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**NATIONAL
TRANSPORTATION
SAFETY
COMMITTEE**

Aircraft Accident Investigation Report

PT. Lion Mentari Airline (Lion Air)

PK-LFI

Boeing 737-900ER

Sultan Kasim Syarif II Airport, Pekanbaru

Riau

Republic of Indonesia

14 Februari 2011



**NATIONAL TRANSPORTATION SAFETY COMMITTEE
MINISTRY OF TRANSPORTATION
REPUBLIC OF INDONESIA
2013**

This Final report was produced by the National Transportation Safety Committee (NTSC), 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 NTSC 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. 3/2001).

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GLOSSARY OF ABBREVIATIONS

AFM	:	Airplane Flight Manual
AGL	:	Above Ground Level
ALAR	:	Approach-and-Landing Accident Reduction
AMSL	:	Above Mean Sea Level
AOC	:	Air Operator Certificate
ATC	:	Air Traffic Control
ATPL	:	Air Transport Pilot License
ATS	:	Air Traffic Service
BMKG	:	<i>Badan Meterologi Klimatologi dan Geofisika</i> (Metrological Climatologically and Geophysical Agency)
°C	:	Degrees Celsius
CASO	:	Civil Aviation Safety Officer
CASR	:	Civil Aviation Safety Regulation
CPL	:	Commercial Pilot License
COM	:	Company Operation Manual
CRM	:	Cockpit Recourses Management
CSN	:	Cycles Since New
CVR	:	Cockpit Voice Recorder
DFDAU	:	Digital Flight Data Acquisition Unit
DFDR	:	Digital Flight Data Recorder
DGCA	:	Directorate General of Civil Aviation
FL	:	Flight Level
F/O	:	First officer or Copilot
FDR	:	Flight Data Recorder
hPa	:	Hectopascals
Hrs	:	Hours
ICAO	:	International Civil Aviation Organizationn
IFR	:	Instrument Flight Rules
IIC	:	Investigator in Charge
ILS	:	Instrument Landing System
Kg	:	Kilogram(s)
Km	:	Kilometer(s)
Kt	:	Knots (nm/hours)
Mm	:	Millimeter(s)
MTOW	:	Maximum Take-off Weight

NM	:	Nautical mile(s)
NOTAM	:	Notice to Airman
KNKT (NTSC)	:	<i>Komite Nasional Keselamatan Transportasi</i> (National Transportation Safety Committee)
PIC	:	Pilot in Command
QFE	:	Height above airport elevation (or runway threshold elevation) based on local station pressure
RESA	:	Runway End Safety Area
RPM	:	Revolution per Minutes
R/W	:	Runway
S/N	:	Serial Number
SSCVR	:	Solid State Cockpit Voice Recorder
SSFDR	:	Solid State Flight Data Recorder
TS/RA	:	Thunderstorm and rain
TSN	:	Time since New
TT/TD	:	Ambient Temperature/Dew Point
TTIS	:	Total Time in Service
UTC	:	Universal Time Coordinate
VFR	:	Visual Flight Rules
VMC	:	Visual Meteorological Conditions

INTRODUCTION

SYNOPSIS

On 14 February 2011, a Boeing 737-900 aircraft registration PK-LFI operated by PT. Lion Mentari Airlines as flight number LNI 392 departed from Soekarno-Hatta Airport, Jakarta (CGK / WIII) to Sultan Syarif Kasim II Airport, Pekanbaru (PKU/WIBB).

The pilot made holding and waited for weather improvement and decided to continue approach after the weather improved to above the minima for landing.

At 14.20 UTC (21.20 LT) the aircraft landed at Sultan Syarif Kasim II Airport, Pekanbaru. The weather condition was rain and the runway was wet. Prior to land, the Tower controller gave clearance to land and informed that the wind was calm, while the pilot saw the wind condition on the Flight Management Computer (FMC) was tail wind up to 11 knot. The aircraft overrun and stop at the stop way with the right main wheels tricked at the corner of the stop way.

The passengers evacuated normally via passenger stair and no one injured.

The examination on the runway found rubber deposit and several spots of standing water up to 3 cm depth.

The FDR data revealed that the aircraft reached the target of deceleration until the thrust reversers stowed at 1000 feet remaining runway length available when the aircraft speed approximately 70 knots.

