KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA

FINAL

KNKT.15.08.17.04

Aircraft Accident Investigation Report

PT. Trigana Air Service

ATR 42-300; PK-YRN

Tanggo Mountain, Oksibil, Papua

Republic of Indonesia

16 August 2015

2017

This final investigation 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, the Indonesian Aviation Act (UU No. 1/2009) and Government Regulation (PP No. 62/2013).

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TABLE OF CONTENTS

TABLE OF FIGURES

ABBREVIATIONS AND DEFINITIONS

AD	:	Airworthiness Directive
AFIS	:	Aerodrome Flight Information Services
AGL	:	Above Ground Level
AHRS	:	Attitude Heading Reference System
AIP	:	Aerodrome Information Publication
ALA	:	Aerodrome for Light Aircraft
AMSL	:	Above Mean Sea Level
AOC	:	Air Operator Certificate
ATPL	:	Airline Transport Pilot License
ATS	:	Air Traffic Services
BEA	:	Bureau d'Enquêtes et d'Analyses
BKN	:	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 BKN (Broken) is when the clouds cover more than half (5/8 up to 7/8) area of the sky
CASR	:	Civil Aviation Safety Regulation
CFIT	:	Controlled Flight Into terrain
C of A	:	Certificate of Airworthiness
C of R	:	Certificate of Registration
CPL	:	Commercial Pilot License
CRM	:	Crew Resource Management
CVR	:	Cockpit Voice Recorder
DGCA	:	Directorate General of Civil Aviation
DVI	:	Disaster Victim Identification
EGPWS	:	Enhanced Ground Proximity Warning System
EI	:	Engineering Instruction
FDR	:	Flight Data Recorder
GBAS	:	Ground-Based Augmentation System
GLONASS	:	Globalnaya Navigazionnaya Sputnikovaya Sistema, or Global Navigation Satellite System. GLONASS is Russia's version of GPS (Global Position System).
GPS	:	Global Positioning System
GPWS	:	Ground Proximity Warning System
GRAS		Ground-based regional augmentation system

IFR	:	Instrument Flight Rules
Kg	:	kilograms
KNKT	:	Komite Nasional Keselamatan Transportasi
LT	:	Local Time
m	:	Meters
MAC	:	Mean Aerodynamic Chord
MHz	:	Mega Hertz
MORA	:	Minimum on Route Altitude
NA	:	Not Applicable
NDB	:	Non- Directional Beacon
Nm	:	Nautical miles
PBN	:	Performance-based Navigation
PIC	:	Pilot in Command
RNAV	:	Area Navigation
RNP	:	Required Navigation Performance
SA	:	Situational Awareness
SB	:	Service Bulletin
SBAS	:	Satellite-based augmentation system
SIC	:	Second in Command
TAWS	:	Terrain Avoidance Warning System
TSO		Technical Standard Order
UTC	:	Universal Time Coordinated

SYNOPSIS

An ATR 42-300 aircraft registered PK-YRN was being operated by PT Trigana Air Service on 16 August 2015 as scheduled passenger flight with flight number IL267 from Sentani to Oksibil. On board of this flight were 54 persons. This flight was the fifth flight of the day and the second flight from Sentani to Oksibil.

The aircraft departed Sentani at 0522 UTC and estimated time of arrival Oksibil was at 0604 UTC. The Second in Command (SIC) acted as Pilot Flying while the Pilot in Command (PIC) acted as Pilot Monitoring.

The weather at Oksibil reported that the cloud was broken (more than half area of the sky covered by cloud) and the cloud base was 8,000 feet (4,000 feet above airport elevation) and the visibility was 4 up to 5 km. The area of final approach path was covered by clouds.

The flight cruising at 11,500 feet and at 0555 UTC, the pilot made first contact with Oksibil Aerodrome Flight Information Services (AFIS) officer, reported on descent at position Abmisibil and intended to direct left base leg runway 11.

At 0600 UTC, Oksibil AFIS officer expected the aircraft would have been on final but the pilot had not reported, the AFIS officer contacted the pilot but did not reply. The AFIS officer informed Trigana in Sentani that they had lost contact with IL267.

The aircraft wreckage was found on a ridge of Tanggo Mountain, Okbape District, Oksibil at approximately 8,300 feet AMSL at coordinates of 04°49’17.34” S, 140°29’51.18” E, approximately 10 NM from Oksibil Aerodrome on bearing of 306°. All occupants were fatally injured and the aircraft was destroyed by impact force and post impact fire.

The Flight Data Recorder (FDR) and Cockpit Voice Recorder were recovered and transported to KNKT recorder facility. The recovery of FDR data was unsuccessful while the recovery of CVR data successfully retrieved accident flight data. The CVR did not record any crew briefing, checklist reading not EGPWS warning prior to impact. The CVR also did not record EGPWS altitude call out on two previous flights. The investigation concluded that the EGPWS was probably not functioning.

The investigation considers the contribution factors of this accident were:

1. The deviation from the visual approach guidance in visual flight rules without considering the weather and terrain condition, with no or limited visual reference to the terrain resulted in the aircraft flew to terrain.
2. The absence of EGPWS warning to alert the crew of the immediate hazardous situation led to the crew did not aware of the situation.

KNKT had been informed several safety actions taken by the PT. Trigana Air Service resulting from this occurrence and considered that the safety actions were relevant to improve safety. In addition, KNKT issued safety recommendations to PT. Trigana Air Service, AirNav Indonesia and Directorate General of Civil Aviation.

1 FACTUAL INFORMATION

1.1 History of the Flight

An ATR 42-300 aircraft, registered PK-YRN, was being operated by PT Trigana Air Service on 16 August 2015 as a scheduled passenger flight with flight number IL267. The flight departed Sentani[1] Airport, Jayapura, with intended destination to Oksibil Airport, Papua. On board the flight was 54 persons consisting of two pilots, two flight attendants, one company engineer and 49 passengers (44 adults, two children and three infants).

The flight plan form was filed with the intention to fly under Instrument Flight Rule (IFR), at an altitude of 15,500 feet (flight level/FL 155), with route from Sentani via airways W66 to MELAM - Oksibil.

The aircraft departed Sentani at 0522 UTC[2] and estimated time of arrival Oksibil was at 0604 UTC. The flight was the 5th flight of the day for the crew and the aircraft and was the second flight on the same route of Sentani to Oksibil.

The Second in Command (SIC) acted as Pilot Flying while the Pilot in Command (PIC) acted as Pilot Monitoring.

At 0555 UTC, the pilot made first contact with Oksibil Aerodrome Flight Information Services (AFIS)[3] officer, reported on descent from an altitude of 11,500 feet at position Abmisibil, and was acknowledged by the AFIS officer. The AFIS officer suggested the pilot to report when position overhead the airport. The pilot replied that they intended to fly direct to a left base leg for runway 11. The Oksibil AFIS officer advised the pilot to continue approach and to call when positioned on final runway 11.

Figure 1: Archive photo of PK-YRN

At 0600 UTC, Oksibil AFIS officer expected the aircraft would have been on final but the pilot had not reported, the AFIS officer attempted to contact the pilot but did

1 Sentani Airport Jayapura will be named as Sentani for the purpose of this report.

2 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 Oksibil is Eastern Indonesia Standard Time / Waktu Indonesia Timur (WIT) is UTC + 9.

3 Aerodrome Flight Information Services (AFIS) is the provision of information useful for the safe and efficient conduct of aerodrome traffic at an aerodrome where the appropriate air traffic services authority determines that the provision of aerodrome control service is not justified.

not receive a reply.

The aircraft wreckage was found on a ridge of Tanggo Mountain, Okbape District, Oksibil at approximately 8,300 feet Above Mean Sea Level (AMSL) at coordinates of 04°49’17.34” S, 140°29’51.18” E, approximately 10 Nm from Oksibil Aerodrome on a bearing of 306°.

All occupants were fatally injured and the aircraft was destroyed by impact force and post-impact fire.

Figure 2: The accident site pictures taken during search and rescue

1.2 Injuries to Persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	4	50	54	-
Serious	-	-	-	-
Minor/None	-	-	-	
TOTAL	4	50	54	

1.3 Damage to Aircraft

The aircraft was destroyed by impact force and post-impact fire.

1.4 Other Damage

There was no significant other damage to property and/or the environment.

