

FINAL
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KOMITE NASIONAL KESELAMATAN TRANSPORTASI

Aircraft Serious Incident Investigation Report

**PT. Enggang Air Service
Grand Caravan C-208B; PK-RSC
Mulia Airport, Papua
Republic of Indonesia
09 September 2014**



KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA
2015



This final report was produced by the Komite Nasional Keselamatan Transportasi (KNKT), 3rd Floor Ministry of Transportation, Jalan Medan Merdeka Timur No. 5 Jakarta 10110, Indonesia.

The report is based upon the investigation carried out by the KNKT in accordance with Annex 13 to the Convention on International Civil Aviation Organization, the Indonesian Aviation Act (UU No. 1/2009) and Government Regulation (PP No. 62/2013).

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ABBREVIATIONS AND DEFINITIONS

AGL	:	Above Ground Level
AMA	:	Associated Mission Aviation
AOC	:	Air Operator Certificated
ATPL	:	Air Transport Pilot License
CASR	:	Civil Aviation Safety Regulation
COM	:	Company Operating Manual
CPL	:	Commercial Pilot License
DGCA	:	Directorate General Civil Aviation
ft	:	feet
ICAO	:	International Civil Aviation Organization
IIC	:	Investigator in Charge
Km	:	Kilometer(s)
KNKT / NTSC	:	<i>Komite Nasional Keselamatan Transportasi</i> / National Transportation Safety Committee
Kts	:	Knot (s)
lbs	:	Pounds (s)
NM	:	Nautical mile(s)
POH	:	Pilot Operating Handbook
SOP	:	Standard Operating Procedure
USA	:	United States of America
UTC	:	Universal Time Coordinate
VFR	:	Visual Flight Rule
VOR	:	Very high frequency Omnidirectional Range
WIT	:	<i>Waktu Indonesia Timur</i> / Eastern Indonesian Standard Time

INTRODUCTION

SYNOPSIS

On 9 September 2014 an aircraft Cessna C208B, registration PK-RSC was being operated by PT Enggang Air Service for an unscheduled flight route from Sentani Airport to Mulia Airport, which conducted under Visual Flight Rule (VFR) and the Pilot in Command (PIC).

The aircraft was airworthy and flown within the weight and balance envelope, and there was no abnormality on the systems and or others until the time of the occurrence.

Before the aircraft join the initial approach pattern to Mulia the pilot was able to contact with Mulia AFIS and received information include that on the final and gap area which was about 2 nm of runway 08 were clear and the wind was westerly 8 knots.

The Mulia Airport was located at approximately 5,500 feet of elevation and 10% up slope runway which normally covered by clouds during the afternoon hours.

According to the pilot interview, the approach crew briefing and the approach check list was performed prior to land on runway 08, no traffic on the ground and the runway was clear. The landing procedures were completed at about 6000 feet (approximate 500 feet Above Ground Level), and the aircraft aligned with the runway.

The aircraft touched down within the touchdown point of runway 08, then bounced and floated. After second touchdown the aircraft started to veer to the left, the pilot recovered by the applying reverse thrust and brake, however the aircraft continued veered to the left.

The aircraft stopped on the left side of the runway with left main and nose landing gear damaged and sunken into soft soil.

The engine shutdown and the passengers disembark the aircraft normally. No persons injured in this occurrence.

The investigation concluded that the contributing factors of this serious incident were;

- The illusion of the runway condition resulted to the pilot misinterpret the situation and late to flare on touchdown and bounced.
- The recovery action performed by the pilot resulted to the force that moved the aircraft further to the left and difficult to recover back to the runway centerline.

At the time of issuing this draft final investigation report, the Komite Nasional Keselamatan Transportasi (KNKT) has been informed of safety actions resulting from this occurrence.

Includes in this final report, the KNKT issued several safety recommendations to address the safety issues identified in this final report to PT. Enggang Air Service to ensure that pilots performs correctly the standard call out and the implementation of COM Chapter 6 page 6-48, and to review the cornering landing technique and ensure that the pilots had well understand and sufficient skilled to this particular cornering technique. KNKT also recommended the Directorate General of Civil Aviation (DGCA) to oversight the implementation of the recommendation addressed to PT. Enggang Air Service.

