KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA

PRELIMINARY

KNKT.20.02.03.04

Aircraft Accident Investigation Report

PT. Trigana Air Service

Boeing B737-300; PK-YSG

Sentani International Airport, Jayapura

Republic of Indonesia

25 February 2020

2020

This Preliminary Report was published by the Komite Nasional Keselamatan Transportasi (KNKT), Transportation Building, 3rd Floor, Jalan Medan Merdeka Timur No. 5 Jakarta 10110, Indonesia.

The report is based upon the initial 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).

The preliminary report consists of factual information collected until the preliminary report published. This report will not include analysis and conclusion.

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Jakarta, 9 April 2020
KOMITE NASIONAL
KESELAMATAN TRANSPORTASI
CHAIRMAN

SOERJANTO TJAHJONO

TABLE OF CONTENTS

TABLE OF FIGURES

ABBREVIATIONS AND DEFINITIONS

AOC	:	Air Operator Certificate
AMM	:	Aircraft Maintenance Manual
ATPL	:	Airline Transport Pilot License
ATS	:	Air Traffic Services
CCTV	:	Closed Circuit Television
CPL	:	Commercial Pilot License
CVR	:	Cockpit Voice Recorder
DGCA	:	Directorate General of Civil Aviation
DME	:	Distance Measuring Equipment
FTD	:	Fleet Team Digest
GPS	:	Global Positioning System
IPC	:	Illustrated Parts Catalog
Kg	:	Kilograms
KNKT	:	*Komite Nasional Keselamatan Transportasi* (National Transport Safety Committee – NTSC)
LT	:	Local Time
MLG		Main Landing Gear
MPD	:	Maintenance Planning Data
NDT	:	Non-Destructive Test
NOTAM	:	Notification Airmen
PF	:	Pilot Flying
PIC		Pilot in Command
PM	:	Pilot Monitoring
QFE	:	QFE is the Q code indicating air pressure at the current ground level.
QNH	:	QNH is the Q code indicating the atmospheric pressure adjusted to mean sea level.
SIC	:	Second in Command
SSFDR	:	Solid State Flight Data Recorder
UTC	:	Universal Coordinated Time
VHF	:	Very High Frequency

SYNOPSIS

On 25 February 2020 a Boeing B737-300 Cargo with the registration PK-YSG was being operated on cargo flight by PT. Trigana Air Service with the flight number TGN 7341. The schedule flight route was from Sentani International Airport, Papua to Wamena Airpot, Papua. The flight was the first of four schedule flights of for the day on routes Sentani – Wamena vv.

The PIC was the Pilot Flying (PF) and the SIC was the Pilot Monitoring (PM). On board to the aircraft was the PIC, SIC, two passenger and the cargo of 16,645 Kg. The total load was 16,965 Kg including the cargo and all persons on board.

At 0748 LT, the Sentani controller issued takeoff clearance and the departure clearance to continue on heading 270° and initial altitude of 8,000 feet.

During takeoff roll, about 2 seconds after the PM called the aircraft speed of 80 knots, the pilots felt aircraft vibration and became severe as the aircraft speed increased. When the aircraft speed was about 110 knots, the PF decided to reject the takeoff and felt that the aircraft direction could not be controlled and the braking was ineffective.

As seen on the Closed-Circuit Television (CCTV) record, it shown that several seconds after rejected takeoff executed, the aircraft skidded longitudinally with the nose headed to the right. Thereafter, the aircraft veered to the right and continued until excursed from the runway. The aircraft still moving on the right of the runway shoulder with the nose headed on the runway heading. After crossed the taxiway D, the aircraft speed decreased while the aircraft was turning about 360°. The aircraft stop on the right runway shoulder about 1,600 meters from the beginning of runway 30 on heading 270°.

Observing the runway condition, about 500 meters from the beginning runway 30, there was an oscillated wheel mark of both main landing gears and continued until the last position of the aircraft.

The operator informed KNKT of the safety action taken after the accident. The KNKT acknowledges the safety actions taken by operator and considered that the safety actions were relevant to improve safety, however there still safety issues remain to be considered. Therefore, the KNKT issued safety recommendations to address safety issues identified in this report.

The investigation is continuing and KNKT plans to complete the investigation within 12 months since the day of the occurrence. Should any further relevant safety issues emerge during the course of the investigation, KNKT will immediately bring the issues to the attention of the relevant parties and publish as required.

1 FACTUAL INFORMATION

1.1 History of the Flight

On 25 February 2020, a Boeing B737-300 Cargo registration PK-YSG was being operated by PT. Trigana Air Service[1] conducted a schedule cargo flight with the flight number TGN 7341. The schedule flight route was from Sentani[2] Airport, Papua to Wamena[3] Airpot, Papua. The flight was the first of four scheduled flights of the day on routes Sentani – Wamena vv.

