FINAL REPORT

AIC 12-1003

PAPUA NEW GUINEA

ACCIDENT INVESTIGATION COMMISSION

FINAL REPORT

MAF-PNG

P2-MFV

Cessna Aircraft Company TU206G

Practice rejected takeoff – aircraft overturned

Simbari, Eastern Highlands Province

PAPUA NEW GUINEA

19 March 2012

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), Civil Aviation Rules 2004 (as amended), and the Commissions of Inquiry Act 1951 (as amended), and in accordance with Annex 13 to the Convention on International Civil Aviation.

The object 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.

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.)

However, it is recognised that an investigation report must include 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

The AIC did not conduct an investigation into this occurrence.

The investigation conducted by a team from the operator’s International organisation, MAF International (MAFI) who also prepared this report.

AIC comment

The AIC acknowledges the detailed investigation conducted by MAF International and has accepted the report as written.

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P2-MFV
Practice Rejected (Aborted) Take-off
19 March 2012

Accident Report
PNG report No.: 1366

Report Compiled by:
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P2-MFV - Practice Aborted Take-off Accident
19 March 2012

TABLE OF CONTENTS

P2-MFV - Practice Aborted Take-off Accident
19 March 2012

INTRODUCTION

During an airstrip checkout on 19 March 2012, the Instructor Pilot (IP) elected to perform a practice aborted (rejected) take-off. At approximately 1050 local time, during the aborted take-off on the slippery airstrip, the C206 failed to slow down in good time and, towards the end of the airstrip, the nosewheel and right main wheel dug into a somewhat softer area in the surface resulting in the aircraft overturning on to its back. The aircraft remained within the confines of the airstrip.

(Note: All times are PNG local time unless stated otherwise.)

1 FACTUAL INFORMATION

1.1 History of the flight

Prior to the day of the accident, the Crew Training and Competency Manager (CTCM) had sent an email (dated 15 March 2012) to the IP detailing what checks and training was necessary for the Pilot Under Instruction (PUI) to undertake in order to be checked out into specific steep airstrips (greater than 10% slope). This email specified the airstrips that should be used (a total of 4) and the minimum requirements for each check (3 or 4 take-off and landings plus one missed approach procedure). The IP also understood that the CTCM didn't want anything "half-checked".

On the morning of the accident flight, the IP and PUI discussed the plans for the day by phone prior to the flight from Mt Hagen to Goroka to position the C206 and IP for this training purpose. No discussion took place on the possibility of an aborted take-off.

The C206, P2-MFV, was fuelled in Goroka (total of 320 litres) and prepared prior to the training flight. Weight and balance calculations were performed along with a "tail push-down test". The CG was calculated to be just inside the forward limit.

The IP planned to perform a practice aborted take-off at one of the 4 airstrips in order to ensure the checkout was done "really completely". As a result, the IP planned to do this at the accident airstrip, Simbari, before moving on to another airstrip.

During the approximately 15 minute flight to Simbari, which was the first airstrip on the training flight, the IP and PUI reviewed the Aerodrome Chart noting the hazards (slippery when wet, sides of strip boggy when wet, and rough surface) and precautions (Line up on far right side of runway). After arriving overhead Simbari the pilots carried out a normal landing and take-off. They then did a low level circuit with normal landing and take-off, a low level circuit to a missed approach and then another normal circuit and landing. They did not shut down or enter the parking area on any of these landings, nor was any airstrip inspection on the ground performed or required.

Just before the first take off the pilots discussed the safe abort point for this airstrip. The PUI then included that in the pre-take off brief for each take-off. The PUI initially chose a tin roofed shed just after the slope change, about 30% along the length of the strip (approx. 150 metres from beginning of airstrip). This decision was based on the feeling that the location was about right for this airstrip. The IP however suggested that a fence post that was some 30 metres earlier be used as it gave better visibility down the slope and extra room to stop. This was agreed upon and used in the subsequent briefings.

At approximately 1050 local time, during the third take-off roll the IP called "Abort, Abort, Abort" to simulate an emergency, but called it 20 or more metres earlier than

the agreed abort point to ensure some extra buffer in case the PUI reacted slowly or incorrectly. This was approximately 75 metres from the take-off threshold.

The IP observed the PUI pulling the power immediately after the abort call and selecting flap up directly after that. However, no immediate braking could be felt. The aircraft proceeded to slide down the centre of the strip without slowing. The IP checked out the right window and could see the wheel locking and unlocking quickly, so determined that the PUI was braking correctly.

