 100, when fully implemented, should address the safety deficiencies identified by the AIC.
The AIC assigned this response as ***satisfactory*** rating and recorded the **Status of the AIC Recommendation: CLOSED RESPONSE ACCEPTED.**

Status of the AIC Recommendation: Closed

4.2.3 Recommendation AIC 20-R17/20-1004 to Mission Aviation Fellowship PNG

On 12 August 2020, the PNG AIC issued the following recommendation:
The PNG Accident Investigation Commission (AIC) recommends that Mission Aviation Fellowship PNG (MAF) should improve the hazard identification process and procedures, to ensure that hazards are captured and their associated risks managed, especially in the context of operations into advanced airstrips like Yenkisa.

Action requested
The AIC requests that MAF note recommendation AIC 20-R17/20-1004, and provide a response to the AIC within 90 days, but no later than 11/10/2020, and explain including with evidence how MAF has addressed the safety deficiency identified in Safety Recommendation AIC 20-R17/20-1004.

4.2.3.1 *MAF Safety Action*

On 10 November 2020, MAF informed the AIC of the safety action plan that has been taken to address the safety deficiency identified in Safety Recommendation AIC 20-R17/20-1004. MAF also provided documentary evidence of the safety actions taken.

PNG Accident Investigation Commission assessment of Mission Aviation Fellowship PNG response
On 9 March 2021, the AIC reviewed the MAF documents providing evidence to the AIC of the safety action taken. The AIC deems the evidence as *satisfactorily* addressing the safety deficiencies identified in the AIC Safety Recommendation AIC 20-R17/20-1004. The AIC assigned MAF response a **satisfactory** rating, and recorded the **Status of the AIC Recommendation: CLOSED RESPONSE ACCEPTED**

Status of the AIC Recommendation: Closed

4.2.4 Recommendation AIC 20-R18/20-1004 to Mission Aviation Fellowship PNG

On 12 August 2020, the PNG AIC issued recommendation AIC 20-R18/20-1004. Based on evidence provided by MAF PNG to the investigation following the initial issue of this Safety Recommendation, the Safety Deficiency to Safety Recommendation AIC 20-R18/20-1004 was revised on 9 March 2021.