The Pilot in Command (PIC) acted as Pilot Flying (PF) and the Second in Command (SIC) acted as Pilot Monitoring (PM). On board to the aircraft were two pilots and two passengers. The total load was 16,965 Kg including 16,645 Kg of the cargo and persons on board.

At 2200 UTC[4] (0700 LT[5]) the crews arrived at the airport, thereafter the PIC conducted the walk around check and the SIC entered the cockpit to conduct the cockpit preparation. Completing the walk around check the PIC entered the cockpit and conducting the cockpit pre-flight procedure and checklist.

At 0722 LT, the Sentani Tower controller (Sentani controller) issued the push back and start clearances. Afterward the pilot conducted the aircraft push back while the engine start was conducted during the push back. After engine start completed, the pilots conducted the before taxi procedures and the PM requested taxi clearance to Sentani controller.

At 0725 LT, the taxi clearance was issued and the Sentani controller instructed the flight crew to taxi to runway 30 via taxiway NP and E. Subsequently the aircraft taxied normally and at 0726 LT the aircraft held on taxiway E waiting for another aircraft for takeoff.

At 0745 LT, the Sentani controller issued clearance to enter the runway 30 and the aircraft taxied backtrack to the beginning of runway 30.

At 0748 LT, the Sentani controller issued takeoff clearance and the departure clearance to continue on heading 270° and initial altitude of 8,000 feet.

About 30 seconds after the takeoff clearance issued by the Sentani controller, the takeoff roll was initiated. About 2 seconds after the PM called the aircraft speed of 80 knots, the pilots felt aircraft vibration and became severe as the aircraft speed increased. The observation to the runway found that about 500 meters from the beginning runway 30, there were oscillated wheel marks of the main landing gear left and right on the runway.

When aircraft speed about 110 knots, the PF decided to reject the takeoff. The PF felt that the aircraft direction could not be controlled and the braking was ineffective.

1 PT. Trigana Air Service will be named as Trigana for the purpose of this report.

2 Sentani International Airport of Papua will be named as Sentani for the purpose of this report.

3 Wamena Airport of Papua will be named as Wamena for the purpose of this report.

4 The 24-hour clock used in this report to describe the time of day as specific events occurred is in Universal Coordinated Time (UTC).

5 Local time for Sentani is Eastern Indonesia Standard Time /Waktu Indonesia Timur (WIT) or UTC + 9.

As seen on the Closed-Circuit Television (CCTV) record, it shown that several seconds after rejected takeoff executed, the aircraft skidded longitudinally with the nose headed to the right. Thereafter, the aircraft veered to the right and continued until excursed from the runway. The aircraft still moving on the right of the runway shoulder with the nose headed on the runway heading. After crossed the taxiway D, the aircraft speed decreased while the aircraft was turning about 360°. The aircraft stop on the right runway shoulder about 1,600 meters from the beginning of runway 30 on heading 270°.

1.2 Injuries to Persons

No one injured in this accident

1.3 Damage to Aircraft

The aircraft was substantially damage. The lower fuselage was damage at the station 390 (between the electronic equipment bay to the first radio altimeter antenna) identified by two scratch mark about 0.5 meter. See figure below.