About half way down the steepest part of the strip the IP recalled the PUI asking if they were going to stop in time. The IP checked the brake pedals to ensure proper braking, but could feel the PUI still pumping the brakes so did not think any further action was required. The IP did not consider adding power for a take-off attempt as they were well down the strip and past the briefed abort point.

At some point the aircraft started to drift right and the IP felt that it might drop off the side of the airstrip down a large bank if they continued in that direction. The IP told the PUI to put in left rudder to try to turn it back to the left. At this time, the PUI thought he relinquished control of the aircraft to the IP, but this was not verbalised and the IP did not recognise that this had taken place. However, the IP put in left rudder to counteract the movement to the right. The aircraft turned at least 30 degrees left and then began tracking back towards the centre of the runway, sliding sideways at the same time.

The aircraft began slowing more quickly, but the right main wheel and the nose wheel rolled onto some softer ground and dug in quickly. The aircraft then tipped forward onto its nose until the right wing touched the ground, and it continued over onto its back. The crew were both left hanging in their 4-point seatbelts.

After the IP and PUI released their seatbelts, the PUI turned the fuel selector to off, master off and then opened the door. The magnetos were also turned off, but neither pilot can recollect who performed this action. Several people had already arrived at the aircraft and tried to assist the crew in getting out. After the crew exited the aircraft, the IP tried to get everyone to move back because of the potential of a fire, but could not be heard over the loud noise from the crowd.

After a few moments the pilots calmed the crowd, moved them back from the aircraft and quickly checked for fire. They then gave a short prayer of thanks and asked the people to move back and preserve the witness marks on the ground.

The IP went back into the aircraft and managed to call Moresby on the HF radio to advise them of the situation. The IP then tried calling the MAF bases at Goroka and Mt Hagen but could not get an answer, so shut down the power, checked that the fuel was selected off and that there was no danger of fire. The crew then walked to the nearby health centre to make use of their HF radio to contact MAF Goroka.

Following the accident event, the PNG programme management stood down (from flying duties) and reassigned the IP to maintenance duties until after an upcoming furlough. This was done as per MAFI requirements and also to allow the IP time to recover from recent events. PNG programme management, in consultation with the Regional Director, took efforts to communicate to all pilots that this action was not taken as a punitive measure.

1.2 Injuries to persons

Nobody was injured.

1.3 Damage to aircraft

The aircraft became inverted and was substantially damaged in the accident.

P2-MFV - Practice Aborted Take-off Accident
19 March 2012

1.4 Other Damage

None

1.5 Personnel Information

1.5.1 Pilot in Command/ Instructor Pilot (IP)

a. Class 1 medical valid to 09 August 2012 (medical check on 30 January 2012, CAR 67.57 applies for medical prior to expiry date)
b. Total aeronautical experience 12130.6
   - Total time in PNG approximately 7562
   - Total time on C206 variants 10510.4 (10334.9 PIC) (not including C207 or C210)
c. Recent Experience (last 30 days)
   - Total 80.0 (at the time of the accident)
   - On type 74.2
   - 96 minutes flight time and four landings on 19 March 2012 prior to the incident
d. Last check flights
   - 25 May 2011 – C206 IP training successfully completed with "MAF Standard" in all sections
   - May/June 2011 – C208 Conversion course and supervised flying
   - 04 August 2011 - C206 Examiner pilot training
   - 20 August 2011 - C206 recurrency
   - 17 October 2011 - GA8 recurrency
   - 13 January 2012 – C208 Base Check
   - 23 January 2012 – C208 Line Check
   - Under type currency rules meets requirements for single engine piston ops with a check required 17 April 2012
e. Current for part 135 operations in accordance with MPO01.B.02 §6.8 requiring 20 hours in the last month and 60 hours in the 90 days for VFR pilots.
   - Also current in accordance with CAR 61 and Part 135.
   - Company authorisations PIC 3 and IP 22 on 206 current for the operation to 31 March 2013 and 30 March 2013 respectively
f. Recent duty time
   - Start of duty on 19 March 2012 0630
   - 78.4 hours (previous 14 days)
   - 35.5 hours (previous 7 days)
   - Off duty previous day
   - Off duty (in last 7 days) 12,16 & 18 March
g. Experience at Simbari
   - Evidence is available of the IP being checked into Simbari
h. Recent occurrences
   - The PIC was recently involved in a C208 hard landing event on 5 March 2012. The initial report into this event concluded that the pilot started the approach too high resulting in a high level of descent and airspeed below V ref in the final stages. The aircraft was at an unacceptable high rate of descent and low airspeed immediately prior to the touchdown. This resulted in bending one gear leg of the C208. The IP felt that the C208 training had been rushed even though the training received was in line with other pilots. The training records indicated that the IP struggled with certain aspects of the conversion to the turbine aircraft, including airspeed control and rate of descent during approach. It was recommended that the pilot undertake remedial training prior to returning to active flight status on this aircraft type. The pilot had not flown the C208 since the hard landing event.