1 FACTUAL INFORMATION

1.1 History of the Flight

On 9 September 2014 an aircraft Cessna C208B, registration PK-RSC was being operated by PT. Enggang Air Service for an unscheduled flight route from Sentani Airport to Mulia Airport – Papua.

Aircraft departed Sentani Airport at 0230 UTC¹ (11.30 LT) and cruised at 10,000 feet. The flight was estimated to arrive at Mulia Airport at 0345 UTC (1245 LT). The flight was conducted under Visual Flight Rule (VFR). On this flight the Pilot in Command (PIC) acted as Pilot Flying (PF) and the First Officer acted as Pilot Monitoring (PM). This flight was the second flight for the Pilot in Command (PIC) to Mulia.

The aircraft was airworthy prior to the occurrence and was operated within the weight and balance envelope, and there was no abnormality reported prior to the time of the occurrence. On board on this flight were 11 occupants included two pilots.



Figure 1: Archive photo of aircraft involved

During descend; prior to join the initial approach pattern of Mulia Airport, the pilot contacted the Mulia AFIS (Aerodrome Flight Information Services) controller. The Mulia AFIS controller informed that the visibility on final and gap area up to 2 Nm to runway 08 was clear and the wind was westerly 8 knots.

The Mulia Airport situated in mountainous area with airport elevation approximately 5.500 feet and one way runway operation due to the final area and runway slope condition of 10% up. The landing performs on runway 08 and takeoff on runway 27. The weather phenomenon was that the airport normally covered by ground fog on the early morning and cumulus clouds builds up on the afternoon.

¹ The 24-hour clock used in this report to describe the time of day as specific events occurred is in Coordinated Universal Time (UTC). Local time for Papua is Waktu Indonesia Tengah (WIT) is UTC + 9 hours.

According to the pilot interview, the pilot approach briefing and the approach check list has been performed prior to land on runway 08. The landing procedures were completed at about 6000 feet (approximate 500 feet Above Ground Level), and at that point the aircraft aligned with the runway. There was no traffic on the ground and the runway was clear.

The aircraft touched down within the touchdown point of runway 08, bounced then floated and started swing to the left. At the second touched the PF pushed the control column and applied full right rudder following by the application of reverse thrust and brake. The aircraft continued veered to the left. The aircraft stopped on the left side of the runway with left main and nose landing gear damaged and sunken into soft soil.

After the aircraft stop, the pilot shut down the engine and the passengers disembark normally. No persons injured in this occurrence.



Figure 2: The aircraft at the occurrence site

1.2 Damage to Aircraft

An observation showed that all propeller blades twisted, left main landing gear damaged. Part of the aircraft belly scratched and dent.



Figure 3 : Damage to the aircraft

1.3 Personnel Information

1.3.1 Pilot in Command

Gender	: Male
Age	: 46 Years
Nationality	: Philippines
Marital status	: Married
Date of joining company	: 29 July 2013
License	: Air Transport Pilot License (ATPL)
Date of issue	: 04 September 2014
Aircraft type rating	: Single Engine Land (SE Land)
Instrument rating	: 30 April 2015
Medical certificate	: First Class
Last of medical	: 14 April 2014
Validity	: 25 October 2014
Medical limitation	: Holder Shall Posses Glasses That Correct For Near Vision
Last line check	: 22-24 August 2014
Last proficiency check	: 21 September 2014
Flying experience	
Total hours	: 12,763 hours 19 minutes
Total on type	: 2,933 hours 45minutes
Last 90 days	: 135 hours 30 minutes
Last 60 days	: 80 hours 08 minutes

Last 24 hours : 07 hours 10 minutes
This flight : 01 hours 12 minutes

1.3.2 Second in Command

Gender : Male
Age : 36 Years
Nationality : Korean
Marital status : Single
Date of joining company : 01 February 2013
License : Commercial Pilot License (CPL)
Aircraft type rating : Single Engine Land (SE Land)
Instrument rating : 31 March 2015
Medical certificate : First Class
Last of medical : 02 September 2014
Validity : 01 March 2015
Medical limitation : nil
Last proficiency check : 29 March 2014