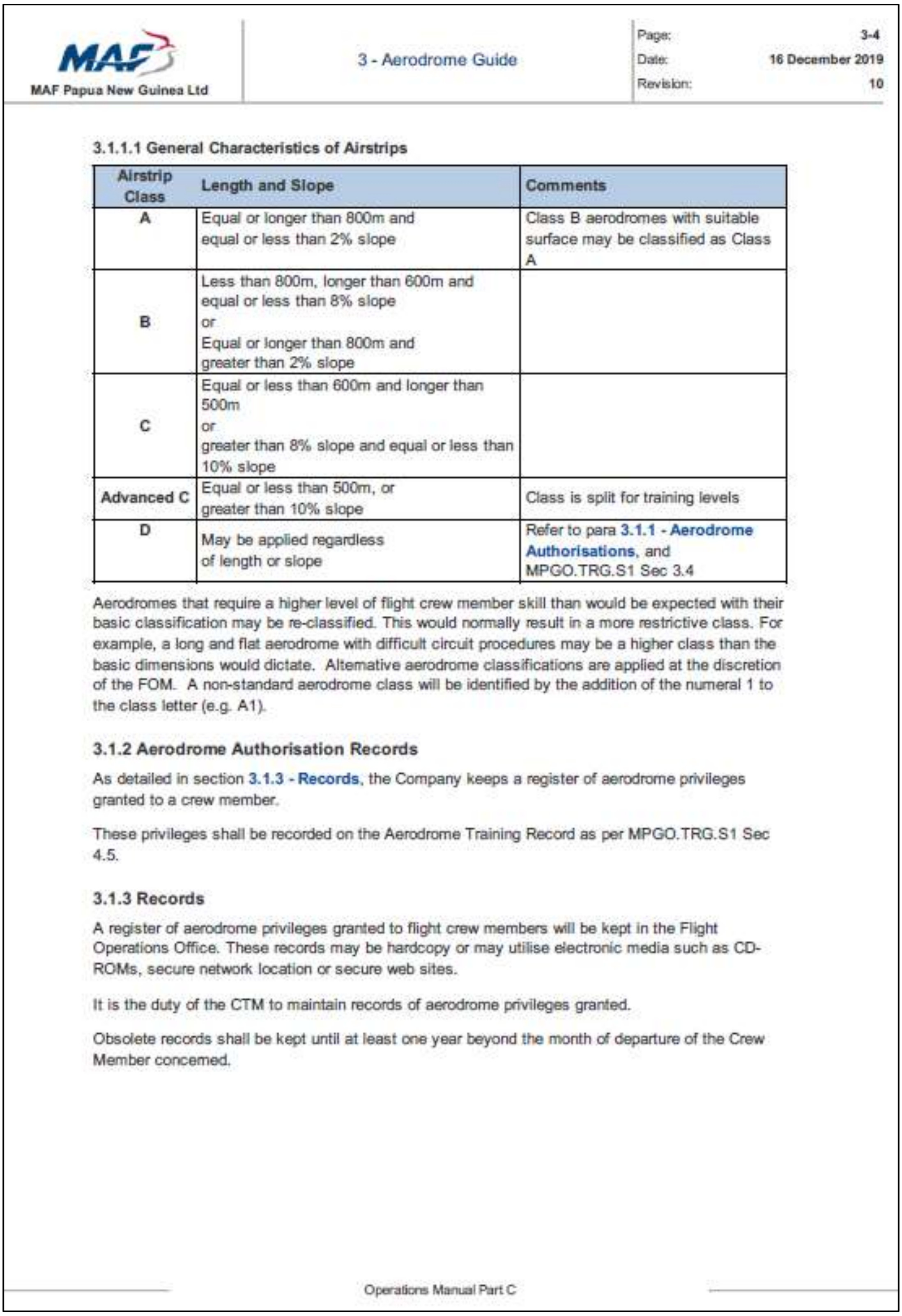
The PNG Accident Investigation Commission (AIC) recommends that Mission Aviation Fellowship PNG (MAF) should review and improve the procedures related to pilots' proficiency, to ensure proficiency is always maintained up to the required level to perform operations into advanced airstrips.

Action requested
The AIC requests that MAF note recommendation AIC 20-R18/20-1004, and provide a response to the AIC within 90 days, but no later than 07/06/2021, and explain including with evidence how MAF has addressed the safety deficiency identified in Safety Recommendation AIC 20-R18/20-1004.

Status of the AIC Recommendation: Open

5 APPENDICES

5.1 Appendix A: MAF Aerodrome Training Levels Table



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3.1.1.1 General Characteristics of Airstrips

Airstrip Class	Length and Slope	Comments
A	Equal or longer than 800m and equal or less than 2% slope	Class B aerodromes with suitable surface may be classified as Class A
B	Less than 800m, longer than 600m and equal or less than 8% slope or Equal or longer than 800m and greater than 2% slope	
C	Equal or less than 600m and longer than 500m or greater than 8% slope and equal or less than 10% slope	
Advanced C	Equal or less than 500m, or greater than 10% slope	Class is split for training levels
D	May be applied regardless of length or slope	Refer to para **3.1.1 - Aerodrome Authorisations**, and MPGO.TRG.S1 Sec 3.4

Aerodromes that require a higher level of flight crew member skill than would be expected with their basic classification may be re-classified. This would normally result in a more restrictive class. For example, a long and flat aerodrome with difficult circuit procedures may be a higher class than the basic dimensions would dictate. Alternative aerodrome classifications are applied at the discretion of the FOM. A non-standard aerodrome class will be identified by the addition of the numeral 1 to the class letter (e.g. A1).