i. Instructor Pilot (IP) training
   - The IP first obtained a Right Hand Seat Company approval in 2001 at a course based in Mt. Hagen and a PNG aviation authority check in February 2002. This allowed the IP to perform route and airstrip checks on pilots.
   - Between 3 August 2005 and 29 August 2005 the IP received company instruction in Mt Hagen and was approved for initial in-country training of new pilots. Aborted take-offs were discussed at every strip covered in normal route and strip training, and demonstrated at some depending on the level of PNG experience of the trainee.
   - The IP did some training in Mt Hagen in November 2009 toward E32 approvals. The training notes recommended that the IP complete some supervised flying when acting as IP due to the lack of IP experience since initial qualification. The AD formal IP standardisation course held in Mareeba did not exist at this time.
   - The IP completed the Check Pilot Module of the IP course in Mareeba, Australia in May 2011. The course was the final IP module due to the previous training the IP had already completed. This training consisted of a short ground school followed by a series of flight training exercises. Specific information on aborted take-offs was not given during this training, although it was covered in other modules.
   - The IP completed a C208 conversion course during June 2011 and was approved for unrestricted operations in January 2012.

1.5.2 Pilot under Instruction (PUI)

a. Class 1 medical valid to 09 April 2012
b. Total aeronautical experience 3116.1
   - Total time in PNG 539.1
   - Total time on type 235.7 (PIC 180.6 ICUS 55.1) (small amount of 206 time prior to PNG not included here)
c. Recent Experience (last 30 days)
   - Total 65.3
   - On type 65.3
   - 54 minutes flight time and three landings on 19 March 2012 prior to the incident
d. Last checked
   - 30 November 2011 Base check
   - 16 December 2011 pre-solo check
   - This flight was for check in to some class D strips listed with a 150 hour PIC requirement
e. Current for part 135 operations in accordance with MPO01.B.02 §6.8 requiring 20 hours in the last month and 60 hours in the 90 days for VFR pilots.
   - Also current in accordance with CAR 61 and Part 135.
   - Company authorisations PIC 1 on 206 current for the operation to 31 December 2012
f. Recent duty time
   - Start of duty on 19 March 2012 - 0700
   - 71.5 hours (previous 14 days)
   - 41.5 hours (previous 7 days)
   - Off duty previous day
   - Off duty (in last 7 days) 16 & 18 March
g. This was the first time into Simbari for the PUI in the C206. He had been into Simbari multiple times as First Officer (F/O) on the Twin Otter, but never as pilot flying in accordance with MAF requirements on F/O as pilot flying.

P2-MFV - Practice Aborted Take-off Accident
19 March 2012

1.6 Aircraft Information

a. TU206G P2-MFV
b. Total airframe hours 18409.6
c. Landings since last inspection 147
d. Last inspection Check 1 due 18384.3 signed off as complete but no record of aircraft hours or date of the inspection
e. Next inspection Check 3 was due 18434.3 hours.
f. EDM MEL cat D item due 20 May 2012
g. Configuration
   i. The aircraft departed Goroka at 1460 kg (the maximum permitted weight was 1633 kg) and forward centre of gravity (within range)
   ii. On final take-off from Simbari the aircraft was down to about 1427 kg CG still forward within limits.

1.7 Meteorological information

Heavy rain had fallen overnight at the airstrip. The PUI said that it had drizzled at the airstrip on the morning of the accident and that there was light drizzle during day of the accident. Visibility was good, and it was a fairly bright day with a medium level overcast layer with a broken layer along the ridge above the airstrip. No record was made of other conditions.

1.8 Aids to Navigation

None available.

1.9 Communication

The aircraft HF radio was used to communicate to another location about the accident, but transmissions could not reach the other bases at Mt Hagen or Goroka.