Flying experience

Total hours : 951 hours 10 minutes
Total on type : 649 hours
Last 90 days : 210 hours
Last 60 days : 133 hours
Last 24 hours : 07 hours 10 minutes
This flight : 01 hours 12 minutes

1.4 Aircraft Information

1.4.1 General

Registration Mark : **PK-RSC**
Manufacturer : Cessna Aircraft Company
Country of Manufacturer : United States Of America
Type/ Model : C208B Grand Caravan
Serial Number : C208B-2330
Year of manufacture : 2011
Certificate of Airworthiness
Issued : 09 May 2014

Validity	:	08 May 2015
Category	:	Normal
Limitations	:	None
Certificate of Registration		
Number	:	3065
Issued	:	09 October 2013
Validity	:	08 October 2014
Time Since New	:	2,765.18 hours
Cycles Since New	:	3,612 cycles
Last Major Check	:	Propeller 100 Hrs and Annual Inspection on 18 August 2014

1.4.2 Engines

Manufacturer	:	Pratt & Whitney
Type/Model	:	PT6A-114A
Serial Number engine	:	PCE-PC1921
▪ Time Since New	:	2,765.18 hours
▪ Cycles Since New	:	3,612 cycles

1.4.3 Propellers

Manufacturer	:	MC CAULEY
Type/Model	:	3GFR34C703
Serial Number propeller	:	110989
▪ Time Since New	:	2,765.18 hours
▪ Cycles Since New	:	3,612 cycles

1.4.4 Weight & Balance

Maximum allowable take-off weight	:	8,750 lbs
Actual take-off weight	:	8,710 lbs
Maximum allowable landing weight	:	8,500 lbs
Actual landing weight	:	8,310 lbs
Fuel at take off	:	1,115 lbs
Flight planned fuel burn	:	400 lbs
Fuel at landing	:	715 lbs

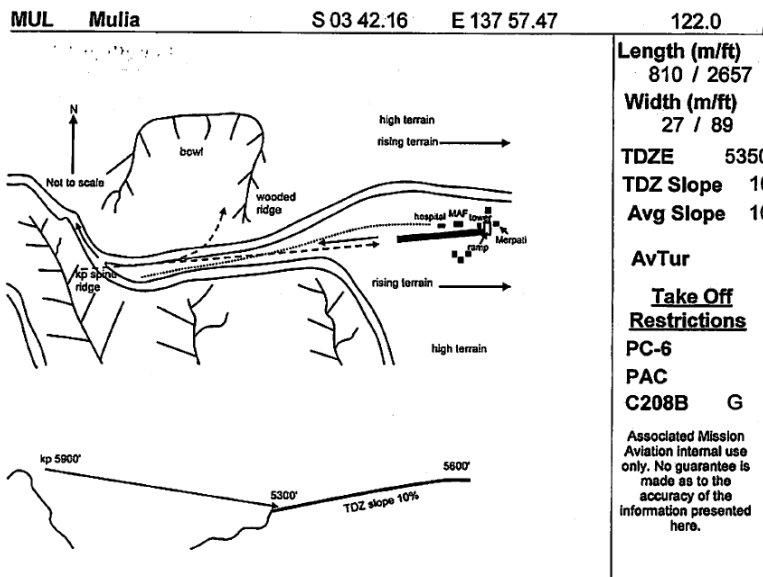
1.5 Meteorological Information

Weather Report for Mulia Airport, issued 9 September 2014, at 0330 UTC as follows:

Wind : Westerly / 08 knots
Visibility : 5 Km
Present Weather : NIL
Cloud base : 3/8 CU SC 8000 ft
Remark : Gap area up to final open

1.6 Aerodrome Information

Airport Name : Mulia Airport
Airport Identification : WAJM / LII
Airport Operator : DGCA
Coordinate : 3° 42' 16S 137° 57' 47E
Elevation : 6,527 ft AMSL
Runway Direction : 08-26
Runway Length : 810 m
Runway Width : 27 m
Surface : Asphalt



The runway slope is 10%

Surface
 Asphalt; hard and rough; side slope from the bottom to middle.

Obstacles
 Dangerous lip between overrun and approach end of runway.