3.1.2 Aerodrome Authorisation Records

As detailed in section **3.1.3 - Records**, the Company keeps a register of aerodrome privileges granted to a crew member.

These privileges shall be recorded on the Aerodrome Training Record as per MPGO.TRG.S1 Sec 4.5.

3.1.3 Records

A register of aerodrome privileges granted to flight crew members will be kept in the Flight Operations Office. These records may be hardcopy or may utilise electronic media such as CD-ROMs, secure network location or secure web sites.

It is the duty of the CTM to maintain records of aerodrome privileges granted.

Obsolete records shall be kept until at least one year beyond the month of departure of the Crew Member concerned.

Operations Manual Part C

5.2 Appendix B: MAF SOP – Approach Speeds

MAF Papua New Guinea Ltd. **Standard Operating Procedures – C208**

2.21.1. Approach Speeds

a. Speeds marked with an (*) in the expanded checklists are standard speeds for operations at MLW in calm conditions, and should be adjusted for weight and weather as required. Pilots shall fly the final approach at a Vref speed that is appropriate for the aircraft weight and which will support a stabilised approach. A controlled and more accurate landing will result.

b. The Reference Speeds Table situated in the Quick Reference Handbook (QRH) should be consulted for the appropriate Vref speed. This table is reproduced below.

Table Amendment 3 – May 2019

Weight kg	Vr30	Vx30	Vr20	Vx20	Voc20	Vx	Vy	Vref	Va	Vglide
3793	66	74	73	78	83	91	107	75	143	97
3700	65	73	72	77	82	90	106	74	143	96
3600	64	72	71	76	81	89	106	73	142	95
3500	63	71	70	75	80	87	106	72	141	93
3400	62	70	69	74	79	85	106	71	141	92
3300	62	69	67	73	77	84	106	70	140	91
3200	61	68	66	71	76	83	106	69	138	89
3100	60	66	64	70	75	81	105	68	137	88
3000	59	65	63	68	74	80	105	67	135	85
2900	58	64	62	67	73	79	105	65	135	84
2800	57	63	61	65	70	77	105	64	133	83
2700	56	62	60	64	69	76	105	62	131	81
2600	55	60	59	63	68	75	105	61	129	80
2500	54	59	57	62	67	73	105	60	126	78

Speed Reference Table

Note: Approach speeds below 70 kts are only recommended if landing performance is deemed critical.

c. For operations in gusty conditions, the approach speed may be increased by adding 50% of the gust speed. If wind shear is expected, an additional increase to the approach speed should also be considered.

d. If a higher approach speed is used, or if tail wind conditions exist, allowance must be made for the greater distance required to bring the aircraft to a stop.

e. The existing tailwind speed plus any extra applied speed increment above 80* kts must be added together and compared to landing penalty figures listed in the Route and Aerodrome Guide MPGO.RTE for the C208. If these are higher than the allowable wind penalty listed, the approach must be discontinued unless a lighter aircraft weight will allow a lower Vref speed to be used.

f. If a lower Vref speed is allowable due to a lower landing weight, this speed reduction in knots can be added to the wind penalty figure listed in the Route