A 406 Mhz ELT was installed on the aircraft, but did not activate during the accident event. It would not have been expected to activate due to the lack of excessive longitudinal deceleration.

Communication with the main base to alert management of the event was established through the use of a mission based HF radio.

1.10 Aerodrome information

1.10.1 General Details

a. S 006° 57.75' E145° 38.76'
   The airstrip is defined by edge markers that were placed at arbitrary distances from the end of the airstrip. It had last been inspected on the 8th March 2012.
b. Current data from Route & Aerodrome Guide (issue G 07.09.11)
   i. 487m x 30m - 10.1% slope - One way landing 07; elevation 3400
   ii. Cautions of
   - Surface rough & slippery when wet.
   - Sides of strip boggy when wet. Centre is firm.
   - Line up on far right side of runway

   iii. Comments of
   - 44m of very rough landing overrun (in addition to runway length)
   - undershoot: there are 24m of "strip" available with a 2 degrees slope before threshold

c. Penalties for TU206
   i. unrestricted penalties of N for landing and N for take-off
   ii. restricted penalties of N-5 for landing and N for take-off
d. Observations
   The runway was generally firm, but slippery. During a visit by the Chief Pilot earlier in the morning, it was noted that the slippery condition was significant when entering the parking bay and noticeable when lining up for take-off.

1.10.2 Airstrip History

a. The airstrip is serviced frequently by MAF, especially during the coffee season
   i. 104 landings total in the 2010-11
   ii. 35 landings in TU206 in 2010-11
b. Current knowledge
   In the previous couple months the Goroka area had experienced a dry period, lasting for a couple weeks. This had changed in the last week or so before the accident to a more normal pattern of mixed rain and sun, although from the previous Friday there had been more rain and cloud than the average for the week.

1.11 Flight Recorders

None – the EDM-700 (Engine Data Management system), which has the capacity to monitor and record 24 engine parameters was flagged as unserviceable and no information could be obtained relating to the accident.

1.12 Wreckage and impact information

1.12.1 Airstrip Marks and Surface (See Appendix)

Airstrip marks show that during the abort process, the airplane turned a little left, then right, then back to the left. At the point where the aircraft was turned towards the left this last time, the tracks indicate that the aircraft rotated around the yaw axis such that the right wing was leading. This is evidenced by the tracks as the nose wheel track converges and then merges with the left main wheel track. At this time, while the aircraft rotated, the resultant aircraft direction of travel did not immediately change.

Only during the last few meters did the aircraft direction of travel begin to change back to the left, towards the centre of the strip. At this point the aircraft encountered a soft spot on the runway. Up until this point the runway had been firm, but slippery. The runway suddenly and noticeably became much softer toward the end of the airstrip. It is difficult to quantify surface strength, but while the spot where the aircraft dug in was soft, it was not to the extent that normal foot prints left substantial marks.

The significant sideways drag – significant because the nose wheel and left main were carving only one track – was sufficient with the aircraft residual momentum to cause the aircraft to over-turn. The quantity of dirt collected by the right side of the nose wheel, compared to the absence of dirt on the left side, confirms the level of drag and angle of travel at the time the aircraft turned over.

Ground marks indicated that the propeller was still rotating until, and perhaps briefly after, the first blade contacted the ground. All three blades showed evidence of low power contact with the ground. Two blades showed significant bends towards the rear of the aircraft. The third blade showed evidence of having travelled through the ground for up to approximately one third of its length from the tip in towards the hub. This blade may have bent slightly forward at a point close to the hub. There was also a clear ground mark from the nose cone that appears to show rotation at entry as opposed to a straight penetration mark.

Pivot points were initially the nose and right main wheels, but as the aircraft continued over the pivot points transitioned to the aircraft nose and right main wing tip. Damage to the left wing strut and tip indicated that at some point after the aircraft was inverted it rolled to put stress on that wing.

1.12.2 Aircraft Damage

During the flip-over, all four extremities of the aircraft contacted the ground, causing varying degrees of damage:

- Propeller blades bent likely requiring replacement of at least two blades and the hub. Engine will therefore require complete disassembly and inspection following a propeller strike event.
- Left wing tip leading edge damaged just past second rib inboard. Left lift-strut bent.
- Right wing leading edge outboard damaged significantly. Lower surface skins all wrinkled; rear spar inboard section "Z"-bent, causing fuel leak
- Upper cabin roof wrinkled at 45°
- Vertical tip/beacon area broken/tip of rudder broken.
- Tail cone, just below the dorsal fin, bent and twisted skin and stringers.