The investigation concluded that the aircraft was decelerated according to the preselected value until the thrust reversers stowed which was known at the last 1000 feet of the runway available and the aircraft speed approximately 70 knots. According performance calculation the aircraft should be able to stop on the remaining runway available. The failure of the aircraft to stop most likely due to the significant deterioration of both the runway friction and brake effectiveness as result of the existing of the combination of the rubber deposit and water spots.

Following this investigation, NTSC issued several safety recommendations to the DGCA, PT. Angkasa Pura II and the aircraft operator.

1 FACTUAL INFORMATION

1.1 History of the Flight

On 14 February 2011, a Boeing 737-900 aircraft registration PK-LFI operated by PT. Lion Mentari Airlines as flight number LNI 392 departed from Soekarno-Hatta Airport, Jakarta (CGK / WIII) to Sultan Syarif Kasim II Airport, Pekanbaru (PKU / WIBB). The aircraft taxi out from Soekarno-Hatta Airport at 1233 UTC¹

The persons on board in this flight were 219 and consisted of 7 crewmember (2 pilots and 5 flight attendants), 209 adults and 3 infant passengers.

While on route to Pekanbaru, the pilot received information from Jakarta Control controller that the weather at Pekanbaru was heavy rain with ground visibility 1 Km.

While approaching Pekanbaru, the pilot saw on the weather radar that the Cumulonimbus cloud formation was over KAMPA holding point. The pilot decided to wait for the weather improvement and made holding at 5000 feet on radial 181 and 20 Nm from PKU VOR to avoid the CB cloud.

During holding, the Tower controller informed that the visibility was 1 Km. The pilot saw the wind velocity indicated on the AFIS was up to 50 knots. After completed 2 holding patterns, the weather was improving and ground visibility increases to 3 Km which was higher than the minima for ILS approach. The pilot decided to make ILS approach RW 36 and descend to 2500 feet.

During approach on long final runway 36, the aircraft was entering the Cumulonimbus. The aircraft flew out of the cloud just before intercept the glide slope and runway was insight. The Tower controller gave clearance to land and informed that the wind was calm. At that time, the pilot saw a head wind condition of 11- 12 knots on the Flight Management Computer (FMC).

The aircraft landing weight was 66,066 kg. The landing configuration was used flap 40 and the auto brake at position 3. At 1420 UTC (2120 LT) the aircraft landed on runway 36. The pilot performed normal procedure by selecting engine thrust reverser, checked the automatic deployment of ground spoiler and auto-brake operation.

The pilot felt no significant deceleration. At below speed 90 knots the pilot applied manual brake up to maximum. The aircraft stop on the stop way on approximately heading 320 with right main wheel on the right side of the

¹ The 24-hours clock in Universal Time Coordinated (UTC) is used in this report to describe the local time as specific events occurred. Local time is UTC+7 hours

pavement.

After the aircraft stop, the PIC gave command to flight attendants “Attention crew on station”. After received the command, all flight attendants checked the outside condition through the viewing windows. The PIC then gave further command “the aircraft is under control”.

The pilot contacted the Tower controller and informed that the aircraft has stop out of runway and request for assistant. After waited for approximately 20 minutes, all passengers disembarked through the front passenger door used the passenger stair.

No one injured in this serious incident.

1.2 Injuries to Persons

Table 1: Injuries to persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/ None	7	212	219	-
TOTAL	7	212	219	-

1.3 Damage to Aircraft

The aircraft suffer minor damage.

1.4 Other Damage

There was no other damage in this serious incident.

1.5 Personnel information

1.5.1 Pilot in command

Gender : Male
Date of birth : 30 November 1973
Nationality : Indonesian
Date of joining company : 18 November 2005
License : ATPL
Valid to : 28 February 2011
Aircraft type rating : B737-200/300/400/500; B737-900 ER
Instrument rating valid to : 10 Augustus 2010
Medical certificate : First Class (Class 1)
Date of medical : 10 August 2010
Valid to : 10 February 2011
Last proficiency check : 29 September 2010
Flying experience
Total hours : *not provided by operator*
Total on type : *not provided by operator*
Last 90 days : 226 hours 49 minutes
Last 30 days : 93 hours 54 minutes
Last 24 hours : 4 hours 40 minutes

1.5.2 Co-pilot

Gender : Male
Date of birth : 09 July 1976
Nationality : Indonesia
Date of joining company : 1 September 2004
License : CPL
Valid to : 31 May 2011
Aircraft type rating : MD 80/90; B737-300/400/500;
B737-900ER