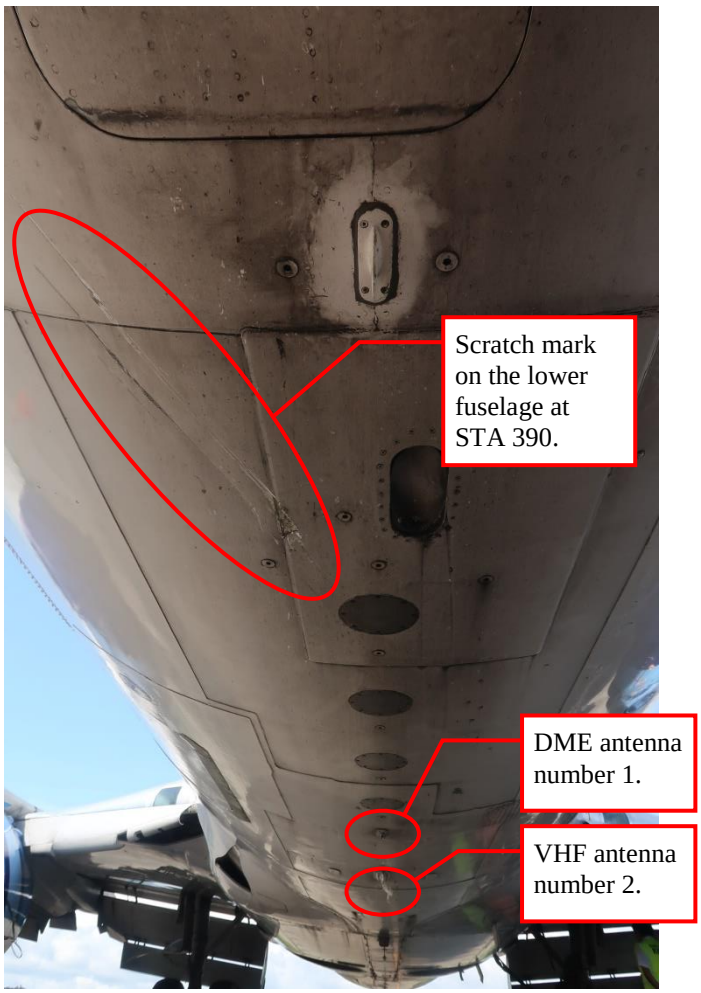

Figure 1: Scratch marks on the lower fuselage

The Distance Measuring Equipment (DME) antenna number 1 at station 468 was broken and the broken DME antenna was not found.

The Very High Frequency (VHF) antenna number 2 (located behind the DME antenna number 1) at station 511 was broken as shown in the figure below.

Figure 2: The broken VHF antenna number 2

A triangle concrete pavement with the dimension approximately 40 × 40 × 50 centimeters with the thickness of approximately 15 centimeters was found in the left engine inlet. The concrete most likely damaged the lower engine inlet cowl with the dimension about 20 × 20 centimeters and also damaged several engine fan blades as shown in the figure below.

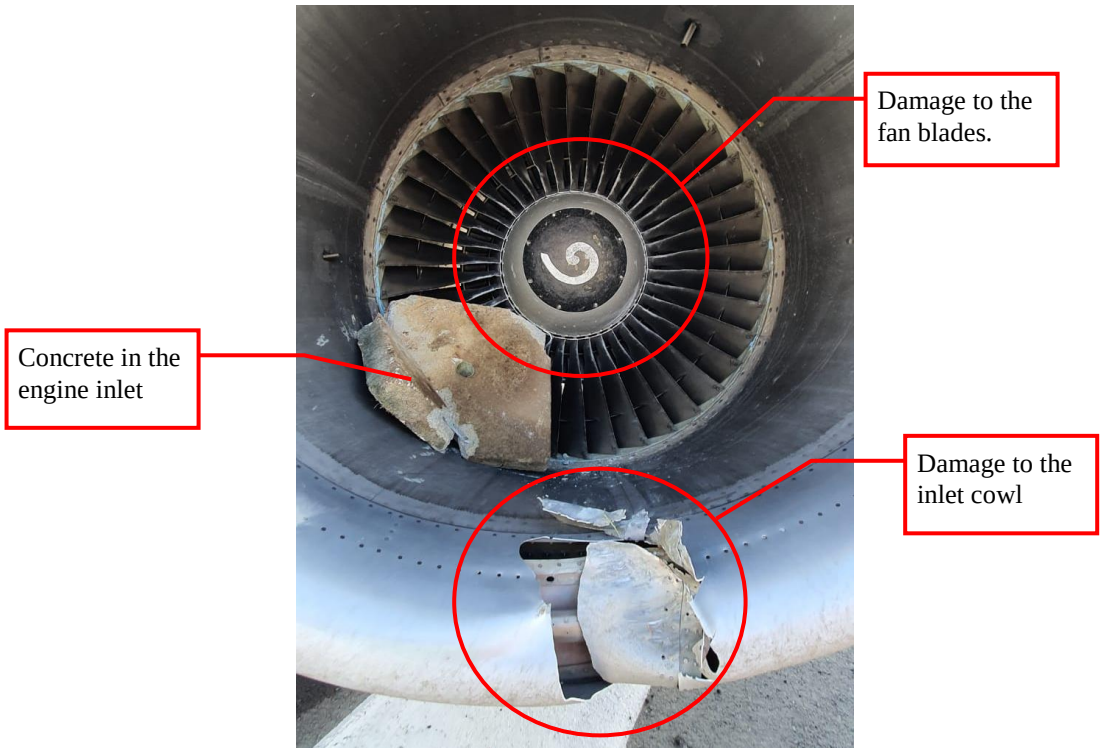

Figure 3: The concrete in the left engine inlet cowl

The right engine fan inlet cowl was damage approximately at the position 9 o'clock (looking aft to the engine) identified by dent mark about 10 centimeters long with the depth about 2 centimeters as shown in the figure below.

Figure 4: Dent on the right engine inlet cowl

The nose wheels were broken at the wheel hub. There was no significant damage to the aircraft nose area and the nose landing gear assembly including the torsion link and steering assembly.

Figure 5: The Nose wheel condition

The left and right Main Landing Gears (MLG) were still intact. The left main landing gear was on the pavement of the runway shoulder and the right main landing gear was on the grass of the runway shoulder. All of the torsion links of the MLG were broken.

The main wheel number 1 and 2 were intact to the left Main Landing Gear (MLG) axle and faced almost 90° relative from the aircraft heading (see figure 6).