1.5 Personnel Information

1.5.1 Pilot in Command

Gender	:	Male
Age	:	60 years
Nationality	:	Indonesia
Marital status	:	Married
Date of joining company	:	1 October 1991
License	:	ATPL
Date of issue	:	18 November 1997
Validity	:	30 September 2015
Aircraft type rating	:	ATR 72/42
Instrument rating	:	30 September 2015
Medical certificate	:	First class
Last of medical	:	19 May 2015
Validity	:	11 November 2015
Medical limitation	:	Holder shall possess glasses that correct for near vision
Last line check	:	20 March 2015
Last proficiency check	:	31 March 2015

Flying experience

Total hours	:	25,287 hours 18 minutes
Total on type	:	7,340 hours 59 minutes
Last 90 days	:	181 hours 10 minutes
Last 60 days	:	87 hours 53 minutes
Last 24 hours	:	8 hours 5 minutes
This flight	:	Approximately 40 minutes

According to the witness statement most of the time the PIC did not follow the visual approach guidance while conducting approach at Oksibil. The CVR also recorded the previous flight to Oksibil was conducted by direct to left base runway 11.

1.5.2 Second in Command

Gender	:	Male
Age	:	44 years
Nationality	:	Indonesia
Marital status	:	Married

Date of joining company	:	1 June 2008
License	:	CPL
Date of issue	:	6 December 2007
Validity	:	30 September 2015
Aircraft type rating	:	ATR 72/42; B 737 CL
Instrument rating	:	30 September 2015
Medical certificate	:	First class
Last of medical	:	21 April 2015
Validity	:	31 October 2015
Medical limitation	:	Holder should wear corrective lens for distance and near vision
Last line check	:	14 October 2014
Last proficiency check	:	30 September 2014
Flying experience		
Total hours	:	3,818 hours 12 minutes
Total on type	:	2,640 hours 17 minutes
Last 90 days	:	103 hours 37 minutes
Last 60 days	:	100 hours 13 minutes
Last 24 hours	:	5 hours 26 minutes
This flight	:	Approximately 40 minutes

1.6 Aircraft Information

1.6.1 General

Registration Mark	:	PK-YRN
Manufacturer	:	ATR (Avions de Transport Regional)
Country of Manufacturer	:	France
Type/ Model	:	ATR 42-300
Serial Number	:	102
Year of manufacture	:	1988
Certificate of Airworthiness		
Issued	:	31 March 2015
Validity	:	Valid until 30 March 2016
Category	:	Transport
Limitations	:	None

Certificate of Registration		
Number	:	2196
Issued	:	27 June 2015
Validity	:	Valid until 26 June 2018
Time Since New	:	50,133 hours 39 minutes
Cycles Since New	:	55,663 Cycles
Last Major Check	:	C1 Check date 20 December 2012 at Total Airframe: 45,839 hours 23 minutes
Last Minor Check	:	Work card 09 date 14 August 2015 at Total Airframe: 50,127 hours 56 minutes

1.6.2 Engines

Manufacturer	:	Pratt & Whitney Canada
Type/Model	:	PW120
Serial Number-1 engine	:	120562
▪ Time Since New	:	42,468 hours 52 minutes
▪ Cycles Since New	:	43,180 cycles
Serial Number-2 engine	:	121372
▪ Time Since New	:	26,186 hours 29 minutes
▪ Cycles Since New	:	27,018 Cycles

1.6.3 Propellers

Manufacturer	:	Hamilton Sundstrand
Type/Model	:	14SF-5
Serial Number-1 propeller	:	20061111
▪ Time Since New	:	8,580 hours 04 minutes
▪ Time Since Overhaul	:	NA
Serial Number-2 propeller	:	2021
▪ Time Since New	:	24,797 hours
▪ Time Since Overhaul	:	4,749 hours

1.6.4 Operator Enhanced Ground Proximity Warning System (EGPWS) Installation

The aircraft was installed with the Enhanced Ground Proximity Warning System (EGPWS) part number 965-1206-011. The installed EGPWS unit including the

database memory card was not recovered from the crash site due to post-impact fire.

Installation of EGPWS was a modification to the aircraft which was previously installed with Ground Proximity Warning System (GPWS).

The aircraft operator engineering division prepared the EGPWS installation document in Engineering Instruction (EI) number EI-001/I/2012 which referred to the ATR Service Bulletin (SB) number ATR42-34-0152. The pre-requisite SBs were previously performed by the operator to comply with requirement of SB ATR42-34-0152. The EGPWS part number 965-1206-011 was not equipped with internal GPS to provide the aircraft position. The operator reported that they had installed a separate Global Positioning System (GPS) KLN 94. The installation did not refer to any manufacturer design change. No aircraft manufacturer documentation enabled to connect the KLN94 with the EGPWS part number 965-1206-011.

For an aircraft without HT1000 GNSS installed, requires EGPWS type P/N 965-1216-01, which includes internal GPS to provide aircraft position to EGPWS predictive modes function, as stated on the SB ATR42-34-0153.

The ATR SB number ATR42-34-0152 stated: "*should ATR 42 operator wish to embody this modification, please contact the manufacturer".* The modification of the EGPWS including the pre-requisite SBs were not communicated by the aircraft operator to the aircraft manufacturer.

In completion of the installation, the operator issued document EI-002/I/2012 which referred to the ATR SB number ATR42-34-0159 to perform the operational and functional test to the EGPWS system. This SB is applicable only to aircraft fitted with GPS HT1000 which was not the case of the PK-YRN. The investigation did not find the result of the functional test. Refer to the operator statement, the operational test indicated successful EGPWS installation. The operator provided a video recording of the functional test of the EGPWS on PK-YRN. The operator stated that the video was taken prior to the completion of the EGPWS installation.

The aircraft operator had installed EGPWS to two ATR aircraft registered PK-YRI and PK-YRN and one Boeing B 737 200 registered PK-YSD.

The terrain database installed in the EGPWS of PK-YRN was the version MK_VIII_Worldwide_Ver_471 that was released in 2014. Referring to the Terrain Database Release Forecast published by Honeywell on 13 August 2014 the Oksibil airport was not included in the high-resolution update in this version of terrain database.

1.6.5 Weight & Balance

Maximum allowable take-off weight	:	16,700 kg
Actual take-off weight	:	16,688 kg
Maximum allowable landing weight	:	16,400 kg
Actual landing weight	:	16,188 kg
Fuel at take off	:	1,900 kg
Flight planned fuel burn	:	500 kg

Estimated Fuel at landing	:	1,400 kg
Take off Centre of Gravity	:	26 % MAC

The aircraft was operating within the weight and balance envelope.

1.7 Meteorological Information

The Oksibil Airport did not have meteorological office. The weather reported based on the AFIS officer observation prior to be issued to the pilot of the accident flight. The weather condition was as follow:

Wind	:	110 / 08 knots
Visibility	:	4,000 – 5,000 m
Weather	:	Nil
Cloud	:	BKN (broken)[4] 8,000 feet above sea level or approximately 4,000 AGL. The cloud covered the area of final approach path.

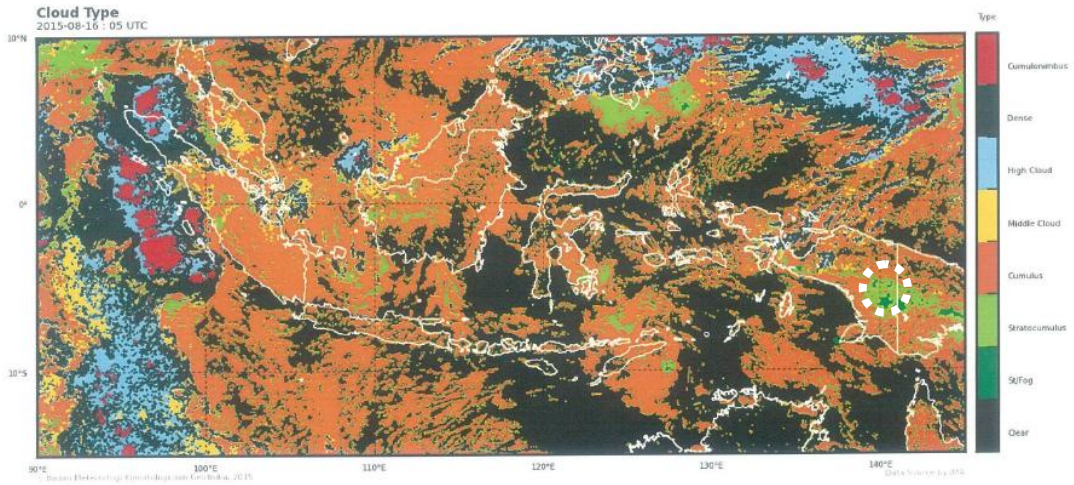


Figure 3: The satellite weather image at 0500 UTC

According to the weather satellite image provided by Badan Meteorologi, Klimatologi dan Geofisika (BMKG - Bureau of Meteorology, Climatology and Geophysics), indicated that over Oksibil area was covered by stratocumulus clouds.