Instrument rating valid to	:	31 May 2011
Medical certificate	:	First Class (Class 1)
Date of medical	:	18 January 2011
Valid to	:	18 July 2011
Last proficiency check	:	14 May 2010
Flying experience		
Total hours	:	<i>not provided by operator</i>
Total on this type	:	<i>not provided by operator</i>
Last 90 days	:	282 hours 39 minutes
Last 30 days	:	108 hours 24 minutes
Last 24 hours	:	04 hours 40 minutes

1.6 Aircraft information

1.6.1 Aircraft Data

Aircraft manufacturer	:	Boeing Company
Aircraft model/type	:	Boeing / 737 - 9GP
Serial number	:	35711
Year of manufacture	:	July 2007
Aircraft registration	:	PK-LFI
Certificate of Registration	:	16 July 2010
Valid to	:	15 July 2011
Certificate of Airworthiness	:	15 July 2010
Valid to	:	14 July 2011
Total time since new (TSN)	:	12,660 hours 36 minutes
Cycles Since New (CSN)	:	8,569 cycles

1.6.2 Engines

Manufacturer	:	General Electric
Engine type	:	Turbofan Engine
Model / Part number	:	CFM56-7B26/3
Serial Number #1	:	894752
TSN	:	12 660 hours 36 minutes
CSN	:	8,569 cycles
Serial Number #2	:	894753
TSN	:	12 660 hours 36 minutes
CSN	:	8,569 cycles

1.7 Meteorological Information

The weather information at Sultan Syarif Kasim II Airport, Pekanbaru reported by BMKG on 14 February 2010 at 14:20 UTC was:

Surface wind	:	Calm
Visibility	:	3 Km
Present weather	:	Thunderstorm
Cloud	:	BKN CB /Sc 1500 ft
Temperature	:	21° C
Due Point	:	21° C
QNH	:	1008 mbs
QFE	:	1004 mbs

During the aircraft on final approach, the tower controller issued wind information based on the indication at wind indicator in tower. The wind indicator in tower source was from the anemometer which was surrounded by vegetation and building which may cause inaccuracy in the reading.



Figure 1: Location of anemometer and the wind direction at the time of landing



Figure 2: location of anemometer for tower wind indicator

1.8 Aids to Navigation

Not relevant to this Serious Incident.

1.9 Communications

At the time of the occurrence all the communication between the pilot of LNI 392 and Tower controller was performed normally and consider not relevant to this serious incident.

1.10 Aerodrome Information

Aerodrome Code	: WIBB / PKU
Airport Name	: Sultan Syarif Kasim II Airport
Airport Address	: Pekanbaru International Airport
Airport Authority	: PT. Persero Angkasa Pura II
Coordinates	: 0° 27'47.6" N / 101°26'47.5"E
Elevation	: 102 feet (31 m)
Runway Length	: 2,240 meters
Runway Width	: 30 meters
Azimuth	: 18 – 36



Figure 3: Rubber deposit on the touchdown zone runway 18.

The airport operator scheduled for rubber deposit removal on six month interval bases. The last runway rubber deposit removal was performed on 31 December 2010 on the end of runway 36 and the result was good. (Refer to letter number BAC.14.09.04/12/2010/330)

The last runway overlay was performed at 2010. After the overlay, the runway skid resistance was measured by Mu meter. The measurement found that the skid resistance was 0.55 to 0.59. According to the DGCA Advisory Circular number SE.04 issued in 2012, the minimum skid resistance was 0.6.

At the day of the serious incident, the rubber deposit was found on the runway especially between the thresholds up to touch down zone runway 18 (see figure 3).

The inspections of the runway friction were performed monthly uses sand patch method. The last inspection was on 1 January 2011 which found that the condition of station B5 runway 36 was “smooth”.

After the serious incident, the runway was examined for existing of standing water. It found several water spots on the runway up to 3 cm depth.



Figure 4: standing water examination performed 1 hour after rain.