1.13 Medical and pathological information

No medical conditions affected the pilots performance.

1.14 Fire

No fire occurred.

1.15 Survival aspects

Both pilots were secured using a 4-point restraint system. No injuries were sustained in the accident. The pilots exited the aircraft through the main front door without difficulty even though the aircraft was inverted.

1.16 Tests and research

None carried out

1.17 Organisational and management information

1.17.1 Use of Safety Management System (SMS) and Quality Management System (QMS)

The Chief Pilot was no longer involved in the Safety Action Group (SAG) as it was felt that aviation issues were not being discussed. In addition, he could not always have attended the meetings as he was located at Goroka away from the main base (Mt. Hagen) much of the time. Aviation issues that were logged into the AIRS system were not being brought to the SAG and only general Health and Safety issues were being discussed.

[Note: A more detailed report is being made separately concerning the safety culture within PNG and the Asia-Pacific region as a whole.]

1.17.2 Training Standards and Manuals

PNG

There are currently no standards or company procedures in the Training and Competency Manual for the checking of pilots into more severe airstrips (slopes exceeding 10%, short, etc.). No lesson plans or flight forms are required and the

actual training undertaken is normally left to the individual IP. Because of recent previous events, the CTCM was actively monitoring all flight training activities.

The CTCM, Chief Pilot, and AD are responsible for managing the pilot training process according to the Training and Competency Manual and for identifying and certifying MAF approved Instructor Pilots.

The practice of simulating aborted take-offs on steep airstrips (normally more than 4%, although not explicitly defined) was not officially restricted or sanctioned within the Training and Competency Manual. Several IPs were performing these on the "150 hour" airstrip checkout. It is not known how the practice of doing aborted take-offs on steep airstrips was first initiated. The CTCM and Chief Pilot were unaware that these practice aborts were taking place.

The PNG Operations Manual (MPGO.01) issued on 3 March 2012 indicates that a Wind LASSO tool (Wind, Length, Altitude, Slope, Surface, Obstructions) is required for landing and take-off in PNG. The CTCM stated that these principles had been incorporated into the operations for some time. However, in face-to-face interviews with several pilots including those who have been in the programme for many years, none of them were aware of this standard.

The Pilot Training and Development Manager said that only half of the IPs in PNG had done the basic Instructor Pilot course in Mareeba. All new IPs had received this training, but it had not been possible for all of the existing IPs who had been trained in the country to undertake this due to capacity limitations. There was no central IP standardisation and recurrency training.

Mareeba Flight Training Centre and MAFI

The Mareeba Flight Training Centre provides a standardisation course for all new pilots to the region. The centre provides classroom training on Safe Abort Points (SAPs) and hands out briefing notes to the delegates. Some actual SAPs are calculated and carried out within the flight elements of the training, but there is no dedicated SAP session where more detailed aborts and analysis are done.

The briefing notes for operations at advanced airstrips are given to pilots who attend the standardisation training that the PUI had attended. SAPs are discussed in the notes along with a chart demonstrating SAPs for a typical 500m airstrip. The chart indicates that the SAP for an airstrip with 10% slope that is wet is zero metres from brake release. Formulas are given to determine the performance check point, but no mathematical formulas are used to help determine the SAP.

The briefing notes further state: "When the SAP is well passed, **or on a steep slippery airstrip**, an aborted take-off and emergency stop should only be considered for an obviously serious problem i.e. a loud noise alone is probably not sufficient reason to abort unless an extreme emergency is supported by other evidence of imminent engine failure such as engine surge, flames, major fuel flow fluctuations, or another major problem such as loss of controllability."

Pilots new to MAFI are taught to use the Wind LASSO acronym for assessing an airstrip prior to landing, but there is no specific risk assessment tool or principle in MAFI as a whole that is used to assess the hazards and risks associated with the take-off.

1.18 Additional Information

1.18.1 Training Culture

The PNG programme was undertaking a high level of training due to the need for pilots to be trained on several types, and the low number of pilots available to meet

the operational needs. The PUI felt that the IP was feeling the pressure to complete the "150 hour" check-out so that more airstrips were available for the use of the PUI.

1.18.2 PIC designation

On the Daily Flight Record, the PUI is identified as being the PIC. MAF PNG standards require the IP to act as PIC on all training and checking flights.