1.8 Aids to Navigation

Based on the navigation chart published in Aeronautical Information Publication (AIP), the flight route from Sentani to Oksibil was via airways W66 that covered instrument route from Sentani up to point MELAM then continued via visual route. The airway W66 had Minimum On Route Altitude (MORA) of 18,500 feet.

4 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 Broken (BKN) is when the clouds cover more than half (5/8 up to 7/8) area of the sky.

The information of Oksibil airport published in AIP volume IV: Aerodrome for Light Aircraft (ALA) did not include approach guidance. According to the ALA the Oksibil was equipped with Non-Directional Beacon (NDB) identified as ZX.

The investigation found that the ZX NDB was inoperative at the day of the accident. Prior to the accident, there was no information of the ZX NDB published in NOTAM[5], indicating that the ZX NDB was inoperative.

The aircraft operator issued visual guidance for approach runway 11 Oksibil. This guidance was intended for internal use. The detail of the guidance available is on the picture below.

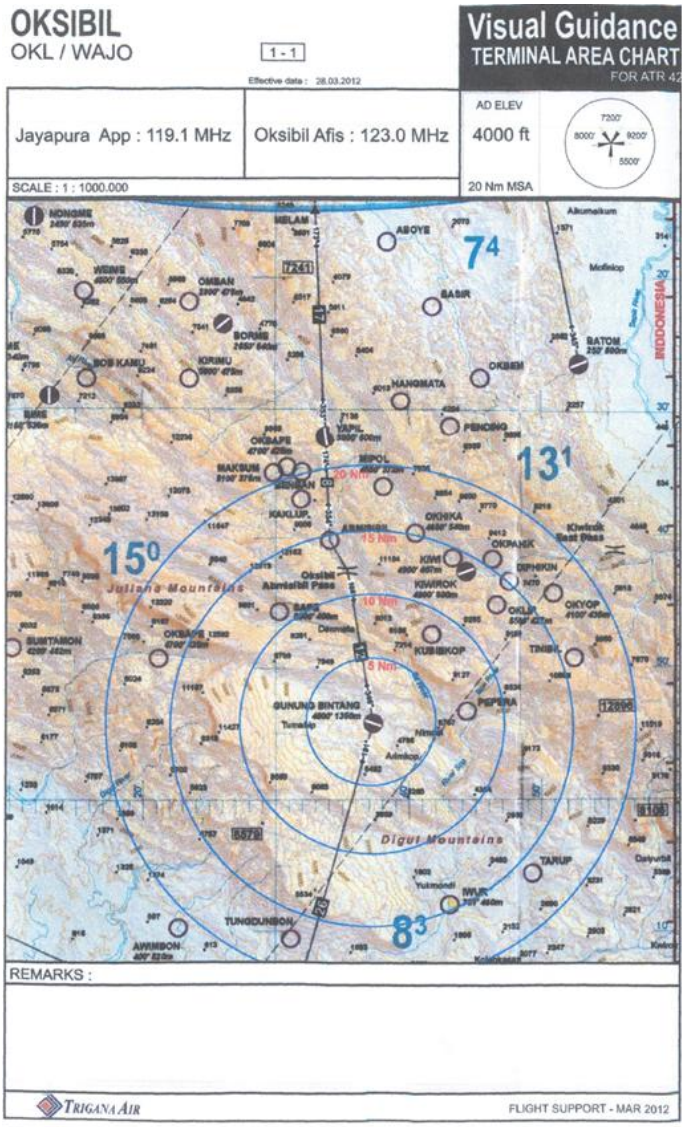


Figure 4: Page 1 of the visual approach guidance showed the visual route after point MELAM

5 Notam: Notification to airmen

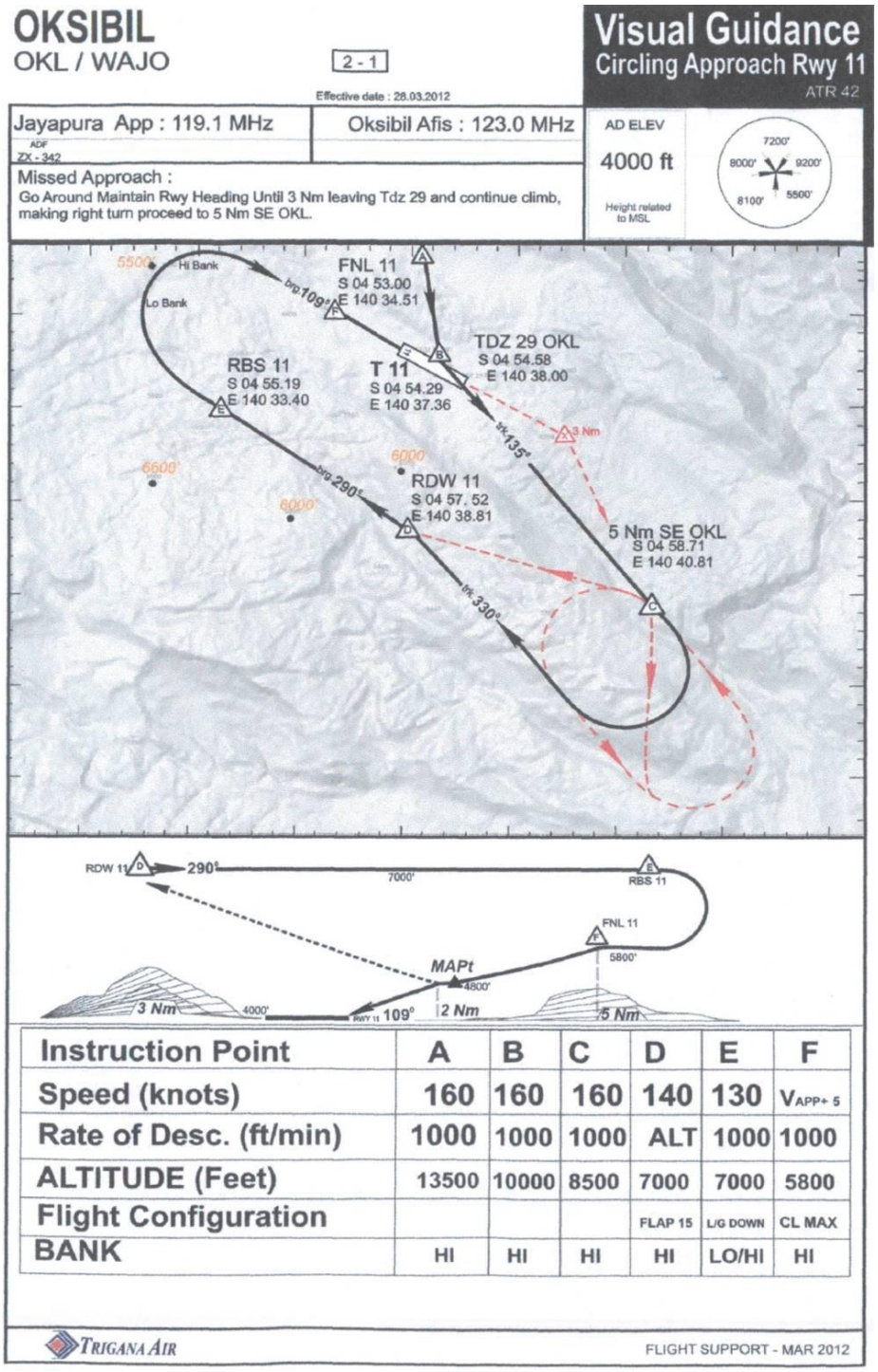
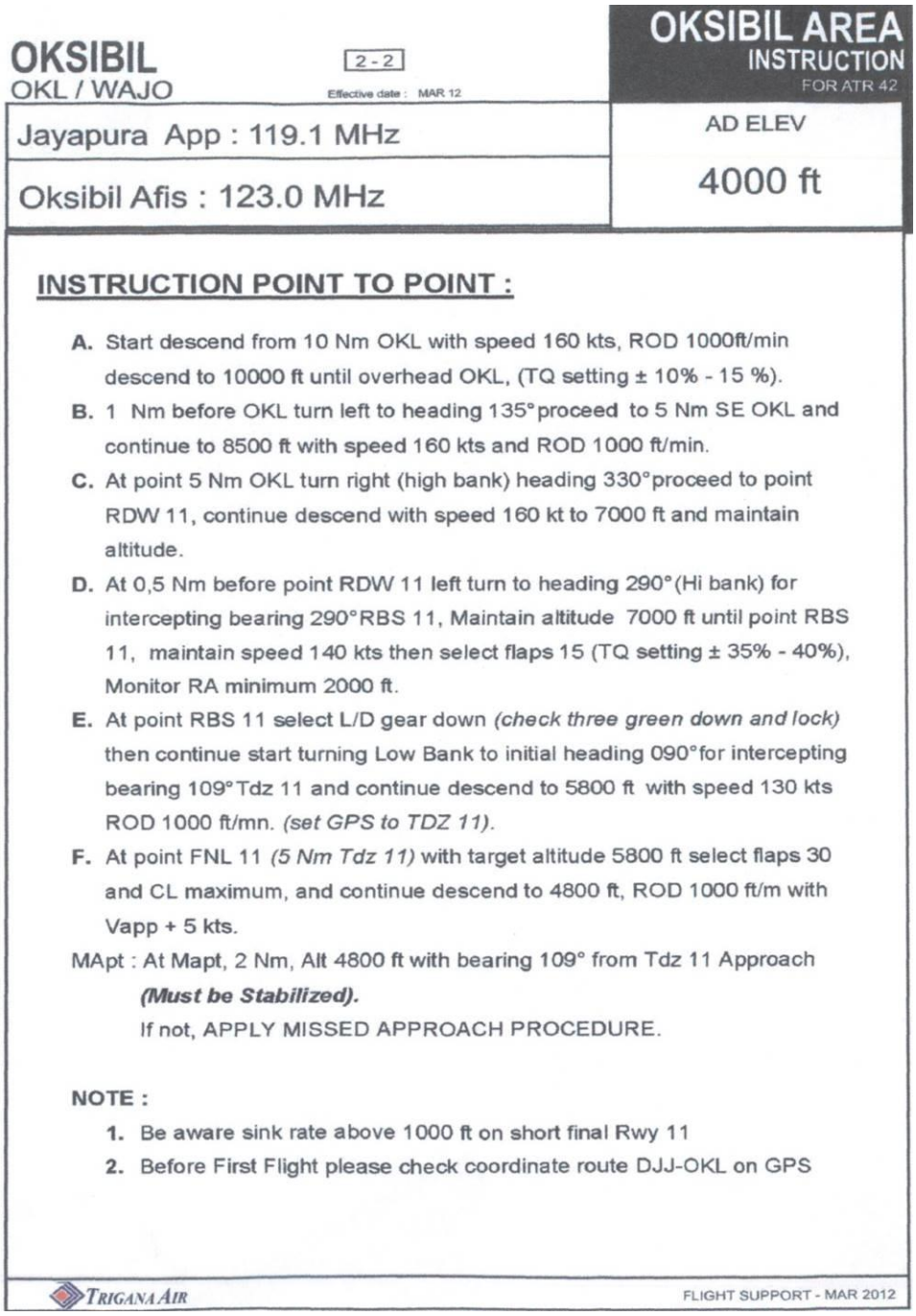