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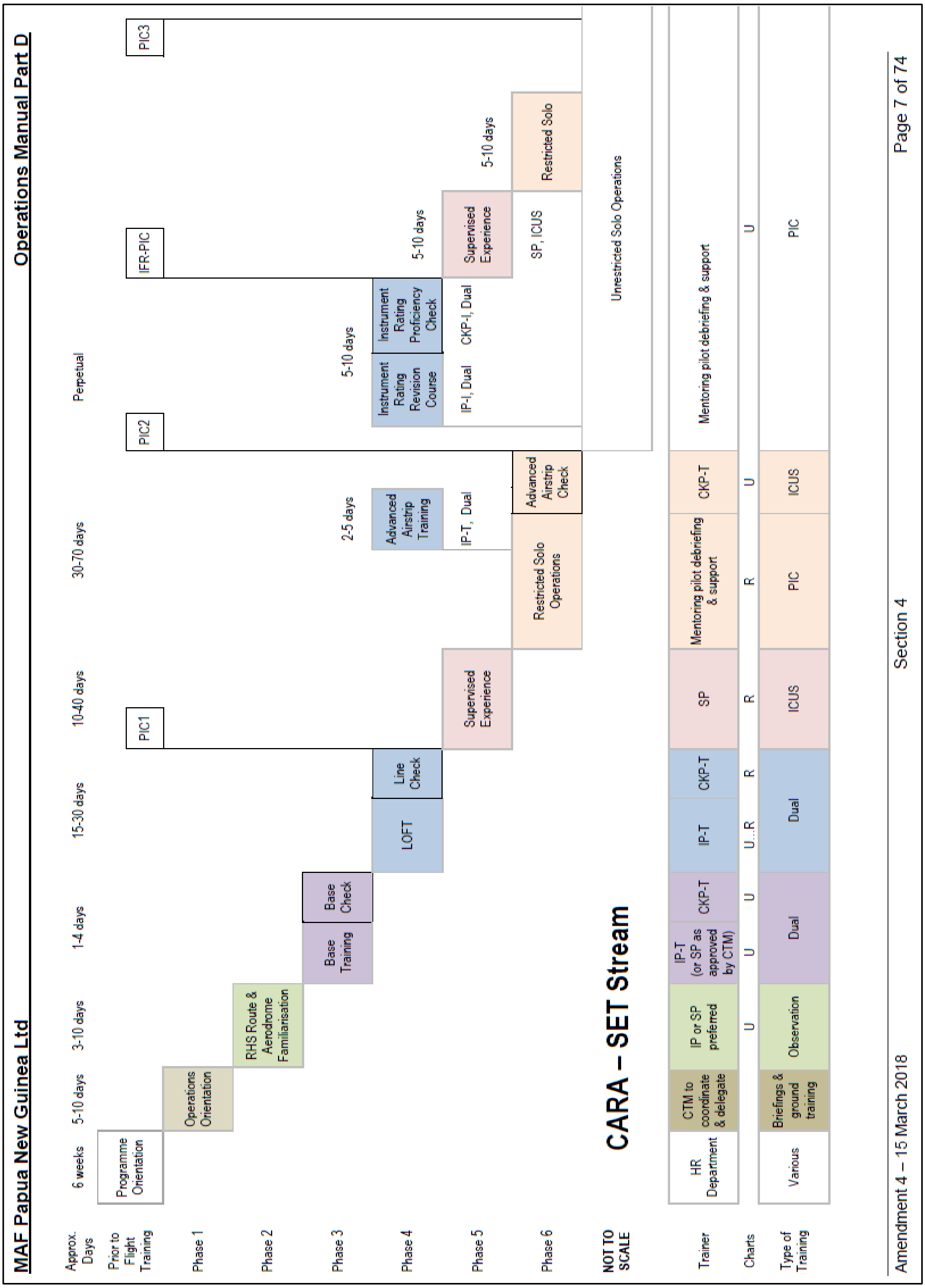
5.3 Appendix C: Country, Area, Route & Aerodrome Training Programme



5.4 Appendix D: Short Field Landing, Note 1

and Aerodrome Guide MPGO.RTE for the C208, and this higher tail wind speed can be accepted for the final approach and landing.

g. In order to be able to have enough energy to convert a normal approach into a climbing flare onto steeper strips, approach speed should be increased by adding one knot (IAS) per 1% slope above 5% slope.