Weather & Wind
 Early morning fog and low clouds common; normally open for the rest of the day. Can have strong upvalley winds midday with some down drafts on short final, but not normally a problem.

Aborted Landing
 3/4 mile final (5700'), left turn out into bowl.

Aborted Take Off
 100-150m into takeoff roll. Continue straight off lower end.

Hazards
 Possible sun/shadow problems 06:15 - 07:00. When clouds and sun on approach make sure runway is in sight before committed to land. Lip where asphalt begins at TDZ.

Remarks

Last Updated 12/18/09

Figure 4: Aerodrome chart issued by Associated Mission Aviation (AMA)

This aerodrome chart was published by Associated Mission Aviation (AMA) for internal purposes. This was not official guidance published by the government, however it has been believed by most of the pilots operated in Papua area that the chart published by AMA was accurate.

Significant information from the picture above are:

- The runway slope was 10° up from runway 08.
- Weather phenomenon
- Aborted landing procedure.

1.7 Flight Recorders

The aircraft was not fitted with a flight data recorder or cockpit voice recorder. Neither recorder was required by current Indonesian aviation regulations.

1.8 Wreckage and Impact Information

The illustration of the impact information based on the marks signed on the surface of the runway.

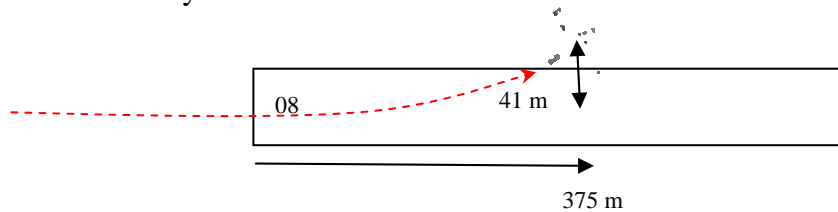


Figure 5: Sketch of the occurrence

1.9 Medical and Pathological Information

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

1.10 Fire

There was no evidence of fire in-flight or after the aircraft impacted terrain.

1.11 Survival Aspects

All crew and passengers conducted the evacuation procedure them self.

1.12 Tests and Research

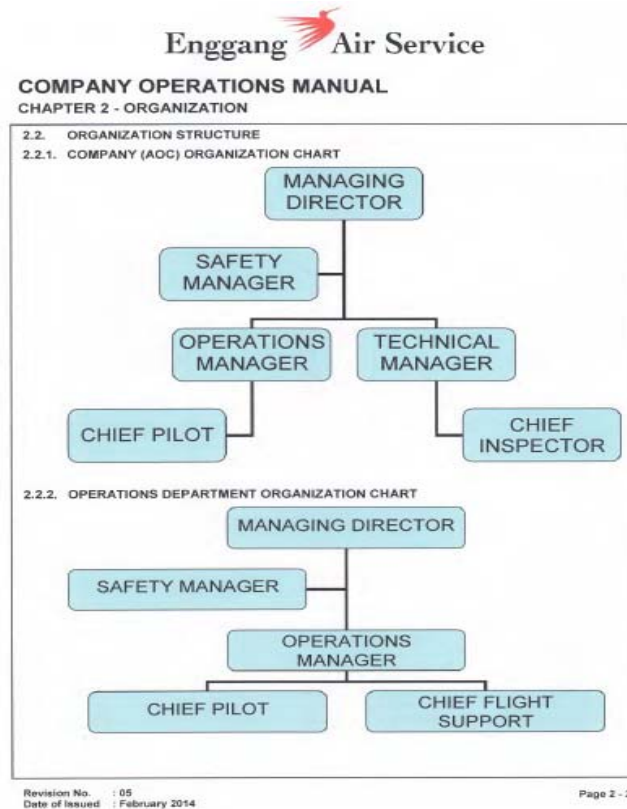
No test and research are needed in this occurrence.

1.13 Organizational and Management Information

Aircraft Owner	:	Cessna Finance Export Corporation
Address	:	100 North Broadway, Suite 600 Wichita
Aircraft Operator	:	PT. Enggang Air Service
Address	:	Halim Perdanakusuma International Airport, Terminal Building 2 nd Floor No. A14 PK, Jakarta 13610
Certificate Number	:	AOC/135-045

1.13.1 The organization structure

The organization structure for several key personnel is shown in following picture.