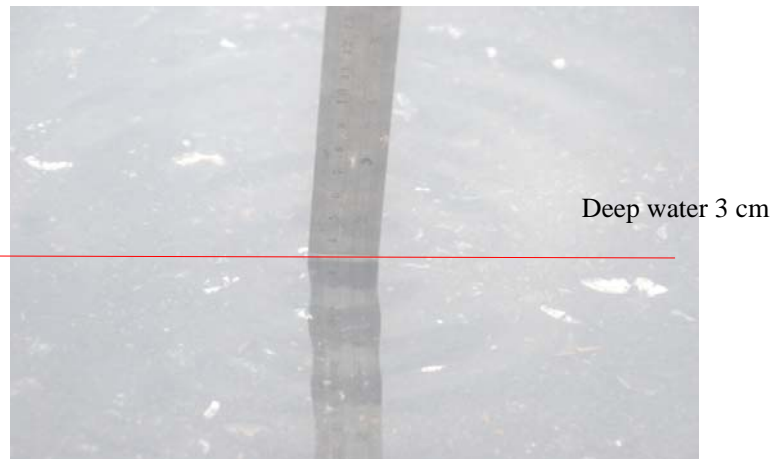


Figure 5: standing water up to 3 cm

1.11 Flight Recorders

1.11.1 Digital Flight Data Recorder

The aircraft was equipped with a Digital Flight Data Recorder (DFDR).

Manufacturer : Honeywell
 Model : SSFDR
 Part number : 980-4700-042
 Serial Number : 13642