Figure 5: Page 2-1 of the visual approach guidance showed the approach path to runway 11



OKSIBIL
OKL / WAJO

2 - 2

Effective date : MAR 12

OKSIBIL AREA
INSTRUCTION
FOR ATR 42

Jayapura App : 119.1 MHz

Oksibil Afis : 123.0 MHz

AD ELEV
4000 ft

INSTRUCTION POINT TO POINT :

A. Start descend from 10 Nm OKL with speed 160 kts, ROD 1000ft/min descend to 10000 ft until overhead OKL, (TQ setting ± 10% - 15 %).

B. 1 Nm before OKL turn left to heading 135° proceed to 5 Nm SE OKL and continue to 8500 ft with speed 160 kts and ROD 1000 ft/min.

C. At point 5 Nm OKL turn right (high bank) heading 330° proceed to point RDW 11, continue descend with speed 160 kt to 7000 ft and maintain altitude.

D. At 0,5 Nm before point RDW 11 left turn to heading 290° (Hi bank) for intercepting bearing 290° RBS 11, Maintain altitude 7000 ft until point RBS 11, maintain speed 140 kts then select flaps 15 (TQ setting ± 35% - 40%), Monitor RA minimum 2000 ft.

E. At point RBS 11 select L/D gear down *(check three green down and lock)* then continue start turning Low Bank to initial heading 090° for intercepting bearing 109° Tdz 11 and continue descend to 5800 ft with speed 130 kts ROD 1000 ft/mn. *(set GPS to TDZ 11).*

F. At point FNL 11 *(5 Nm Tdz 11)* with target altitude 5800 ft select flaps 30 and CL maximum, and continue descend to 4800 ft, ROD 1000 ft/m with Vapp + 5 kts.

MApt : At Mapt, 2 Nm, Alt 4800 ft with bearing 109° from Tdz 11 Approach
(Must be Stabilized).
If not, APPLY MISSED APPROACH PROCEDURE.

NOTE :

1. Be aware sink rate above 1000 ft on short final Rwy 11
2. Before First Flight please check coordinate route DJJ-OKL on GPS

TRIGANA AIR

FLIGHT SUPPORT - MAR 2012

Figure 6: Page 2-2 of the the visual approach guidance showed the description of the approach guidance

1.9 Communications

Oksibil air traffic services did not provide ground based communication recording.

All communications between Air Traffic Services (ATS) and the pilot were recorded by the aircraft Cockpit Voice Recorder (CVR) for the duration of the flight.

1.10 Aerodrome Information

Airport Name	:	Oksibil
Airport Identification	:	WAJO/OKL
Airport Operator	:	Directorate General Civil Aviation (DGCA)
Coordinate	:	S 4°54.47'; E 140°37.76'
Elevation	:	4,000 feet (1219.2 m)
Runway Direction	:	11-29
Runway Length	:	1,350 m
Runway Width	:	30 m
Surface	:	Asphalt 14 F/C/Y/T

The airport situated on a valley surrounded by mountainous area with the highest terrain up to 11,000 feet at approximately on 9.5 Nm northwest from the airport.

1.11 Flight Recorders

1.11.1 Flight Data Recorder

Manufacturer : Fairchild
Type/Model : F800
Part Number : 17M800-251
Serial Number : 3612

The Flight Data Recorder (FDR) was recovered from the accident site on 20 August 2015 and was transported to the KNKT facility. The FDR recorder used tape storage media. On 21 August 2015, the download data process in KNKT facility was conducted and was observed by BEA (Bureau d'Enquêtes et d'Analyses) France investigator as the Accredited Representatives of the State of Manufacture. The downloading process to retrieve data from the FDR was unsuccessful.

In September 2015, the FDR was transported to BEA facility in Paris, France for downloading process. The downloading process recovered some flight data which were not consistent with the previous flights recorded in the aircraft log. The accident flight data was not recorded.

The maintenance record provided by the operator showed that the FDR had a serviceability issue since 4 April 2012, which became repetitive.

The following table shows the FDR maintenance records.

No	Date	Remark	Serviceable Duration
1	4 Apr 2012	Sent to repair station.	
2	7 Feb 2013	Returned from repair station and sent to operator maintenance store in Jayapura for spare.	
3	12 Mar 2013	The FDR was installed to an aircraft and found unserviceable as indicated by FDR inoperative light illuminated. The FDR was removed and sent to repair station for repair and test.	5 days
4	17 Mar 2013	Received from repair station and installed to PK-YRN	
5	8 Apr 2013	The FDR was found unserviceable as indicated by FDR inoperative light illuminate and sent to repair station	22 days
6	29 Aug 2013	The FDR was received from repair station	
7	13 Sep 2013	The FDR installed on PK-YSA (Boeing 737-200)	
8	28 Oct 2013	The FDR was found unserviceable from PK-YSA as indicated by FDR inoperative light illuminate and sent to repair station	45 days
9	28 Oct 2014	The FDR was received from repair station	
10	27 Nov 2014	The FDR installed on PK-YRN	
11	24 Jan 2015	The FDR was found unserviceable as indicated by FDR inoperative light illuminate and sent to repair station	58 days
12	3 Feb 2015	The FDR was received from repair station	
13	3 Feb 2015	The FDR installed on PK-YRX	
14	19 Feb 2015	The FDR was found unserviceable as indicated by the unit unable to test and sent to repair station	16 days
15	25 Feb 2015	The FDR was received from repair station	
16	27 Feb 2015	Installed to the aircraft (registration not known)	
17	4 Mar 2015	The FDR was unserviceable due to light illuminate and sent to repair station under WO 014/2015	5 days
18	2 Jul 2015	The FDR was received from repair station	
19	7 Jul 2015	The FDR installed on PK-YRN up to the accident flight	

Since 2013 until the occurrence date showed that the FDR had several problems. The operator stated that the FDR unit was sent to the same repair station. The cause of the problem could not be detected.