1.13.2 Policy and Regulation

The Company Operating Manual Chapter 6 page 6-48 stated that, *should circumstances prevent such stability is achieved before reaching 500 feet, then it must be realized that safe continuation of the approach to landing becomes questionable. Vital factors such speed descend rate, threshold height and point of touchdown can all be adversely influenced.*

COMPANY OPERATION MANUAL
CHAPTER 6 – COMPANY POLICY AND REGULATIONS

In a "see to land" concept, it is understandable that a pilot wishes to make the transition from instrument guidance to ground visual as early as possible.

Although the approach lights may often be in sight before DH is reached, the visibility may decrease or fluctuate during the remainder of the approach.

Misjudgment of visual cues or deviations from the intended flight path through outside causes (e.g. wind shear) can best be detected by reference to the flight instruments.

It is therefore strongly recommended that the PF cross-checks/monitors the instruments, also passing MDA/DH until a safe landing is assured. As already mentioned that in the beginning of this paragraph, the PNF will have his/her attention focused mainly on the outside world.

500 Feet Call

To provide protection against subtle incapacitation, a 500 feet call shall be included in the final part of each approach. The call shall be made by the PNF and be responded by PF.

Considering the purpose of the call, it will be clear that it is not meant to be a precision call. The call will be made with reference to the radio altimeter or if this is impracticable due to underlying terrain, with reference to the pressure altimeter. When the latter is the case, the subject shall be discussed during the crew briefing.

When no radio altimeter is carried, reference should be made to the pressure altimeter.

Approach Stability

Early stabilization on the final approach path with respect to glide path and centerline is considered essential.

At not less than 500 feet above threshold elevation this flight path stabilization must also be accompanied by a basic stability of speed and thrust, thus ensuring that any disturbing influence or deviations in the latter stage of the approach can be readily recognized and rapidly corrected. Should circumstances prevent such stability is achieved before reaching 500 feet, then it must be realized that safe continuation of the approach to landing becomes questionable. Vital factors such as speed, descent rate, threshold height and point of touchdown can all be adversely influenced.

On short or wet runways such factors become of paramount importance. It is therefore strongly recommended that no landing be attempted if the desired stabilization has not been achieved when passing 500 feet above threshold elevation.

It will be self evident that the basic principles outlined in the preceding paragraph presuppose the availability of accurate glide slope and localizer guidance.

However, should such guidance not be available and a non-precision type approach executed, the basic principles remain unchanged.

Their achievement merely demands a higher order of pre-approach planning and calculation (e.g. drift angles, rate of descent, etc.) so that basic data are available to the pilot when judging the degree of approach stability being achieved.

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Figure 6: Shows the requirement of stability at 500 feet above the threshold elevation (red box)

1.14 Additional Information

1.14.1 Crew Resource Management

The Good CRM pattern is techniques that help build habit pattern on the flight deck are discussed, situational awareness and communication are stressed.

The Situational Awareness or the ability to accurately perceive what is going on in the flight deck and outside the airplane, requires ongoing monitoring, questioning, crosschecking, communication, and refinement of perception.

1.15 Useful or Effective Investigation Techniques

The investigation was conducted in accordance with the KNKT approved policies and procedures, and in accordance with the standards and recommended practices of Annex 13 to the Chicago Convention.

2 ANALYSIS

The analysis part will discuss the relevant issues resulting in the runway excursion involving a Cessna C208B on 9 September 2014, registration PK-RSC aircraft. The investigation determined that there was no issue related to the aircraft and all systems were operating normally. The analysis will therefore discuss on the following issues:

- Runway alignment
- Landing Roll Cornering Technique

2.1 Runway alignment

The Company Operating Manual Chapter 6 page 6-48 stated that, *should circumstances prevent such stability is achieved before reaching 500 feet, then it must be realized that safe continuation of the approach to landing becomes questionable. Vital factors such speed descend rate, threshold height and point of touchdown can all be adversely influenced.*

On short or wet runways such factors becomes of paramount. It is therefore strongly recommended that no landing be attempted if the desired stabilization has not been achieved when passing 500 feet above threshold elevation.