2.21.2. Normal Circuit and Landing

a. Set HSI HDG bug on runway heading. HSI CDI should also be set to runway heading if GPS navigation is being used in OBS mode.

b. Enter the circuit at 1000 ft AGL with torque 700 - 900 ft-lbs, flaps 10°, and speed 100 kts.

c. Complete the "Pre Landing" Checklist while on downwind.

d. Abeam the touchdown point, reduce torque to ~450 ft-lbs and slow to 90 kts. Upon reaching the base turn position, select flaps 20°, smoothly roll into the base turn, and start to descend.

e. On base leg adjust the torque to maintain 90 kts or Vref + 10 kts until the turn onto final approach at 500 ft AGL.

f. Once established on final, reduce torque to ~300 ft-lbs, select flaps 30° and allow the speed to stabilize at 80* kts. Complete the Final Approach Checklist before 300 ft AGL.

Note: An asterix (*) Indicates airspeeds at MLW. To calculate the correct speeds for lower weights, refer to the reference speeds table in the Quick Reference Handbook.

g. At 10 ft commence the flare by smoothly reducing power to idle and raising the nose to gently touch the mains first. Having the aircraft initially trimmed (nose-up) so that control forces are reduced in the flare will assist with providing better feel and response.

h. After the main wheels touch down, gently lower the nose wheel onto the runway and then move the power lever to the beta range immediately to reduce ground roll. Use minimal braking as necessary for clearing the runway and/or stopping. Use beta range as necessary for normal taxi.

2.21.3. Short Field Landing

a. Refer to procedures specified on the MAF approved performance charts found in AFM Supplement 1003-002F01. Proceed as per the normal circuit and landing, above.

b. Once established on final, reduce torque to ~300 ft-lbs, select flaps 30° and establish a stabilised final approach speed based on the aircraft weight. Refer to the speed reference table available to the pilot in the cockpit. Determine a suitable aiming point to permit the aircraft to touch down at the required location, and complete the Final Approach Checklist before 300 ft AGL.

c. At 10 ft commence the flare by reducing power to idle (at a quicker rate than normal) and raising the nose for a positive touch down on the main wheels first.

d. After the main wheels touch down, lower the nose wheel onto the runway and then move the power lever to maximum beta/reverse as required to reduce ground roll. Use maximum braking as necessary without skidding. If reverse is used it should be deselected before the airspeed reduces below 25 kts. Use beta range as necessary for normal taxi.

Note: 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 kts, to avoid engine FOD.

Note: On airstrips with unknown or poor surfaces, use appropriate braking to reduce speed to a slow taxi speed as soon as possible

2.21.4. Soft Field Landing

a. Refer to procedures specified on the MAF approved performance charts found in AFM Supplement 1003-002F01. Proceed as per the normal circuit and landing, above.

b. Once established on final, reduce torque to ~300 ft-lbs, select flaps 30° and establish a stabilised final approach speed based on the aircraft weight. Refer to the speed reference table available to the pilot in the cockpit. Complete the Final Approach Checklist before 300 ft AGL. Trim the aircraft more nose-up than normal to reduce the control force required to hold the nose up in the landing flare.

c. At 10 ft commence the flare by smoothly reducing the power (at a slower rate than normal), raising the nose to allow the aircraft to fly parallel with the ground, and achieving a soft touch down.

d. After the main wheels touch down, hold the nose wheel off, until the aircraft slows, but gently lower it onto the runway before the tail stalls, to avoid it slamming down. Avoid beta range initially, to keep weight off the nose wheel. Avoid heavy braking. Use minimal braking as necessary for clearing the runway and/or stopping. Use beta range as necessary for normal taxi.

Note: On airstrips with unknown or poor surfaces, use appropriate braking to reduce speed to a slow taxi speed as soon as possible

2.21.5. Go-Around

a. Advance power lever smoothly to take-off target torque

b. Pitch nose up to an 8° to 10° attitude

c. Retract flaps to 20°

d. Climb away at 83 kts

e. Once all obstacles have been cleared, retract flaps fully and set climb power as per the standard departure profile.