The investigation could not find any evidence of any maintenance action related to the aircraft system, which normally be taken if the recording problem on the FDR was caused by aircraft system problem.

The repetitive FDR problems indicated that the surveillance to the repair station conducted by operator was not effective.

1.11.2 Cockpit Voice Recorder

Manufacturer : L3 Communication
Model : FA2100
Part Number : 2100-1020-02
Serial Number : 000274767

The Cockpit Voice Recorder (CVR) was recovered from the accident site on 19 August 2015, and transported to the KNKT facility. On 21 August 2015, the download data process was performed in the KNKT facility and observed by BEA (Bureau d'Enquêtes et d'Analyses) France investigator as the Accredited Representatives of the State of Manufacturer.

The CVR data was successfully recovered and contained two hours voice recording data. The recording data included the approach on the previous flight from Sentani to Oksibil, the flight from Oksibil to Sentani and the accident flight.

During the accident flight, most likely the crew did not use their headset resulting in crew conversation were not recorded with high quality on their respective CVR channels.

The Cockpit Area Microphone (CAM) captured the ambient voices in the cockpit, including some crew discussions. However, the quality of the recording of the CAM channel was found polluted by high level noise due to the presence in the audio band of several frequencies generated by the aircraft electrical power supply (AC Wild Generator).

Some in-depth filtering processes were applied on the audio recording to reach an acceptable level of voice quality allowing some transcription of the crew speech.

The CVR data revealed that on the previous flight from Sentani to Oksibil, the PIC acted as PF and the SIC acted as PM. The flight cruised at 11,500 feet and the approach was conducted by flying direct to left base for runway 11.

The CVR did not record EGPWS altitude call out including the "FIVE HUNDRED" call out prior to land at Oksibil and Sentani.

During the accident flight, the CVR did not record EGPWS warning up to the impact nor any crew briefing and checklist reading, from cruise up to the impact.

Except the absence of EGPWS warning, no evidence of any other aircraft system malfunction was obtained from CVR data.

The excerpt of the accident flight voice recorded data is described in the table below. The time synchronization between CVR time and UTC utilized the Oksibil AFIS time when the aircraft conducted the first contact to Oksibil AFIS.

The excerpt of CVR is as follows:

Estimate Time (UTC)	From	To	Description
5:49:11	IL267	Other pilot	Informing that IL267 was at point MELAM and cruised at 11,500 feet.
5:54:22	IL267	Other pilot	Confirm the other aircraft that was passing by, above IL267 which was maintained at altitude 11,500 feet.
5:55:00	IL267	OKL AFIS	First contact to Oksibil.
5:55:02	IL267	OKL AFIS	Mention the intention to descend from 11,500 feet.
5:55:10	OKL AFIS	IL267	Confirm the descent and requested the pilot to report when position overhead Oksibil.
5:55:17	IL267	OKL AFIS	The pilot intended to direct left base runway 11.
5:55:40			Flight Attendant announces the arrival to the passenger.
5:56:44	P2	P1	P2 requested for flap fifteen.
5:56:46			Flap fifteen was selected.
5:57:13	P2	P1	P2 requested Gear down.
5:57:13			Gear down was selected.
5:57:40	P1	P2	Flap fifteen and gear down was confirmed.
5:58:14			End of recording.

The significant events recorded in the CVR are as follows:

- On the previous flight during approach in Oksibil, the CVR did not record EGPWS altitude call out of “FIVE HUNDRED”.
- On the previous flight during approach in Sentani, the CVR did not record EGPWS altitude call out including “FIVE HUNDRED” callout
- At 05:49:11 UTC, the flight cruised at 11,500 ft via W 66 up to point MELAM, then to Abmisibil.
- At 05:54:22 UTC, the pilot confirmed seeing another aircraft which was passing by.
- At 05:55:00 UTC, the first communication between pilot and Oksibil AFIS officer was conducted when the aircraft position over Abmisibil and pilot stated the intention to fly direct to left base runway 11.
- At 05:57:40 UTC, the pilot had extended the flap and landing gear in preparation for landing.
- The CVR did not record EGPWS warning up to the impact.
- The CVR did not record any crew briefing and checklist reading recorded, from cruising up to the impact.

1.12 Wreckage and Impact Information

The aircraft wreckage was found on a ridge of Tanggo Mountain, Okbape District, Oksibil at approximately 8,300 feet AMSL at coordinates of 04°49'17.34" S, 140°29'51.18" E, approximately 10 Nm from Oksibil Aerodrome on a bearing of 306°.

According to the information of the pilot observing the accident site, the wreckage distributed was on direction approximately 200°.

The area of the aircraft fuselage debris was destroyed by post-impact fire.

Figure 7: The view from the accident side toward the aircraft flight path showed opening forest trees that likely caused by impact to the aircraft

Figure 8: The wreckage of the fuselage damaged by post-impact fire

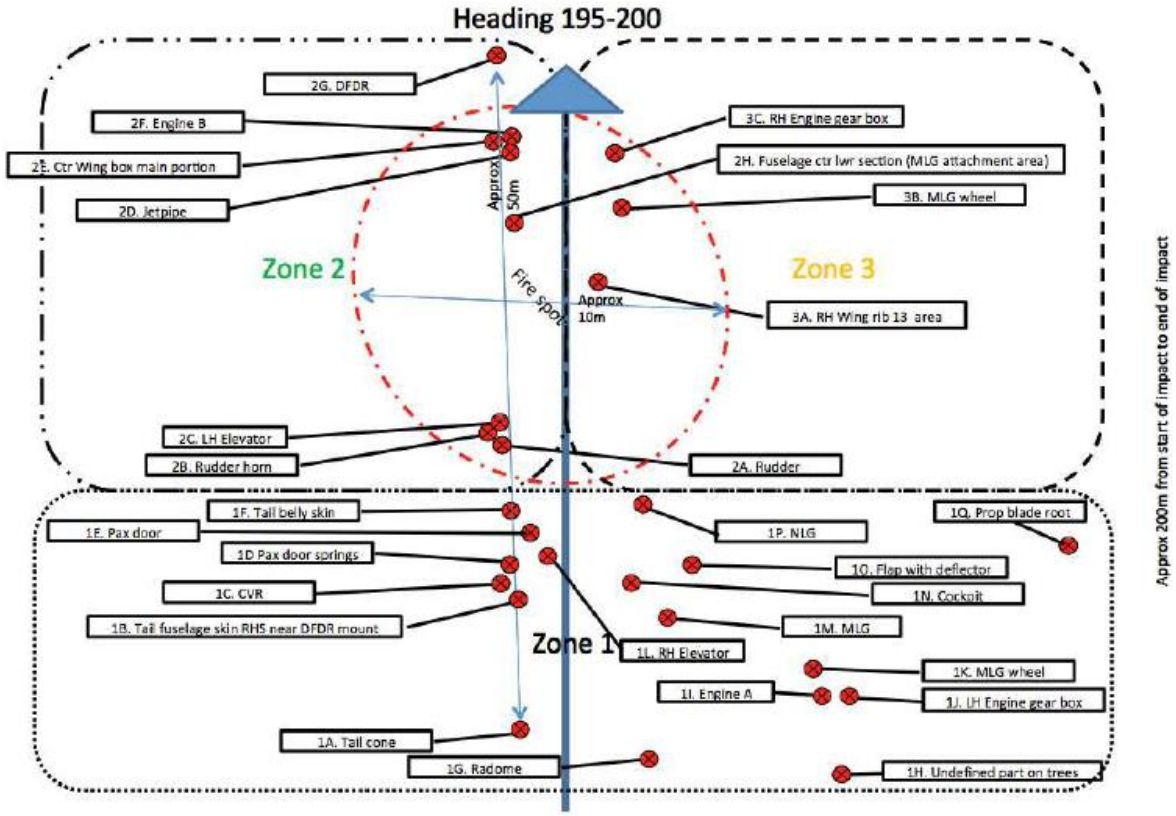


Figure 9: Wreckage distribution chart. Red circle indicated fire area

1.13 Medical and Pathological Information

Total occupants on board were 54, included two flight crew members, two flight attendants, one company engineer and 49 passengers. All occupants were fatally injured and recovered from the accident site.

The deceased victims were recovered from the accident site and evacuated to Bhayangkara Hospital in Jayapura for identification purposes.

The identification of the victims was performed by the Indonesian Disaster Victim Identification (DVI).

1.14 Fire

There was no indication of in-flight fire and the fuselage was destroyed by impact force and post-impact fire. The fire had extinguished when the search and rescue team arrived at the accident site.