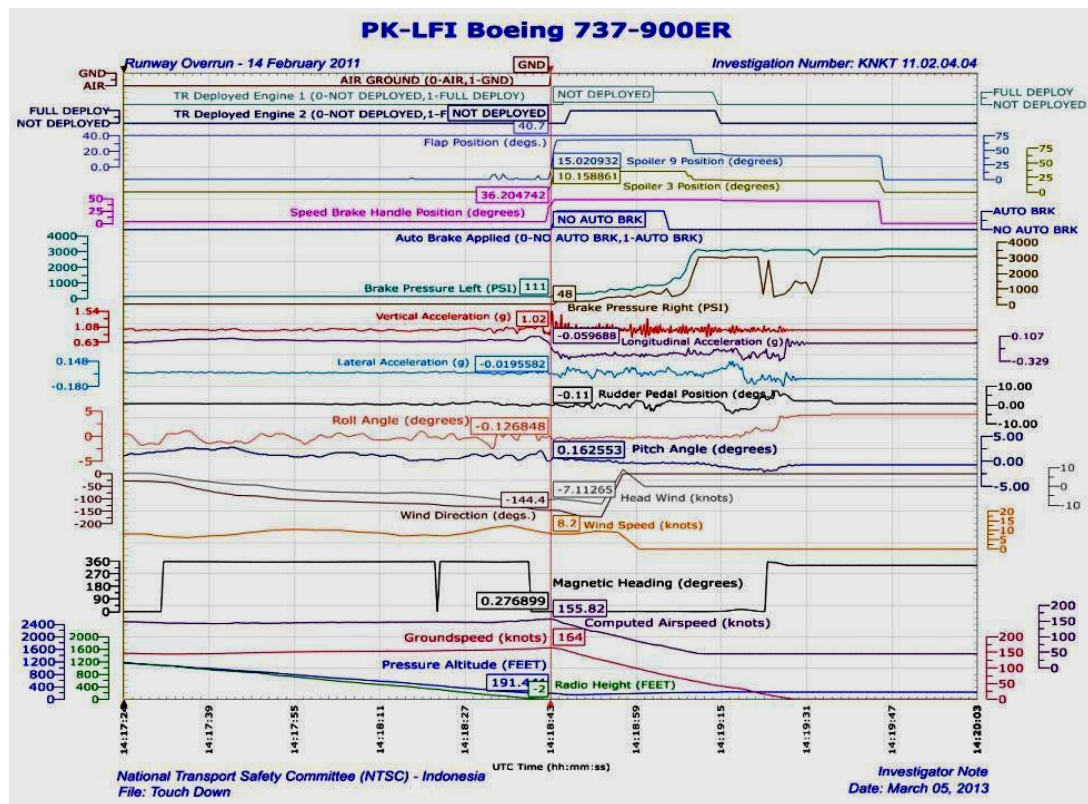


Figure 6: FDR data with special information during touch down

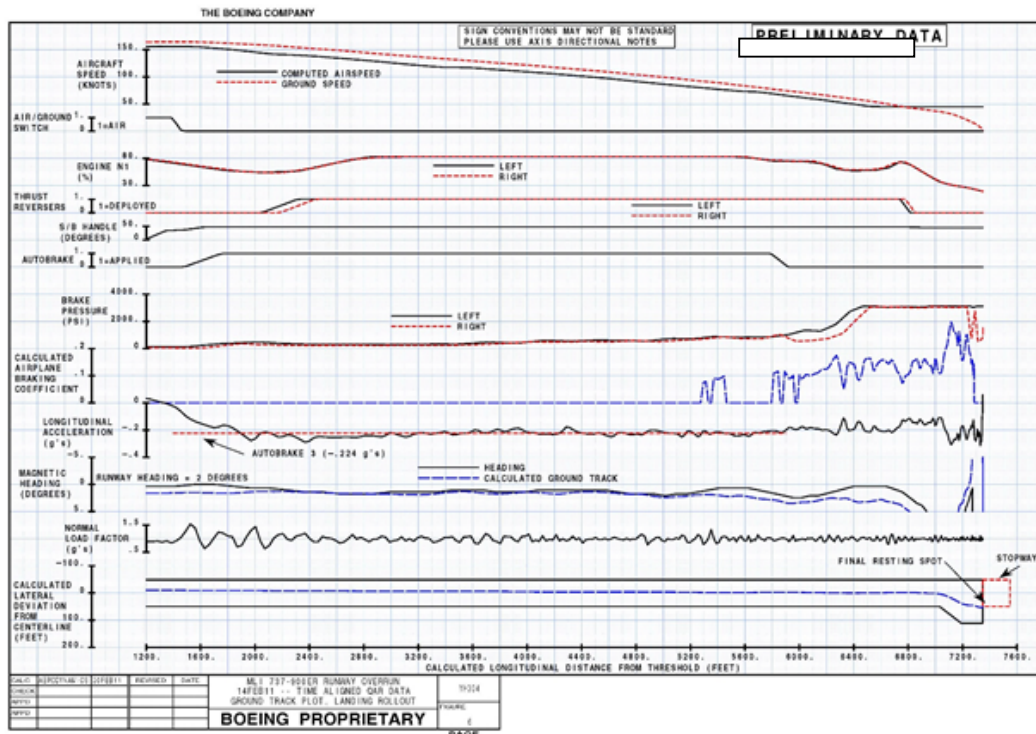


Figure 7: Boeing data on the landing roll phase retrieved from the DFDAU

1.11.2 Cockpit Voice Recorder

The aircraft was equipped with a Cockpit Voice Recorder (CVR) with a 30 minutes recording time.

Manufacturer : Honeywell
 Model : SSCVR
 Part number : 980-6022-001
 Serial Number : 09551

After the serious incident, the electrical was fed to the aircraft system for more than 30 minutes. The information of the flight has been automatically overwritten and the CVR contain activities during the aircraft recovery process.

1.12 Wreckage and Impact Information

The investigation found several marks on the runway after the serious incident. The illustration below is based on the marks found on the runway.

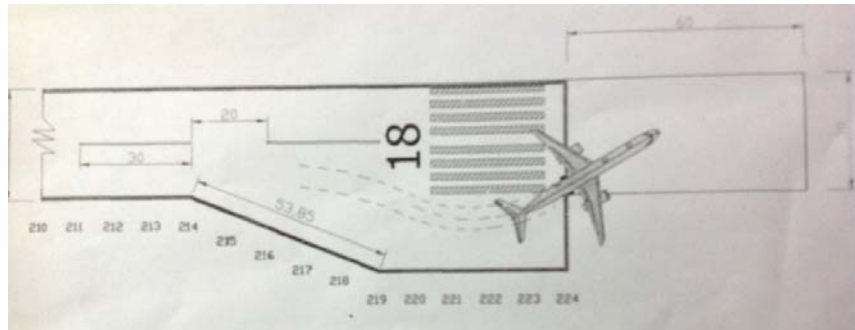


Figure 8: Illustration on the last part of aircraft movement.



Figure 9: Final aircraft position after the aircraft has been removed

1.13 Medical and Pathological Information

No medical or pathological investigations were conducted on the flight crew.

1.14 Fire

There was no pre- or post- impact fire.

1.15 Survival Aspects

Not relevant to this serious incident.

1.16 Tests and Research

Not relevant to this serious incident.

1.17 Organisational and Management Information

Aircraft Owner : Celestial Aviation Trading 12 Limited
Aircraft Operator : PT. Lion Mentari Airlines
Gajah Mada Street No: 7, Jakarta 10130,
Republic of Indonesia
AOC Number : 121-010

1.18 Additional Information

The following information are related to auto-brake system which was taken from the Boeing manuals,.

Auto-brake System (FCOM 14.20.4)

The auto-brake system uses hydraulic system B pressure to provide maximum deceleration for rejected takeoff and automatic braking at preselected deceleration rates immediately after touchdown. The system operates only when the normal brake system is functioning. Antiskid system protection is provided during auto-brake operation.