The position of the left and right MLG is shown in the figure below.

Figure 6: The position of left and right main wheels

The left MLG upper torsion link was separated from the lower torsion link. The left upper torsion link bent about 45° and twisted to the right (relative to the forward movement of the aircraft).

The left MLG lower torsion was bent to the right and fractured about 19 centimeters from the torsion link joint (see figure 7 and figure 8).

Figure 7: Left upper torsion link

Figure 8: Left lower torsion link

The left shimmy damper manifold assembly was separated with the shimmy damper piston assembly. The left shimmy damper manifold assembly was found intact with the hydraulic hose of the left main landing gear.

The shimmy damper piston assembly was broken and found on the runway about 1,300 meters from the beginning runaway 30 (300 meters from the final aircraft position). The piston was separated from the piston housing of the shimmy damper piston assembly.

Until the publishing of this preliminary report, the piston with the apex nut has not been found. See the figure 9 and figure 10 below.

Figure 9: Left shimmy damper manifold assembly and shimmy damper piston assembly

Figure 10: Broken piston of left shimmy damper

The right MLG upper torsion link was separated from the lower torsion link. The

right upper torsion link was bend about 35° and twisted to the right (relative to the forward movement of the aircraft). The lower torsion link was broken in two pieces. The broken lower torsion link was found on the runway about 1,600 meters from the beginning of runway 30 (near the final aircraft position).

Figure 11 Right upper torsion link condition

Figure 12:Part of the right lower torsion link

The right shimmy damper manifold assembly was separated with the shimmy damper piston assembly. The right shimmy damper manifold assembly was intact with the hydraulic hose of the right main landing gear.

Figure 13: The right manifold of shimmy damper assembly

The right shimmy damper piston assembly was broken and found on the runway about 1,600 meters from the beginning runaway 30 (see figure 14 and 15). Part of broken piston was found about 1,500 meters from the beginning of runway 30 (100 meters from the final aircraft position).

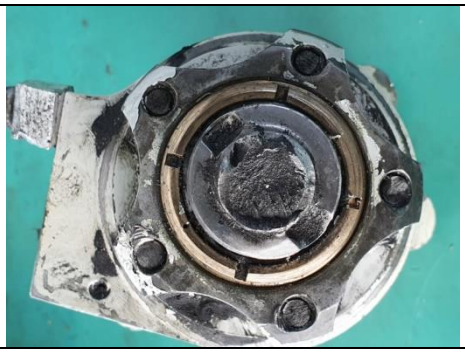

Figure 14: The broken right shimmy damper piston assembly

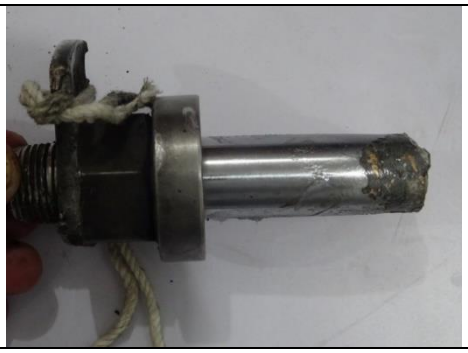

Figure 15: Part of broken piston with the check nut

1.4 Other Damage

The sign boards of taxi way C and D were broken.

The runway shoulder at distance about 1,600 meters from the beginning runway 30 damaged with the dimension approximately 10 × 2 meters.

1.5 Personnel Information

1.5.1 Pilot in Command

Gender	:	Male
Age	:	33
Nationality	:	Indonesia
Marital status	:	Married
Date of joining company	:	1 May 2012
License	:	ATPL
Date of issue	:	5 April 2018
Aircraft type rating	:	B737
Instrument rating validity	:	30 November 2020
Medical certificate	:	
Last of medical	:	8 October 2019
Validity	:	8 April 2020
Medical limitation	:	None
Last line check	:	4 December 2019
Last proficiency check	:	22 June 2019

Flying experience

Total hours	:	5,397 hours 16 minutes

Total on type	:	5,397 hours 16 minutes
Last 90 days	:	120 hours 22 minutes
Last 30 days	:	54 hours 15 minutes
Last 7 days	:	16 hours 4 minutes
Last 24 hours	:	TBA
This flight	:	26 minutes

1.5.2 Second in Command

Gender	:	Male
Age	:	24
Nationality	:	Indonesia
Marital status	:	Married
Date of joining company	:	6 July 2017
License	:	CPL
Date of issue	:	20 July 2016
Aircraft type rating	:	B737
Instrument rating validity	:	31 July 2020
Medical certificate	:	
Last of medical	:	27 August 2019
Validity	:	27 February 2020
Medical limitation	:	Shall wear corrective lenses
Last line check	:	TBA
Last proficiency check	:	17 July 2019