1.15 Survival Aspects

After the attempted contact with the pilot of flight IL267 was not responded to, the Oksibil AFIS controller contacted Trigana flight operations in Sentani Airport and informed that they had lost contact with the pilot. The Oksibil AFIS officer also contacted the airport authority in the vicinity (Dekai and Tanah Merah Airport) confirming that the aircraft might have diverted but there was no information available.

The Trigana flight operation staff contacted another company pilot who was flying near the area to attempt to contact the pilot of IL267 and to search for the aircraft.

At 0730 UTC (1630 LT), the search and rescue team assembled. The team consisted of the Oksibil Airport Authority, local government, police, and army. At 0900 UTC (1800 LT) the search operation was postponed and would be continued the following morning.

On 17 August 2015, a Twin Otter aircraft registration PK-YPX, was on a flight from Oksibil to Sentani Airport and the pilot saw smoke on left base runway 11. The pilot of PK-YPX asked the pilot of a Pilatus Porter aircraft that was also flying nearby to verify the smoke. The Pilatus Porter pilot flew to the position at low altitude and confirmed that the smoke was from the debris of an aircraft. The Pilatus Porter pilot informed the location of the aircraft debris to the Oksibil AFIS officer.

The Oksibil AFIS controller informed the location of the aircraft debris to search and rescue (SAR) team. The SAR assembled a team to proceed to the location of the debris.

On 18 August 2015, the search and rescue team arrived at the accident site. The aircraft wreckage was found on a ridge of Tanggo Mountain in Okbape District, Oksibil at approximately 8,300 feet AMSL at coordinates of 04°49’17.34” S, 140°29’51.18” E, approximately 10 NM from Oksibil Aerodrome on a bearing of 306°. All occupants were fatally injured and the aircraft was destroyed by impact force and post-impact fire.

The search and rescue team built a helipad to transport all recovered victims to Oksibil. Subsequently all the deceased victims were transported Bhayangkara Hospital in Jayapura for identification purposes.

1.16 Tests and Research

Spectrum Analysis

Since the recovery FDR data was unsuccessful, the investigation analyzed the spectrum of the CVR and determined the engine torque. The analysis was conducted by BEA.

Certain frequency was detected in the CVR and showed the engine torque variation. The torque variation at 5 minutes before the end of recording shown in the following figure.

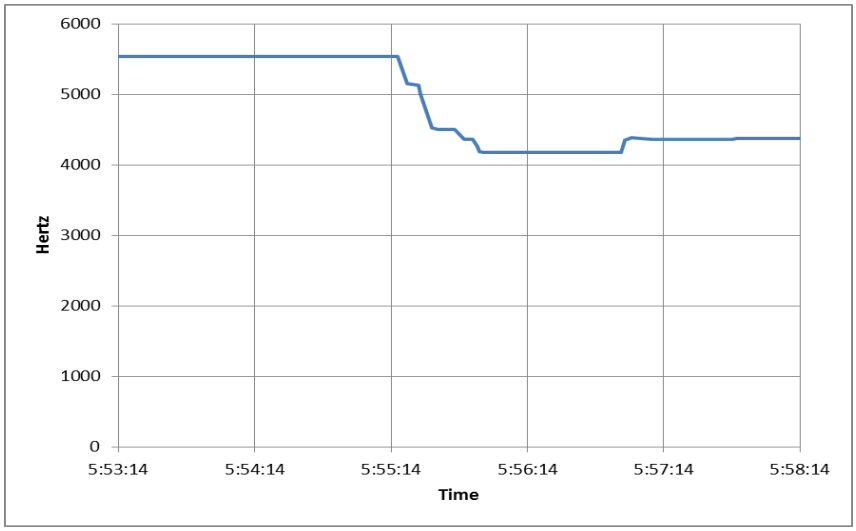


Figure 10: Torque trends versus time extracted at last five minutes of the flight

The graph above showed the torque was maintained and at 5:55:17 UTC the torque started steping down until reached the minimum value recorded for approximately one minute. Subsequently at 5:56:57 UTC the torque slightly increase and maintained until the end of recording.

1.17 Organizational and Management Information

1.17.1 PT. Trigana Air Service

Aircraft Owner and Operator	:	PT. Trigana Air Service
Address	:	Komplek Puri Sentra Niaga. Jl. Wiraloka Blok D 68-70 Kalimalang, Jakarta 13620.
Certificate Number	:	AOC 121 - 006

PT. Trigana Air Services head office is located in Jakarta with several bases of operation such as Jayapura and Ketapang (Kalimantan).

PT. Trigana Air Services serve domestic routes for both passenger and cargo flight, operates 13 aircraft consisting of three ATR 42-300 (including the accident aircraft), two ATR 72-212, three DHC6-300, four Boeing B737-300 and one B737-400.

The operator conducted the flight from Jayapura to Oksibil with average five flights per day utilizing ATR 42 aircraft.

The operator has several company manuals that have been approved by Indonesia Directorate General of Civil Aviation (DGCA). Relevant parts of the manuals, service bulletin compliance and training are described in the following section.

1.17.1.1 Company Operation Manual (COM)

3.4.21. APPROACH AND LANDING

3.4.21.1. APPROACH LANDING AND BRIEFING

a. The approach and landing briefing review following:

1. The type of approach, landing runway, VOR, NDB frequencies, and the inbound course (this should include the name and effective date of the instrument approach procedure);

2. Minimum altitudes (minimum safe, minimum sector, IAF, procedure turn, FAF, DH, or MDA);

3. Standard altitude calls (see section Standard Callout);

4. Timing /transition;

5. Missed approach procedure; and

6. Speeds.

b. Refer to approved Approach Chart:

1. Let down

2. Approach

3. Circling

4. Landing and Missed approach.

3.4.21.3. VISUAL APPROACH

A visual approach is an approach by an IFR flight when all or part of an instrument approach procedure is not completed and the approach is executed in visual reference to terrain.

PIC may request to make a "VISUAL APPROACH" when:

a. The pilot has the airport in sight and can maintain visual reference to terrain. and;

b. The reported ceiling is not below the approved initial approach level, or

c. He reports at the initial approach level or at any time during the instrument approach procedure that the visibility will permit a visual approach and he has reasonable assurance that the landing can be accomplished.

When a visual approach is made, and particularly when over dark terrain at night, special emphases must be placed on the familiarity with terrain, elevation and obstruction data from the approach charts. A descent below minimum sector altitude shall not be made until but pilots certain of the aircraft's position and the safety of this descent. More over sample terrain and obstacle clearance must be maintained until final descent is started.

The PIC must be prepared for an overshoot from any point of the visual approach.

1.17.1.2 Operator FCOM ATR42 volume 1

** Maximum Flap Extended Operating Speed V_{FE}*

FLAPS 15 160 kt

FLAP 30 145 kt

FLAP 45 130 kt (EMERGENCY ONLY)

** Maximum Landing Gear Extended or Operating Speed*

$V_{LE} = V_{LO}$ =160 kt

AA

CRUISE 2 ENGINES

16.5 T

MINIMUM TIME

	FLT LEVEL	DELTA ISA -10		0		+10		+15		+20	
	60	90.0	90.0	90.0	89.9	81.7	90.0	76.3	85.2	71.1	79.4
		349	322	350	323	325	323	309	309	293	293
		237	226	235	224	225	223	218	217	210	210
		254	242	256	245	249	247	243	243	237	237
R	80	90.0	90.0	90.0	90.0	79.5	88.7	74.4	83.0	69.4	77.5
		343	317	343	318	313	314	298	298	283	283
		235	224	233	222	220	219	213	212	206	205
		258	247	261	250	251	251	245	244	239	239
R	100	90.0	90.0	87.3	90.0	77.0	85.9	72.2	80.3	67.5	75.3
		336	312	329	313	300	302	286	287	272	272
		232	222	227	221	214	214	208	207	201	200
		263	252	263	255	253	252	247	246	241	240
	120	90.0	90.0	84.4	90.0	74.4	82.9	69.8	77.9	65.4	72.9
		330	307	315	308	286	289	273	275	260	261
		230	221	222	218	209	209	202	201	195	194
		268	258	264	260	254	253	248	247	242	241
R	140	90.0	90.0	81.1	90.0	71.6	79.8	67.3	75.0	63.2	70.4
		325	302	300	304	273	276	261	263	249	250
		227	218	216	215	203	203	196	195	189	188
		274	263	265	265	254	254	248	247	242	241
R	160	86.7	90.0	77.3	86.2	68.4	76.2	63.9	71.1	60.0	66.8
		311	298	284	289	259	262	246	248	235	236
		222	215	209	209	196	195	188	187	181	180
		275	267	265	265	254	253	246	245	240	238
	180	81.4	90.0	72.9	81.3	65.0	72.4	61.1	68.0	57.1	63.6
		290	295	266	271	244	248	233	235	221	223
		213	212	201	201	188	188	181	180	173	172
		273	272	263	263	252	251	245	243	237	235
R	200	76.7	85.4	69.0	76.8	61.5	68.5	58.0	64.5	54.4	60.5
		273	279	250	255	230	233	220	222	209	211
		205	205	193	193	180	179	173	171	165	163
		271	271	262	261	249	247	242	240	232	231
R	220	71.9	80.1	64.8	72.2	57.9	64.3	54.5	60.7	51.3	57.0
R		256	262	235	239	215	218	206	208	197	198
		196	196	184	184	170	169	163	161	154	152
		268	268	258	257	244	241	235	233	225	222
R	240	65.7	73.1	60.4	67.2	54.0	60.0	50.8	56.3		
		234	240	219	223	200	203	191	193		
		184	184	173	173	159	157	149	146		
		261	261	251	250	235	233	224	218		
	250	62.6	69.7	58.1	64.6	52.0	57.7	48.5			
		224	229	211	215	192	195	183			
		178	178	167	166	152	149	136			
		256	256	247	245	229	224	208			