Factors Affecting Landing Distance (FCTM 6.32)

Advisory information for normal and non-normal configuration landing distances is contained in the PI section of the QRH. Actual stopping distances for a maximum effort stop are approximately 60% of the dry runway field length requirement. Factors that affect stopping distance include: height and speed over the threshold, glide slope angle, landing flare, lowering the nose to the runway, use of reverse thrust, speed brakes, wheel brakes and surface conditions of the runway.

Note: *Reverse thrust and speed-brake drag are most effective during the high speed portion of the landing. Deploy the speed-brake lever and activate reverse thrust with as little time delay as possible.*

Note: *Speed-brakes fully deployed, in conjunction with maximum reverse thrust and maximum manual antiskid braking provides the minimum stopping distance.*

Automatic Brakes (FCTM 6.36)

Immediate initiation of reverse thrust at main gear touchdown and full reverse thrust allow the auto-brake system to reduce brake pressure to the minimum level.

Since the auto-brake system senses deceleration and modulates brake pressure accordingly, the proper application of reverse thrust results in reduced braking for a large portion of the landing roll.

1.19 Useful or Effective Investigation Technique

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

2 ANALYSIS

The FDR recorded that the aircraft touched down at touchdown point with correct speed. This indicated that the approach phase of the flight was not a factor to the serious incident. The analysis focused on the deceleration process.

2.1 Deceleration performance

The aircraft landing weight was 66,066 kg. Aircraft configuration was flaps 40 and auto brake was selected at auto brake 3. The FDR revealed that the aircraft was touched down at speed 155 knot which was 17 knots above the target. The FDR also revealed that at the time of touch down there was tail wind component of 8 knots.

The calculation base on Boeing Manual (FCOM page 12.3 Advisory Information; Performance In-flight) for the existing conditions of the landing weight, temperature, tail wind component, approach speed, and assume braking action was at medium are as follow:

Required landing distance for existing weight	5580 feet
Tail wind component 8 knot	816 feet
Temperature (ISA + 6)	66 feet
Approach speed 17 knot above target	867 feet
The required runway distance	7329 feet

The runway length available was 7349 feet.

According to the Boeing report the preselected rate of the longitudinal acceleration on auto brake 3 was - 0.224 G. The longitudinal acceleration was combination of application of thrust reversers, spoilers and wheel brake. The FDR data shown that on the high speed portion of landing roll, the average longitudinal acceleration of -0.224 G was achieved. The FDR data showed that the engine thrust reversers were applied, the engine N1 was reached 80% and only small amount of brake pressure was applied. This indicated that the achievement of longitudinal acceleration of -0.224 G was mainly due to the effect of engine thrust reversers.

This aircraft longitudinal acceleration of -0.224 G was relatively constant until the pilot applied the manual brake to maximum at speed approximately 70 knots.

The manual braking was applied while the aircraft position at approximately 1,000 feet to the end of runway on aircraft speed approximately 70 knots. The application of manual brake will terminate the auto brake function of automatic longitudinal acceleration adjustment.

The FDR data showed an increment of brake pressure up to maximum during the application of manual brake. The FDR data showed that from this point the longitudinal acceleration was changed to approximately -0.1 G. The engine thrust reversers were stowed at aircraft speed approximately 50 knots.

Based on the Boeing data, the maximum manual brake should produce a longitudinal acceleration of more than auto-brake at MAX position which was preselected at -0.435 G. According to the calculation by referring to longitudinal acceleration of -0.435 G, the stopping distance required started from the aircraft speed of 70 knots was 564 feet. This means that the aircraft would be able to stop in the runway.

Based on the performance calculation, assumed the runway braking action was medium, additional factors of 8 knot tail wind, and selection of auto-brake 3 would be able to stop the aircraft on the runway.

2.2 Brake Effectiveness

The aircraft auto-brake system provides automatic braking at preselected deceleration rates. Based on the Boeing data, the preselected longitudinal acceleration for auto-brake 3 was -0.224 G.

The DFDAU data indicated that the preselected deceleration rates of -0.224 G was achieved. The FDR data indicated that during the high speed portion of the landing roll, only small amount of brake pressure was applied until the application of manual brake. This data showed that the rate of deceleration was achieved mostly by the function of engine thrust reversers.

The manual braking was applied while the aircraft position approximately at 1,000 feet to the end of runway and the thrust reversers have been stowed, the aircraft deceleration was solely depend on the function of wheel brake. The aircraft speed at that point was approximately 50 knots.