5.5 Appendix E: Landing Distance Performance Chart with Cargo Pod Installed

CARGO POD INSTALLED

A39285

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
Cargo Pod Installed

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.	650	1500	675	1540	700	1580	720	1620	745	1660	770	1700
		1000	670	1540	700	1580	725	1620	750	1660	775	1705	800	1745
		2000	695	1580	725	1620	750	1665	775	1705	805	1750	830	1790
		3000	725	1620	750	1665	780	1710	805	1750	835	1795	860	1835
		4000	750	1665	780	1710	810	1755	835	1800	865	1845	895	1885
		5000	780	1710	810	1755	840	1805	870	1850	900	1895	925	1940
		6000	810	1755	840	1805	870	1850	900	1900	930	1945	965	1995
		7000	840	1805	870	1855	905	1905	935	1955	970	2000	1000	2050
		8000	875	1855	905	1905	940	1955	975	2010	1005	2060	1040	2105
		9000	905	1910	940	1960	975	2015	1010	2065	1045	2115	—	—
		10,000	945	1965	980	2015	1015	2070	1050	2125	1085	2180	—	—
		11,000	980	2020	1020	2075	1055	2130	1090	2185	1130	2240	—	—
		12,000	1020	2080	1060	2135	1095	2195	1135	2250	1175	2310	—	—

Figure 5-42. Landing Distance (Sheet 1 of 2)

CARGO POD INSTALLED

A39286

LANDING DISTANCE

7300 LBS AND 6800 LBS
SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES

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
7300	75	S.L.	610	1430	630	1465	655	1505	675	1540	700	1580	725	1615
		1000	630	1465	655	1505	680	1545	700	1580	725	1620	750	1655
		2000	655	1505	680	1545	705	1585	730	1625	755	1660	780	1700
		3000	680	1545	705	1585	730	1625	755	1665	780	1705	805	1745
		4000	705	1585	730	1625	755	1670	785	1710	810	1755	835	1795
		5000	730	1625	760	1670	785	1715	815	1755	840	1800	870	1845
		6000	760	1670	785	1715	815	1760	845	1805	875	1850	900	1895
		7000	785	1715	815	1765	845	1810	875	1855	905	1900	935	1945
		8000	820	1765	850	1815	880	1860	910	1910	940	1955	975	2000
		9000	850	1815	880	1865	915	1915	945	1960	980	2010	—	—
		10,000	885	1865	915	1915	950	1970	985	2020	1020	2070	—	—
		11,000	920	1920	955	1970	990	2025	1025	2075	1060	2130	—	—
		12,000	955	1975	990	2030	1030	2085	1065	2140	1100	2190	—	—
6800	72	S.L.	565	1360	585	1400	610	1435	630	1470	650	1505	670	1540
		1000	585	1395	610	1435	630	1470	650	1505	675	1545	695	1580
		2000	605	1435	630	1470	655	1510	675	1545	700	1585	725	1620
		3000	630	1470	655	1510	680	1550	700	1585	725	1625	750	1665
		4000	655	1510	680	1550	705	1590	730	1630	755	1670	780	1710
		5000	680	1550	705	1590	730	1630	755	1675	780	1715	810	1755
		6000	705	1590	730	1635	760	1675	785	1720	810	1760	840	1805
		7000	730	1635	760	1680	785	1725	815	1765	845	1810	870	1855
		8000	760	1680	790	1725	820	1770	845	1815	875	1860	905	1905
		9000	790	1725	820	1775	850	1820	880	1865	910	1915	—	—
		10,000	820	1775	850	1825	885	1870	915	1920	945	1970	—	—
		11,000	855	1825	885	1875	920	1925	950	1975	985	2025	—	—
		12,000	890	1880	920	1930	955	1980	990	2035	1025	2085	—	—

Figure 5-42. Landing Distance (Sheet 2 of 2)