TQ % NP=86%
KG/H/ENG
IAS
TAS

TQ % NP=77%
KG/H/ENG
IAS
TAS

FCOASO-03.05.02.012.001

AA

Descent charts are established in clean configuration for 3 speed laws (200, 220, 240 kt) and one reference weight (15 T = 33 000 lb).

Two kinds of descent are proposed :

- at given rate
  from cruise altitude, descent at 1500 ft/mn (or 2000 ft/mn with pressurization in FAST mode)
  1) set power to reach the desired descent speed
  2) maintain descent speed and rate of descent
- at given gradient
  from cruise altitude, descent at chosen gradient (3°, 4° or 5°)
  1) set power to reach the desired descent speed
  2) maintain descent speed any gradient of descent

R

From 1500 ft to final landing, the tables are calculated with time and fuel allowances of :

- 3 mn for the time

R - 24 kg (53 lb) for the consumption

WEIGHT CORRECTION

- Increase the fuel consumption by :

R + 2 % at 3° descent gradient

R + 3 % at 4° descent gradient

R + 4 % at 5° descent gradient

for a 1000 kg (2200 lb) weight decrease

- No correction for weight increase
- No influence on time and distance

USE OF NP = 77 %

The effect of reduced propeller speed is negligible on the performance.
The use of reduced propeller speed is forbidden in icng conditions.

AA

DESCENT 2 ENGINES

NP = 86 %

R **15000 KG** — **NORMAL CONDITIONS**

	FLIGHT LEVEL	200 KT IAS		220 KT IAS		240 KT IAS	
		1500 ft/mn	2000 ft/mn	1500 ft/mn	2000 ft/mn	1500 ft/mn	2000 ft/mn
R	250	19 99 64	15 69 48	19 119 70	15 83 53	19 145 76	15 101 57
R	240	18 96 61	14 67 45	18 115 67	14 80 50	18 140 72	14 98 54
R	230	17 93 57	14 65 43	17 111 63	14 78 47	17 135 69	14 94 52
R	220	17 90 54	13 64 41	17 107 60	13 75 45	17 130 65	13 91 49
R	210	16 87 51	13 62 38	16 103 56	13 73 42	16 125 61	13 87 46
R	200	15 84 48	12 60 36	15 99 53	12 71 40	15 120 58	12 84 43
R	180	14 78 42	11 57 32	14 91 47	11 66 35	14 109 51	11 78 38
R	160	13 72 37	10 53 27	13 83 40	10 61 30	13 99 44	10 71 33
R	140	11 66 31	9 50 23	11 75 34	9 57 26	11 89 37	9 65 28
R	120	10 60 26	8 46 19	10 67 28	8 52 21	10 78 31	8 58 23
R	100	9 54 20	7 42 15	9 59 23	7 47 17	9 68 25	7 52 18
R	80	7 47 15	6 38 12	7 51 17	6 42 13	7 58 19	6 45 14
R	60	6 40 11	5 33 8	6 43 12	5 36 9	6 47 13	5 39 9
R	40	5 33 6	4 29 4	5 35 6	4 31 5	5 37 7	4 32 5
R	15	3 24 0	3 24 0	3 24 0	3 24 0	3 24 0	3 24 0

FROM START OF DESCENT TIME (MIN) FUEL (KG)

FROM START OF DESCENT DIST (NM)

ENGINES

ENGINE PARAMETERS

Operation limits with no unscheduled maintenance required.
Beyond these limits refer to maintenance manual.

	POWER SETTING	TIME LIMIT	TQ (%)	ITT (°C)	NH (%)	NP (%)	OIL PRESS (PSI)	OIL TEMP (°C)
	RESERVE TAKE OFF	10 mn (***)	105 (****)	816	100	101	55 to 65	0 to 115 (3)
	TAKE OFF	5 mn	92	785	(*)	101	55 to 65	0 to 115 (3)
R	MAXIMUM CONTINUOUS	NONE	85	785	100	101 (**)	55 to 65	0 to 115 (3)
	GROUND IDLE				62 mini		40 mini	- 40 to 115 (3)
	HOTEL MODE (5)			785			40 mini(4)	115 (6)
	STARTING	5 s (2)		950				- 40 mini (7)
R R R	TRANSIENT	10 mn(1) 10 mn (-1)(2) 20 s (-1)(2)	112.5 125(8) 125	850	102	110	40 to 100	
		20 mn						125

1.17.1.3 Standard Operating Procedure ATR 42/72

The aircraft operator issued Standard Operating Procedure (SOP) ATR 42/72 in addition to the existing aircraft manuals. Related to the operation of EGPWS, the SOP revision 0 dated November 2010 stated:

A pilot should never fly in a situation which may put his passengers, his aircraft and himself in danger. Activation of EGPWS is therefore a crucial alarm regarding flight safety. An analysis of some crashes shows that the pilots involved did not believe in EGPWS warning and, as a consequence of their disbelief, entered into a state of inability to take proper action.

Note: When flying under daylight VMC conditions, a warning threshold may be deliberately exceeded due to a good knowledge of the present terrain; the warning may be regarded as a caution and the approach may be continued.

A go around shall be initiated if the cause of the warning cannot be identified immediately.

1.17.1.4 Maintenance management

The operator maintenance management data utilized self-developed information system which called Trigana Application System. The system consists of:

- Component Status (to identify the installed component on the aircraft);

- Aircraft Document control (e.g. C of A and C of R status);
- Airworthiness Directive (AD) and Service Bulletin (SB) control;
- Material and inventory control.

Referring to the data from the system provided by the operator, the investigation found some differences between the recorded data with the actual e.g.:

- The recovered FDR part number was 17M800-251 while the part number provided by the operator was 980-4100-DXUN. The recovered CVR part numbers was 2100-1020-02 while the data provided by the operator was 93A-100-83.
- The Enhanced Ground Proximity Warning System (EGPWS) part number was stated 965-0476-088 and then it was revised to part number 965-1206-011.

1.17.1.5 Training

The operator conducted all the mandatory training for pilots including Crew Resource Management (CRM) and Controlled Flight into Terrain (CFIT) training as required by Civil Aviation Safety Regulation (CASR).

The operator had provided all the flight crew and the engineers with the briefing introduction of EGPWS.

The training for the application of the EGPWS conducted in the Line Oriented Flight Training as stated in the Operation Training Manual revision 005 dated 9 June 2015 for the flight crew in the recurrent training assessment syllabus. The pilot recurrent in the simulator exercises was conducted every 6 months for Captains and 12 months for First Officers.

1.17.1.6 Flight Crew Behaviour

Referring to the management statement, several ATR pilots sometimes found the circuit breaker (CB) of the EGPWS pop out when they were conducting pre-flight checks. When the CB was reset, the EGPWS system was functioning properly. Furthermore, the management stated that several pilots including the pilot in command of the accident flight had the behavior of pulling the EGPWS CB.

Prior to the accident, the management had scheduled to brief the pilot regarding to the behavior to prevent the pilots pulling the EGPWS CB and some other issues.

Several pilots stated that the reason for pulling the EGPWS CB was due to the pilots considered that the EGPWS warning activations sometime were not appropriate to the flight conditions.