Flying experience

Total hours	:	1,330 hours 13 minutes
Total on type	:	1,330 hours 13 minutes
Last 90 days	:	102 hours 1 minutes
Last 30 days	:	50 hours 23 minutes
Last 7 days	:	26 hours 5 minutes
Last 24 hours	:	10 hours 2 minutes
This flight	:	26 minutes

1.6 Aircraft Information

1.6.1 General

Registration Mark	:	PK – YSG
Manufacturer	:	Boeing Company
Country of Manufacturer	:	United State of America
Type/Model	:	B737 – 300F
Serial Number	:	23930
Year of Manufacture	:	1988
Certificate of Airworthiness		
Issued	:	4 June 2019
Validity	:	3 June 2020
Category	:	Transport
Limitations	:	None
Certificate of Registration		
Number	:	3467
Issued	:	16 July 2019
Validity	:	3 June 2022
Time Since New	:	69360:05
Cycles Since New	:	49606
Last Major Check	:	1C, performed on 18 November 2017
Last Minor Check	:	1A, performed on 3 January 2020

1.6.2 Engines

Manufacturer	:	CFM International
Type/Model	:	CFM56 – 3B2
Serial Number-1 engine	:	721366
▪ Time Since New	:	57,587:38
▪ Cycles Since New	:	29,391
Serial Number-2 engine	:	723160
▪ Time Since New	:	59,753:39
▪ Cycles Since New	:	40,163

1.6.3 Torsion Link and Shimmy Damper Assembly

To ease the part identification of the torsion link and shimmy damper assembly, the figure below shows the part location and identification.

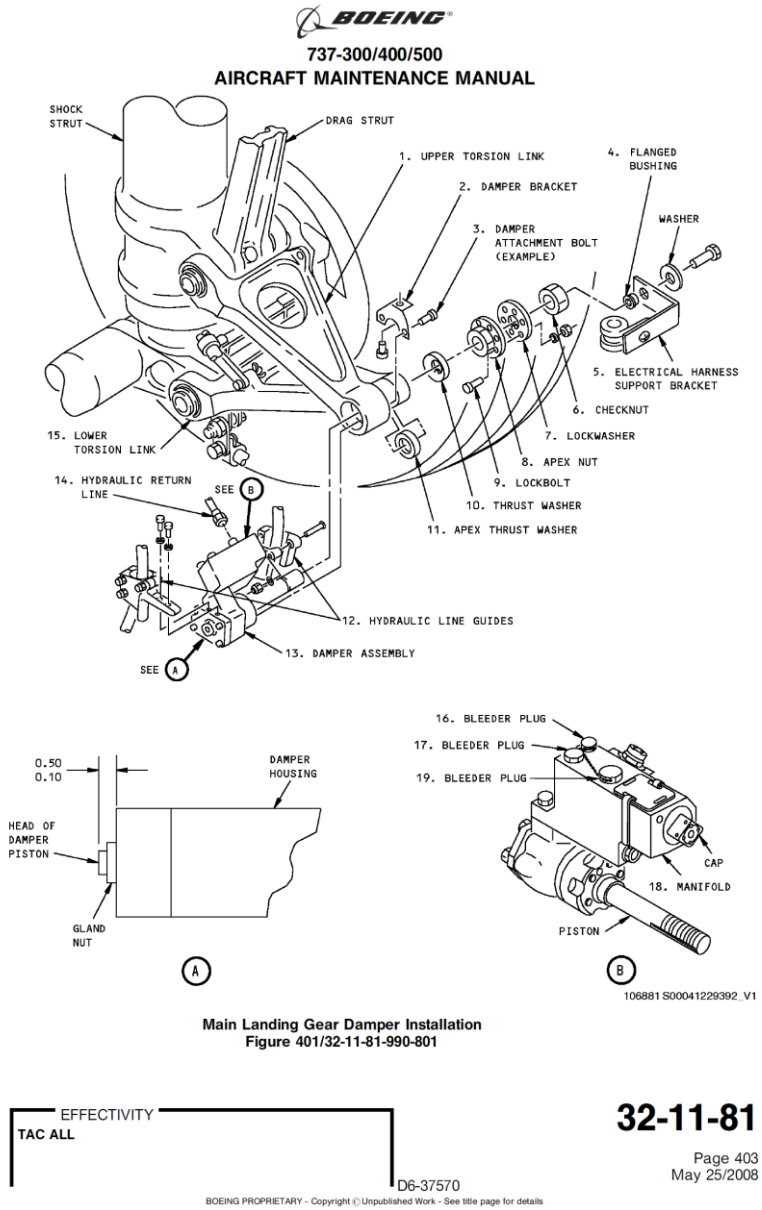

Figure 16: The torsion link and shimmy damper assembly

The investigation will conduct detail examination to the left and right torsion link and shimmy damper assembly which recovered from the occurrence site. The detail examination result will be included in the final report.