The standard call out by one pilot may be able to develop awareness of the other pilot. The Pilot Monitoring shall call any standard position call such as 1000 feet or 500 feet AGL, or if any deviations from standard such as higher speed, misalign from the centre line, etc.

The missed of the standard call out might have led to the one pilot focus on one task while another pilot did not remind any deviation.

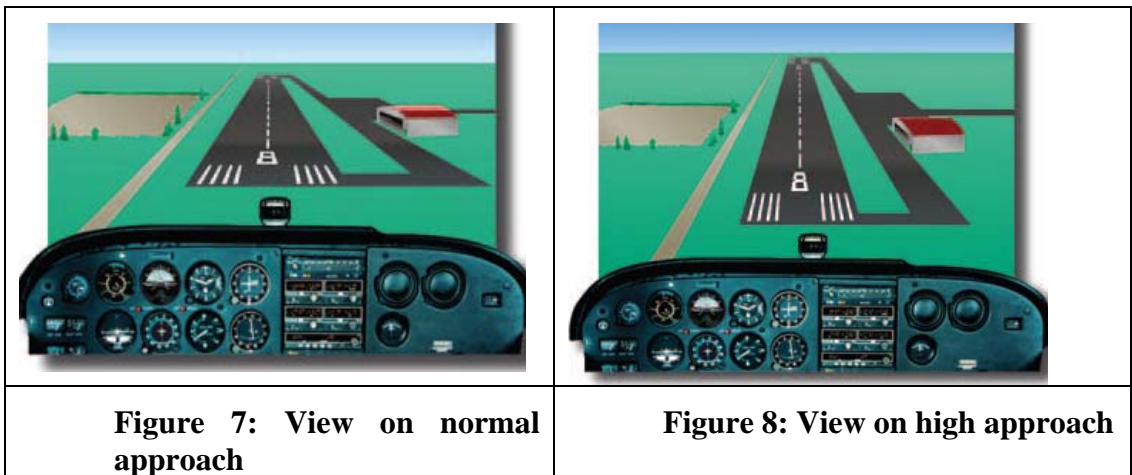
The standard call out also might have made effective CRM. A good CRM pattern is techniques that help build habit pattern on the flight deck are discussed, situational awareness and communication are stressed. The Situational Awareness or the ability to accurately perceive what is going on in the flight deck and outside the airplane, requires ongoing monitoring, questioning, crosschecking, communication, and refinement of perception.

During the final approach, the aircraft did not align with the runway. The miss of the standard call out might have made the PF did not aware of it and focused to land the aircraft.

2.2 Landing Roll Cornering Technique

According to the pilot interview, the aircraft touched down within the touchdown point of runway 08, bounced then floated. When the aircraft touched it started drift to the left.

The bounced was possibly due to the runway illusion to the pilot as the runway slope was 10%. The illusion was the aircraft felt like higher approach angle than normal approach. This may result to late flare out for touchdown.



To recover the condition, at the second touched the PF pushed the control column down and applied full right rudder followed by the application of reverse thrusts and brakes. The aircraft continued yaw to the left.

Examinations of the side force energy and several sequences of events prior to the aircraft stop it found that, after touched down the aircraft veered to the left and the pilot applied brake and reverse thrust. These two actions resulted backward moment (force) while the aircraft moved to the left. The resultant of the backward moment and side movement resulted to the force further to the left.

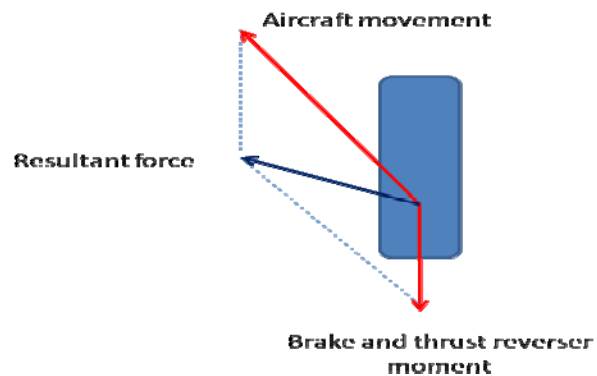


Illustration of the forces applied to the aircraft.