The performance calculation indicated that the remaining distance after the aircraft speed decelerated below 70 knots was sufficient for the aircraft to stop before the end of the runway. The failure of the aircraft to stop on the runway indicated that the braking action might be a factor.

The maximum manual braking, according to the Boeing manual may produce longitudinal acceleration more than -0.435 G. The manual brake applied up

to maximum; however, the rate of deceleration was decreasing. Boeing data retrieved from the DFDAU also found that Calculated Airplane Braking Coefficient was decreasing to average of -1.5. This indicated that the runway friction, which was one of the factors of stopping distance, was ineffective for aircraft deceleration.

Observation on the runway performed after the serious incident found rubber deposit on the runway especially between the thresholds up to touch down marker runway 18. The touchdown markers located at 1000 feet from the runway thresholds. The examination also found some water spots. The combination of the rubber deposit and water spots would significantly reduce both the runway friction and brake effectiveness.

2.3 Discrepancy of Wind Data

Prior to land the pilot received information from the Tower controller that the surface wind was calm. The pilot saw on the FMC that the wind was around 11 knots. The FDR data retrieved that the surface wind condition was tail wind up to 8 knots.

The discrepancy of the surface wind data might arise from the fact that the location of the anemometer was surrounded by vegetation and building which might generates turbulence that might cause reading inaccuracy. Based on this condition it can be concluded that the wind speed report from the Tower controller might be incorrect.

The incorrect wind information to the pilots may affect to the pilot decision and flying technique.

3 CONCLUSION

3.1 Findings

- a) The aircraft was airworthy and there was no evidence that the aircraft has any system malfunction prior to the serious incident.
- b) Both pilots have valid license and medical certificates.
- c) The aircraft was within the correct weight and balance limitation.
- d) The PIC acted as pilot flying.
- e) The weather condition was raining and the runway was wet. The pilot had made holding to wait for weather improvement and continued to approach after the weather improved to above minima for landing.
- f) Aircraft landing weight was 66,066 kg. Auto brake was selected at 3 and the preselected longitudinal acceleration at $- 0.224$ G (decelerate) was achieved.
- g) Based on performance calculation refer to the Boeing manuals the runway was sufficient to stop the aircraft with existing weight and temperature with assumption of runway braking action was medium and tail wind component of 8 knot.
- h) The FDR recorded that on short final up to touch down, the aircraft had tail wind component of 8 – 10 knots while the Tower controller reported that the wind was calm. The consequences for tail wind 8 knots for current aircraft weight and temperature would be additional 816 feet to the stopping distance. (FCOM page 12.3)
- i) At approximately 1,000 feet to the end of runway, the aircraft speed was approximately 70 knots and manual brake was applied to maximum should produce a longitudinal acceleration of $- 0.435$ G and the required distance to stop would be 564 feet.
- j) At approximately 1,000 feet, the pilot applied manual brake to maximum pressure. It was recorded that the brake pressure was increase however the deceleration was decrease to less than $- 0.2$ G instead of -0.435 G.
- k) The runway examination found rubber deposit and water spots up to 3 cm depth on the runway along 1000 feet to the end of runway 36.
- l) The combination of the rubber deposit and water spots would significantly reduce both the runway friction and brake effectiveness.

- m) The last runway rubber deposit removal was performed on 31 December 2010 on the end of runway 36 and the result was good.
- n) Prior to land, the Tower controller informed that the wind was calm. This incorrect information was result of the location of anemometer.
- o) The electrical power was fed to the aircraft system for more than 30 minutes after the serious incident. The information of the flight has been automatically overwritten.

3.2 Causes

The following issues are the significant findings that most probably contribute to this serious incident.

The aircraft was decelerated according to the preselected value until the thrust reversers stowed which was known at the last 1000 feet of the runway available and the aircraft speed approximately 70 knots. According performance calculation the aircraft should be able to stop on the remaining runway available. The failure of the aircraft to stop most likely due to the significant deterioration of both the runway friction and brake effectiveness as result of the existing of the combination of the rubber deposit and water spots.