1.7 Meteorological Information

Weather report from *Automatic Weather Observation System (AWOS)* Sentani Airport reported on 25 February 2020 as follows:

Time (UTC)	22:00	22:30
Wind (°/knots)	Calm	050/02KT
Visibility (km)	more than 10	more than 10
Weather	Nil	Nil

Cloud[6]	SCT 1,000 feet	SCT 1,000 feet
Temperature/dew point (°C)	26/24	27/24
QNH[7](mb)	1010	1010
QFE[8] (mb)	1000	1000
Remarks	No significant	No significant

1.8 Aids to Navigation

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

1.9 Communications

All communications between Air Traffic Services (ATS) and the crew were recorded by ground based automatic voice recording equipment. The detail transcript of the communication will be included in the final report.

1.10 Aerodrome Information

Airport Name	:	Sentani Jayapura
Airport Identification	:	WAJJ
Airport Operator	:	DGCA
Airport Certificate	:	-
Validity	:	-
Coordinate	:	02° 34’ 37” S;140° 30’ 59” E
Elevation	:	289 feet
Runway Direction	:	30/12
Runway Length	:	2500 meters
Runway Width	:	45 meters
Surface	:	Asphalt Concrete

On 3 October 2019 the aerodrome operator conducted a meeting to discuss the runway height variation on 500 meters and 1,400 meters from the threshold runway 30. The meeting was also to discuss the displacement of the threshold after runway extension. However due to the height variation of the runway, the meeting concluded that the displacement of the threshold would be postponed until the height variation has been resolved. As part of the discussion, it was decided that the AirNav

6 Cloud amount is assessed in total which is the estimated total apparent area of the sky covered with cloud. The international unit for reporting cloud amount for Few (FEW) is when the clouds cover 1/8 area of the sky, scattered (SCT) is when the clouds cover 3/8 to 4/8 area of the sky and Broken (BKN) is when the clouds cover more than half (5/8 up to 7/8) area of the sky.

7 QNH is the Q code indicating the atmospheric pressure adjusted to mean sea level.

8 QFE is the Q code indicating air pressure at the current ground level.

Indonesia was requested to issue a Notification Airmen (NOTAM) regarding the height variation on the runway.

On 20 December 2019, the AirNav Indonesia issued NOTAM number B6188/19 which valid until 5 March 2020 regarding about runway elevation variation at 500 meters and 1,400 meters from threshold runway 30.

The investigation requested to aircraft operators in Sentani to observe the height variation on runway and to report to the KNKT the vertical acceleration recorded on the aircraft Flight Data Recorder (FDR). KNKT received some information from the operators and the average of the vertical acceleration during takeoff was between 1.3 and 1.4 g. The detail evaluation of the information will be included in the final report.

1.11 Flight Recorders

1.11.1 Flight Data Recorder

The aircraft was fitted with a Honeywell Solid State Flight Data Recorder (SSFDR) with part number 980-4700-003 and serial number 5479.

The SSFDR data has been downloaded in KNKT recorder facility. The memory unit recorded 405 parameters and approximately 53 hours of aircraft operation, which contained 82 flights including the accident flight.

The detail of flight recorder information will be included in the final report.

1.11.2 Cockpit Voice Recorder

The aircraft was fitted with a FA2100 Cockpit Voice Recorder (CVR) manufactured by L3 Technologies with part number 2100-1020- 02 and serial number 000494555. The CVR data has been downloaded in KNKT recorder facility. The transcript of the CVR will be included in the final report.

1.12 Wreckage and Impact Information

The aircraft took off from the runway 30 and stop about 1,600 meters from the beginning of the runway 30. Based on the wheels mark on the runway, the investigation traced the track using the handheld GPS to visualize took off track.

The estimated track is shown in the figure below.

Figure 17: Takeoff roll track

The first oscillation wheels marks were found to since about 500 meters from the beginning runway 30 until the position of the aircraft stop. Part of the oscillation wheel marks is shown in the figure below.

Figure 18: The oscillation wheels marks

The left main landing gear was on the pavement runway shoulder about 1.5 meters from the runway edge mark and the right main landing gear was on the right runway shoulder and trapped in the soft surface. The right main landing gear torque link was broken.

Figure 19: The main wheel number 3 and 4 of the right MLG

The sign board of taxi way D was damage as shown in the figure below.

Figure 20: The damage of the taxiway sign board

The damage of runway shoulder as result of the aircraft rotation is shown below.

Figure 21: The damage of the runway shoulder

1.13 Medical and Pathological Information

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

1.14 Fire

There was no evidence of fire in this occurrence.

1.15 Survival Aspects

The occupants were evacuated safely using the portable passenger stair.

1.16 Tests and Research

The investigation performs the material examination as result of this occurrence. The detail of the examination will be included in the final report.