All the forces applied to the aircraft have made the aircraft moved further to the left and difficult to recover back to the runway centerline. This situation would be worst on slippery runway.

3 CONCLUSIONS

This part should list the findings and the causes established in the investigation. The conclusions are drawn from the analysis. However, it is essential to maintain the same degree of certainty in a conclusion as was established in the analysis. For example, if the discussion in the analysis indicates that an event or circumstance was likely, then the finding should contain the same qualifier (likely).

3.1 Findings

According to factual information during the investigation, the National Transportation Safety Committee founded any initial findings as follows:

1. All crew have valid licenses with current type rating and valid medical certificates.
2. The aircraft was airworthy prior to the occurrence.
3. PT. Enggang Air Service for an unscheduled flight route from Sentani Airport to Mulia airport
4. The Pilot in Command (PIC) acted as pilot flying (PF) while the Second in Command (SIC) acted as Pilot Monitoring (PM).
5. Aircraft departed from Sentani at 0230 UTC and estimate time of arrival Mulia Airport at 0345 UTC.
6. Conducted a Visual Flight Rule (VFR) and it was the second time for the PIC to Mulia.
7. On the final and gap area which was about 2 nm of runway 08 were clear and the wind was westerly 8 knots.
8. The Mulia airport elevation is 5,500 feet and the runway slope is 10%.
9. No traffic on the ground and the runway was clear.
10. The landing procedures were completed at about 6,000 feet (approximate 500 feet Above Ground Level), and the aircraft aligned with the runway.
11. The aircraft touched down on runway 08, then bounced and floating and started swing to the left.
12. At the second touched the PF pushed the pitch down and applied full right rudder following by the application of reverse thrusts and brakes but the aircraft continued yaw to the left.
13. The aircraft stopped on the left side of the runway with left main gear and nose gear damaged and submerged into mud grass.
14. The engines were shutdown normally and the passengers disembark from the aircraft normally.
15. No persons injured in this occurrence

3.2 Contributing Factors²

- The illusion of the runway condition resulted to the pilot misinterpret the situation and late to flare on touchdown and bounced.
- The recovery action performed by the pilot resulted to the force that moved the aircraft further to the left and difficult to recover back to the runway centerline.

² “Contributing Factors” is defined as events that might cause the occurrence. In the case that the event did not occur then the accident might not happen or result in a less severe occurrence.

4 SAFETY ACTION

At the time of issuing this final report, the Komite Nasional Keselamatan Transportasi (KNKT) had been informed of any safety actions resulting from this occurrence.

4.1 PT. Enggang Air Service

As for improvement program the operator prepares some Action plans which is leaded by the operation manager and the detail of such action plans are as follows:

- The route manual is reviewed
- Applying 300 hours of minimum flying hour on mountainous area, as requested by DGCA prior to be programmed for captain.
- All the candidates captain should perform the performance reviewed prior to be re planning for captaincy training.
- All instructors will be refreshed towards the SOP acknowledgment start 18 September 2014.

5 SAFETY RECOMMENDATIONS

According to factual information and findings, the Komite Nasional Keselamatan Transportasi (KNKT) issued safety recommendations to address safety issues identified in this report.

5.1 PT. Enggang Air Service

- a. The missed of the standard call out as required by the COM might cause less of effectiveness of the goals of such statement on COM as well as cause the pilot kept to land un align aircraft with the runway, as such the KNKT recommends that the operator should ensure that pilots performs correctly the standard call out and the implementation of COM Chapter 6 page 6-48.
- b. Examinations of the side force energy and several sequences of events prior to the aircraft stop found that, when reverse being applied the aircraft start veer off to the left. The pilot reaction to these moments was applying the reverse thrust and breaks intermittently but the aircraft kept move to the left. As such the KNKT recommends that the operator has to review the cornering landing technique and ensure that the pilots had well understand and sufficient skilled to this particular cornering technique.

5.2 The Directorate General of Civil Aviation (DGCA)

Consider to the recommendations address to PT. Enggang Air Service, the Komite Nasional Keselamatan Transportasi (KNKT) recommends to the DGCA has to ensure that the aforesaid recommendations are well implement.