2 ANALYSIS

The final stage of the accident sequence was set in motion once the IP elected to do a practice aborted take-off, on a steep, short airstrip with a wet slippery surface.

Once the IP called the abort during the take-off roll the aircraft, in the circumstances, was unlikely to be brought successfully to a safe stop in the runway length available. Even though there was some confusion over who was acting as PIC, complete control of the aircraft does not seem to have been lost during the event. Had the aircraft remained upright, it was more likely than not to have either gone off the edge or over the end of the airstrip.

The contributing factors that led up to the final stage, however, are systemic MAFI organisational issues that may also have a detrimental impact on other operational activities. Therefore, the analysis will place special emphasis on these factors in order that the greatest benefit is gained from the lessons learned as a result of this accident.

2.1 Crew Actions

2.1.1 Requirement for Practice Aborted Take-offs

The IP thought aborted take-offs were necessary for a complete checkout into steep airstrips, because he had not been instructed otherwise. It was difficult to determine how this practice was initiated in the programme. The fact that some other IPs were apparently doing the same would have reinforced to the IP that the check was necessary in spite of not having been explicitly instructed to do so.

The lack of any definitive guidance or policy with regard to the practice of aborted take-offs prevented the IP from having a bench-mark for normal checking and training in this area and left him vulnerable to making errors. The fact that aborted take-offs were practiced in other checks and training would have enhanced the IPs understanding that these were required.

More regular formal meetings or communication with all of the IP team together in PNG to discuss roles and plans could have enabled the training management team to pick up on any discrepancies and more risky manoeuvres that may have crept in.

A recurrency approval process for all IPs at the Mareeba Training Centre would have enabled a more effective learning process to take place on new and upcoming standards and training practices.

At the same time, however, a lack of defined standards for training on procedures that had an elevated level of risk contributed to the inability of the training management team to effectively guide the IPs. Although, some standards did exist for certain training activities, these were not broad enough to cover all high risk events such as aborted take-offs.

The lack of a robust SMS and safety culture that proactively sought to identify possible hazards and manage the associated risks would have contributed to the inability of management to see the hazards of some training operations. A robust

SMS and hazard management system could have identified the hazards; the appropriate team could have assessed the associated risks, and put in place corrective actions to reduce them to an acceptable level.

2.1.2 Safe Abort Point (SAP)

The SAP selected was inappropriate for the airstrip conditions and environment. Although the PUI had selected a highly inappropriate SAP and the IP then selected one closer to the beginning of the airstrip, this SAP was still not correct for the airstrip conditions. The actual SAP was at brake release as identified in an example in the briefing notes. The IP did not have ready access to these notes as they were not received during the training in Mareeba. However, because of the standardisation training, the PUI could have identified the SAP as being at brake release, but did not do so. This was due to previous experiences at this airstrip and a feeling that the SAP was about right for the circumstances. In any case, there appears to have been a disconnect between the actual airstrip conditions and the training the PUI received on SAPs.

The lack of a dedicated SAP training session during the standardisation course in Mareeba may have reduced the effectiveness of the transfer of learning. The briefing notes did not demonstrate the basis for calculating an SAP, did not factor in reaction time or slipperiness, and did not demonstrate required acceleration and braking distances. Neither were any standards established as to the required margin when planning for stopping during an aborted take-off. Therefore, the SAP was a subjective assessment based on pilot experience and open to error as demonstrated by both pilots in this case. In addition, on this airstrip, no predetermined set markers or physical points were present to help the pilots identify exact distances in determining SAPs in less severe conditions.

Therefore, the pilots did not have the information or skills necessary to help manage the hazards and associated risks in a more effective way when selecting the SAP.

2.1.3 Hazard Assessment and Management

A practice aborted take-off was commenced without the associated hazards being fully assessed even though the crew were aware of some of the airstrip hazards (i.e. wet surface, steep and short airstrip). They did nothing to consciously assess and manage those hazards because no established standard hazard assessment was in place for take-offs. In addition, because the IP had not briefed the PUI to expect a practice abort, the PUI was in no position to assess the associated hazards and challenge the wisdom of doing one. When the IP called the abort he did not precede it with the word "practice" as the standard required. The PUI was left with no choice but to reject the take-off accepting that it was real.