1.17 Organizational and Management Information

1.17.1 Aircraft Operator

AOC Number	:	121 - 006
Validity	:	January 14, 2021
Aircraft Owner	:	PT. Trigana Air Service
Address	:	Komplek Puri Sentra Niaga Jl. Wiraloka Blok D68 – 69 – 70 Kelurahan Cipinang Melayu Kecamatan Makasar Jakarta Timur – 13620 Indonesia
Aircraft Operator	:	PT. Trigana Air Service
Address	:	Komplek Puri Sentra Niaga Jl. Wiraloka Blok D68 – 69 – 70 Kelurahan Cipinang Melayu Kecamatan Makasar Jakarta Timur – 13620 Indonesia
Certificate Number	:	121 – 006

1.17.2 Boeing Service Letter (SL) 737-SL-32-057-E

On 22 December 2015, Boeing issued Service Letter 737-SL-32-057-E with the title Main Landing Gear (MLG) Lower Torsion Link Fractures.

APPLICABILITY:

All 737-100/-200/-300/-400/-500 Airplanes

REFERENCES:

a) *Fleet Team Digest (FTD) 737-FTD-32-11001, dated 5 October 2012*

b) *Aircraft Maintenance Manual (AMM) 32-11-00, Page 601, Torsional Free Play Inspection*

c) *AMM 32-11-81, Page 501, Main Gear Damper Adjustment*

d) *AMM 32-11-51, Page 601, MLG Torsion Links-Inspection/Check*

e) *737-200 Maintenance Planning Data (MPD), D6-17594*

f) *737-300/-400/-500 MPD, D6-38278*

g) *737-300/400/500 MPD, MSG-3 D6-82981*

h) *AMM 32-11-81, Page 401, Main Gear Damper Installation*

i) *Illustrated Parts Catalog (IPC) 32-11-00-01, item 470B.*

BACKGROUND

Boeing occasionally receives reports of broken torsion links and damaged shimmy damper pistons on 737-100 through -500 airplanes. These events have been attributed to excessive wear or looseness in the main landing gear torsion link apex joint. This looseness can make the shimmy damper ineffective and may allow a shimmy event to occur. Recently, there has been an increase in shimmy events that can be attributed to 737 -100 through -500 operators who may be unaware of the importance of the recommended MLG damper maintenance practices.

This service letter is provided to advise operators of recommended maintenance practices to prevent main landing gear torsion link and shimmy damper piston fractures.

BOEING ACTION:

The reference (b) AMM provides instructions for main landing gear torsional free play inspection. Adjustment of the shimmy damper and the torsion link apex joint is necessary prior to performing the torsional free play inspection.

The reference (c) AMM provides instructions for the adjustment of the torsion link apex joint and shimmy damper.

The reference (d) AMM provides wear limits for the interface of the thrust washers and the spherical shaped bushings common to the lower torsion link apex lug. After tightening the apex nut, the minimum allowable distance across the outer faces of the thrust washers is 2.700 inches. A dimension less than 2.700 inches indicates the bushings and thrust washers need replacement. Wear on the non-spherical side of the thrust washers also occurs and is not accounted for in the face to face measurement of the installed spherical washers. Periodic disassembly of the joint should be performed in order to fully inspect these washers and to look for unusual wear on the damper piston rod. See Figures 1 and 2.

The reference (e) and (f) MPD documents recommend a functional check of MLG torsional free play at specified intervals. However operators may benefit from performing these checks on a more frequent basis.

The reference (h) AMM provides a procedure for bleeding air out of the damper assembly.

SUGGESTED OPERATOR ACTION:

In order to reduce the likelihood of a MLG shimmy event, Boeing recommends that operators of 737-100 through -500 airplanes with limited or no experience with the maintenance practices noted in this service letter perform the following steps. This is in addition to the maintenance tasks outlined in the referenced (e), (f), and (g) MPD documents.

1) Adjust the main landing gear torsion link apex joint per the reference (c) AMM starting at A-check and escalating incrementally up to every C-check or annually as service experience with the damper is attained.

2) After adjusting the apex joint per item 1) above, measure across the faces of the thrust washers. If a dimension of less than 2.700 inches is obtained, there is excessive wear and the joint should be disassembled. Any worn parts should be replaced.

3) Disassemble the apex joint and examine the spherical cup washers, the damper piston, and the spherical bushings in the torsion link for wear annually escalating incrementally up to every C-check as service experience with the damper is attained. Any measurable wear at these locations is cause for replacement of parts.

4) Bleed any air entrained in the hydraulic fluid or trapped within the damper at per the reference (h) AMM annually, escalating incrementally up to every C-check as service experience with the damper is attained. See Attachment 2 for further clarification.

5) Ensure overhauled shimmy dampers and the Apex Torsion joint contain only Boeing approved components or equivalent.