4 SAFETY ACTION

Following the two serious incident of runway excursion in Sultan Syarif Kasim II Airport, involving B 737 900 which occurred on 14 February 2011 and 15 February 2011, the DGCA, PT Angkasa Pura II and airport authority of Sultan Syarif Kasim II held a meeting on 3 May 2011. The meeting was agreed that:

1. The airport authority of Sultan Syarif Kasim II was revised the interval schedule for the rubber deposit cleaning. The previous cleaning schedule was 6 (six) months, the revised schedule became "*On Condition*", depends on the inspection result;
2. The airport authority of Sultan Syarif Kasim II was conducted some repair on runway surface to ensure the standing water will be eliminate;
3. The airport authority of Sultan Syarif Kasim II shall issue a notam² to inform that the runway skid resistance was 0.55 and was below the minimum requirements of 0.60. This condition may result in poor braking action when the runway is wet.

² Notam : Notice to airmen

5 RECOMMENDATION

As a result of this accident investigation, the National Transportation Safety Committee issued safety recommendation to address safety issues identified in this report.

5.1 Directorate General of Civil Aviation

The National Transportation Safety Committee recommends to the Directorate General of Civil Aviation to:

- ensure that all airport operator conduct periodic runway friction test to ensure the runway friction is within the approved value;
- ensure that all airport operator conduct rubber deposit removal with approved method and personnel in a period according to the DGCA Advisory Circular number SE.04 issued in 2012;
- ensure that weather observation sensor shall be put in a location that free of any possible disturbance according to the ICAO Annex 3, 4.5: Observing and reporting of surface wind.
- ensure all aircraft operators to conduct proper flight crew training on the Approach and Landing Accident (ALAR) including the criteria of stabilised approach to be included in the simulator training.

5.2 PT. Angkasa Pura II

The National Transportation Safety Committee recommends to the PT. Angkasa Pura II to:

- conduct periodic runway friction test to ensure the runway friction is within the approved value;
- conduct rubber deposit removal with approved method and personnel in a period according to the DGCA Advisory Circular number SE.04 issued in 2012;
- ensure that weather observation sensor shall be put in a location that free of any possible disturbance according to the ICAO Annex 3, 4.5: Observing and reporting of surface wind.

5.3 PT. Lion Mentari Airlines

The National Transportation Safety Committee recommends to the PT. Angkasa Pura II to:

- To emphasize the flight crew training on the Approach and Landing Accident (ALAR) including the criteria of stabilised approach to be included in the simulator training.
- Pilot should calculate the landing distance required based on the actual wet runway condition.
- To provide a comprehensive system to ensure the electrical power to the CVR disconnect immediately after the serious incident to prevent automatic overwritten of the information.

6 APPENDICES

6.1 Boeing Performance In-Flight Table

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/BELOW 60000 KG	PER 1000 FT STD/HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV

Dry Runway

MAX MANUAL	2690	180/-130	70/80	-100	340	30	-30	50	-50	200	50	80
MAX AUTO	3380	200/-180	80/110	-130	430	0	0	70	-70	330	0	0
AUTOBRAKE 3	4660	310/-300	150/200	-210	720	0	-20	110	-110	510	0	0
AUTOBRAKE 2	5950	430/-410	200/260	-280	980	80	-110	160	-160	490	0	130
AUTOBRAKE 1	6580	490/-480	230/310	-330	1160	160	-200	180	-180	480	230	690

Good Reported Braking Action

MAX MANUAL	3690	230/-210	100/150	-160	590	80	-80	80	-80	280	200	360
MAX AUTO	4040	250/-230	110/150	-180	620	70	-70	80	-100	340	230	410
AUTOBRAKE 3	4660	310/-300	150/200	-210	720	20	-20	110	-110	510	30	50
AUTOBRAKE 2	5950	430/-410	200/260	-280	980	80	-110	160	-160	490	0	130

Medium Reported Braking Action

MAX MANUAL	4990	360/-330	160/230	-260	980	210	-180	130	-130	380	620	1070
MAX AUTO	5120	360/-340	160/230	-260	980	200	-150	130	-130	430	620	1080
AUTOBRAKE 3	5200	380/-340	180/250	-280	1020	160	-110	130	-150	510	640	1000
AUTOBRAKE 2	6000	440/-430	200/280	-310	1120	160	-160	160	-160	490	300	560

Poor Reported Braking Action

MAX MANUAL	6450	510/-460	230/330	-410	1570	540	-340	160	-180	440	1570	2540
MAX AUTO	6710	510/-460	230/330	-410	1560	540	-340	160	-180	460	1590	2580
AUTOBRAKE 3	6710	510/-480	250/330	-410	1560	510	-330	160	-200	480	1590	2590
AUTOBRAKE 2	6870	520/-490	250/340	-410	1610	490	-330	180	-200	490	1460	2280

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.

Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 220 ft.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

*For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.