The Wind LASSO tool in MAFI is used for assessing hazards prior to landing at an airstrip, but there is no similar hazard and risk management process used for take-off. Even though this tool is required in PNG, it was not used by the crew and its use is not consistent throughout the programme or in MAFI.

In addition, there was no guidance material or standards regarding hazard and risk management in the training and operational manuals. Although the hazard and risk assessment concepts are in the Health and Safety Manual and in other training material, this had not been explicitly translated into the flight operation practices. Consequently, the aircrew had no expectation to perform a hazard assessment and management process prior to each take-off.

2.2 *Training Standards*

2.2.1 IP Training and Checkout

The decision by the Mareeba Training Centre to give the IP the final module was based on the significant length of time as an IP and previous IP training. No consideration was made for recurrency or refresher training on policies and procedures that may have been incorporated since the IP was first approved. As a result, the checkout given to the IP at Mareeba did not include critical information about SAPs on steep airstrips.

The IP completed the checkout in May 2011 and then immediately went into the C208 conversion in PNG which was completed in June 2011. Within a short period of time, the IP was having recurrency checks on the C206 and GA8 aircraft. The multiple checks and training on 3 aircraft types within a short period of time (2 to 3 months) did not give the IP sufficient time to consolidate the training that had taken place. There is evidence to suggest that this contributed to the C208 heavy landing in March 2012. Similarly, the lack of time to consolidate the IP training principles from Mareeba may have contributed to the accident event.

2.2.2 Training and Standards Manuals

The PNG Training and Standards Manual does not have any policies with regard to performing aborted take-offs from steep airstrips. Although the Chief Pilot and CTCM did not want them practiced on steep airstrips, this was not policy or understood by all IPs. Nor are there any explicit standards within the MAFI Asia Pacific region regarding this practice, including the rationale and learning objectives for doing them. The only reference is in the briefing notes for new pilots which shows a chart illustrating the various SAPs for slope and airstrip conditions.

Normally, for any formal instructional period, lesson plans are used to ensure that students are aware of expectations and topics to be covered. Therefore, lesson plans help prevent surprises and give the PUI an opportunity to challenge or query any proposed training. Since this did not happen, the PUI was denied the opportunity to have input into aborted take-off practice at an early stage.

There is a discrepancy in the training process and procedures between the PNG programme and MAFI as illustrated by the Wind LASSO requirements. This will lead to confusion and an overall loss of learning transfer in the procedures that are required.

2.3 *Other Related Issues*

2.3.1 Forward CG

The aircraft loading with a forward CG increased the potential for it to flip-over (especially on a steep downslope) and have less effective braking. This does not seem to have been understood by the crew as no action was taken to reduce this potential (such as loading ballast in the rear of the aircraft to bring the CG more central). In the end, it is likely that the forward CG contributed to the loss of effective braking, the propensity for the nosewheel to dig in on the soft surface patch, and the flip-over at the end of the event.

2.3.2 Decision to Stand Down the IP

In spite of efforts by the PNG management, the decision to remove the IP from flight duties for an extended period of time was seen by several staff members as punitive action. Therefore, staff could perceive that a robust just culture is not being fostered.

3 CONCLUSIONS

3.1 Cause-Related Findings

3.1.1 Standards

1. There was no clear policy in MAFI regarding when practice aborted take-offs were to be performed.
2. There was no MAFI AP requirement for each IP to complete a training course in Mareeba or undertake comprehensive MAFI recurrency training.
3. Policies were lacking with regard to the routine monitoring of and communication with IPs.
4. All high risk training events were not clearly identified and, therefore, managed.
5. A comprehensive informal hazard and risk assessment tool was not used for take-off such as the Wind LASSO tool.

3.1.2 Training

1. No clear understanding of the rationale for actually doing a real or practice abort existed.
2. Comprehensive methods on the calculations of SAPs for take-offs during training were not illustrated effectively, resulting in the pilots' inability to know how to apply real acceleration and stopping distances.
3. There was a lack of time allowed for the IP to consolidate the training received.
4. Lesson plans were not used to guide all key training events.

3.1.3 Management

Conclusions relating to management are covered comprehensively in the "Safety Culture Review" document.

3.1.4 Individual

An aborted take-off was performed without a full assessment and appreciation of the associated hazards and risks.

3.1.5 Forward CG

The forward CG contributed to both the lack of effective braking and the aircraft nosing over.

4 SAFETY RECOMMENDATIONS

P2-MFV - Practice Aborted Take-off Accident
19 March 2012

5 Appendix