Some operators have initiated a program in which the torsion links, shimmy damper and associated hardware are replaced at scheduled intervals, such as each C-check or a 2-C check. Other operators may wish to consider this practice to help prevent unscheduled maintenance and/or shimmy events. For those operators that have implemented their own shimmy damper maintenance practices based upon in-service history or have a long operational history without a main landing gear shimmy event, this service letter is information only.

See reference (a) FTD for additional information on MLG Shimmy.

1.18 Additional Information

The investigation is continuing and KNKT plans to complete the investigation within 12 months since the day of the occurrence. Should any further relevant safety issues emerge during the course of the investigation, KNKT will immediately bring the issues to the attention of the relevant parties and publish as required.

1.19 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 FINDINGS

Findings are statements of all significant conditions, events or circumstances in the accident sequence. The findings are significant steps in the accident sequence, but they are not always causal, or indicate deficiencies. Some findings point out the conditions that pre-existed the accident sequence, but they are usually essential to the understanding of the occurrence, usually in chronological order.

According to factual information during the investigation, the KNKT identified initial findings as follows:

1. The aircraft had the valid Certificate of Airworthiness prior to the accident.
2. The pilots held the valid licenses and medical certificates.
3. The pilots felt aircraft vibration about 2 seconds after the PM called the aircraft speed of 80 knots and vibration became severe as the aircraft speed increased.
4. Oscillation wheel marks of the both main landing gears were found on the runway since about 500 meters from the beginning runway 30 until the aircraft stop position.
5. When the aircraft speed about 110 knots, the PF decided to reject the takeoff and felt the aircraft direction could not be controlled and the braking was ineffective.
6. As seen on the Closed-Circuit Television (CCTV) record, the aircraft skidded longitudinally and veered to the right and continued until excursed from the runway. The aircraft turned about 360° prior to stop on the right runway shoulder about 1,600 meters from the beginning of runway 30 on heading 270°.
7. The upper torsion link and lower torsion link of both main landing gears were separated. Both upper torsion links bent and twisted to the right. The left lower torsion link was fracture while the right lower torsion link broken.
8. Both left and right main landing gear shimmy damper assembly were broken and the shimmy damper manifold separated with the piston housing assembly. The broken part of the left piston has not been found.

3 SAFETY ACTION

At the time of issuing this Preliminary Report, the KNKT had been informed of safety actions resulting from this occurrence.

3.1 PT. Trigana Air Service

1. On 25 February 2020, The Trigana issued the Notice to Pilot to review as follows:
   a. To refer the Flight Crew Training Manual (FCTM) regarding the rejected take off and the rejected take off decision (FCTM3.21-3.22)
   b. To consider the Go/Stop Decision Near V1 and RTO Execution Operational Margin (FCMT 3.24-3.26)
   c. To consider the Rejected take off (QRH MAN.1.2-1.3).
2. On 26 February 20202, Trigana issued the Engineering Instruction (EI) identified by number B737-EI/32/083R1 with the title DVI Main Landing Gear Shimmy Damper Bolt.

   The Engineering Instruction contained instruction to inspect all B737 operated by Trigana in regard to the shimmy damper bolt. The Engineering Instruction consists of the inspection refer to:
   a. Aircraft Maintenance Manual (AMM) chapter 32-11-51 page 601, MLG Torsion Links Inspection/Check.
   b. AMM chapter 32-11-00 page 601, Torsional Free Play Inspection.
   c. The Non-Destructive Test (NDT) to the bolt attachment between shimmy damper manifold with the piston housing assembly.

4 SAFETY RECOMMENDATIONS

The KNKT acknowledges the safety actions taken by Trigana and considered that the safety action were relevant to improve safety, however there still safety issues remain to be considered. Therefore, the KNKT issued safety recommendations to address safety issues identified in this report.

4.1 PT. Trigana Air Service

04.O-2020-03.01

Trigana had issued the Engineering Instruction (EI) identified by number B737-EI/32/083R1 with the title DVI Main Landing Gear Shimmy Damper Bolt. However, the EI did not reflect the content of Service Letter (SL) 737-SL-32-057-E issued by the Boeing such as the inspection of the apex bolt, regularly bleed the hydraulic manifold of the shimmy damper and define the maintenance interval. The absence of inspection requirement to the shimmy damper assembly might lead to the similar accident.

Therefore, KNKT recommend to implement the Boeing SL 737-SL-32-057-E (or the latest revision) requirement.

4.2 Directorate General of Civil Aviation (DGCA)

04.R-2020-03.02

The height variation on the runway resulted in the bumpy to the aircraft during take-off and landing that led to increasing the vertical acceleration during takeoff as reported by some operators. Since the height variation was not resolve yet, the height variation on the runway might contribute to the fatigue to the landing gear system including the torsion link and shimmy damper.

Therefore, KNKT recommend to resolve the height variation on the runway.

5 APPENDICES

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