The system architecture, stated when the EGPWS circuit breaker is pulled, “GPWS” amber light illuminates on the Crew Alerting Panel (CAP) and the “FAULT” lights illuminate on the TERRAIN and GPWS pushbutton located in the cockpit.

1.17.2 Directorate General Civil Aviation

1.17.2.1 Civil Aviation Safety Regulations Part 121

121.354 Terrain Awareness and Warning System.

(a) No person may operate a turbine-powered aeroplane after November 30, 2009, unless that aeroplane is equipped with an approved Terrain Awareness and Warning System (TAWS) that meets the requirements for Class A equipment in the FAA Technical Standard Order (TSO)–C151 or its equivalent. The aeroplane must also include an approved terrain situational awareness display.

(b) [Reserved]

(c) Aeroplane Flight Manual.

The aeroplane Flight Manual shall contain appropriate procedures for—

(1) The use of the Terrain Awareness and Warning System (TAWS); and

(2) Proper flight crew reaction in response to the Terrain Awareness and Warning System (TAWS) audio and visual warnings.

1.17.2.2 Civil Aviation Safety Regulations Part 91

91.155 Basic VFR Weather Minimums

(a) Except as provided in Paragraph (b) of this section and Section 91.157, no person may operate an aircraft under VFR when the flight visibility is less, or at a distance from clouds that is less, than that prescribed for the corresponding altitude and class of airspace in the following table:

Airspace	*Flight visibility*	*Distance from clouds*
Class A	*Not applicable*	*Not applicable*
Class B	*8 km above 10,000 feet* *5 km below 10,000 feet*	*Clear of clouds*
Class C	*8 km above 10,000 feet* *5 km below 10,000 feet*	*1,000 feet above* *1,000 feet below* *1,500 meters horizontal*
Class D	*8 km above 10,000 feet* *5 km below 10,000 feet*	*1,000 feet above* *1,000 feet below* *1,500 meters horizontal*
Class E	*8 km above 10,000 feet* *5 km below 10,000 feet*	*1,000 feet above* *1,000 feet below* *1,500 meters horizontal*
Class F	*8 km above 10,000 feet* *5 km below 10,000 feet* *The higher of 3,000 feet AMSL 5 km or 1,000 feet AGL insight*	*1,000 feet above* *1,000 feet below* *1,500 meters horizontal* *Clear of clouds*
Class G	*8 km above 10,000 feet* *5 km below 10,000 feet* *The higher of 3,000 feet AMSL 5 km or 1,000 feet AGL insight*	*1,000 feet above* *1,000 feet below* *1,500 meters horizontal* *Clear of clouds*

1.17.2.3 DGCA Evaluation for PT. Trigana Air Service

During the course of investigation, DGCA conduct safety evaluation on 28 until 30 March 2016 to PT. Trigana Air Service to ensure the implementation of KNKT recommendation issued in the KNKT preliminary report of PK-YRN investigation. The evaluation was focused on flight crew compliance to the company procedures and to ensure the maintenance data records were up to date related to the component status.

The evaluation concluded that the operator has implemented the KNKT safety recommendations. Details of the DGCA evaluation of PT. Trigana Air Service is attached in the appendix of this report.

1.18 Additional Information

1.18.1 EGPWS Mode 2 and Terrain Awareness and Display

The Ground Proximity Warning System (GPWS) Mode 2 provides alerts to protect the aircraft from impacting the ground when rapidly rising terrain with respect to the aircraft is detected. The Enhance Ground Proximity Warning System (EGPWS) provides the terrain closure awareness respect to the phase of flight, configuration and speed. This system enhanced the GPWS Mode 2 to provide the terrain information which was provided by the terrain database and displayed onto dedicated display in the cockpit to enhance the pilot awareness.

Mode 2 is based on Radio Altitude and on how rapidly Radio Altitude is decreasing (closure rate). Mode 2 exists in two forms, 2A and 2B.

Mode 2A active during climb out, cruise and initial approach in clean configuration (flap and landing gear retracted).

During an approach, if the aircraft penetrates the Mode 2B envelope with both gear and flaps in the landing configuration, the aural “PULL UP” messages are suppressed and the aural message “TERRAIN” is repeated until the envelope is exited.

The figure below shows the Mode 2B illustration and the envelope.

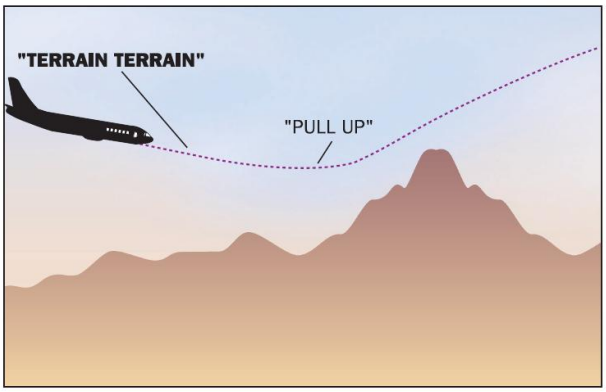


Figure 11: GPWS Mode 2B illustration

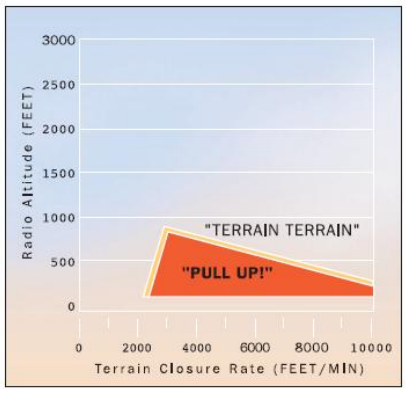


Figure 12: GPWS Mode 2B envelope

Refer to Honeywell EGPWS pilot guide document number 060-4314-000 in extend of mode 2, the Terrain Alerting and Display as part of EGPWS functionality provide the activation timing to provide the crew awareness before conflicting into terrain. The activation times are as follows:

- At 60 seconds before the aircraft ahead terrain the caution "TERRAIN TERRAIN" activated
- At 30 seconds before the aircraft ahead terrain the warning "TERRAIN TERRAIN, PULL UP" activated

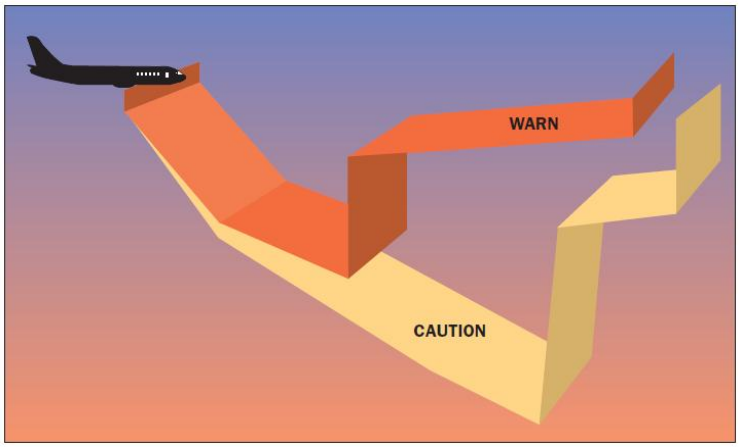


Figure 13: Terrain Alerting and Display envelope

According to EGPWS pilot guide document number 060-4314-000, the EGPWS featured with a basic altitude callout "FIVE HUNDRED" when the aircraft at 500 feet AGL. The document stated that to meet the aircraft for installation of EGPWS onto any aircraft, there must be a form of call out for five hundred feet. This can be achieved via one of three options, in the EGPWS, as a "hard 500", "smart 500" or "500 above field" call outs.

1.18.2 Terrain Data Coverage

Refer to EGPWS Line Maintenance Manual document number 060-4199-180, Rev G dated 29 Mar 2010, the EGPWS terrain database is the earth's surface which divided into grid sets and cells referenced to the geographic (latitude/longitude) coordinate system of the World Geodetic System 1984 (WGS-84).

Elements of the grid sets include the highest terrain altitude (above MSL) in each cell respective area. Grid sets vary in resolution depending on geographic location. Usually higher resolution grids are used around airports and lower resolution grids are used outside of airport areas where aircraft altitude en-route for which detailed terrain features are not important to the flight crew. Default data resolution (lower resolution grids) in EGPWS is 30 arcs-second while the high-resolution terrain data is 15 arcs-second.

However, some en-route area which included high terrain, the low-resolution terrain database may generate nuisance to the flight crew by the EGPWS warning of "TERRAIN TERRAIN PULL-UP".

When sufficient or significant new data is available, Honeywell will release a database update

The illustration of terrain alerting related to the terrain resolution of low resolution and high resolution is as follow:

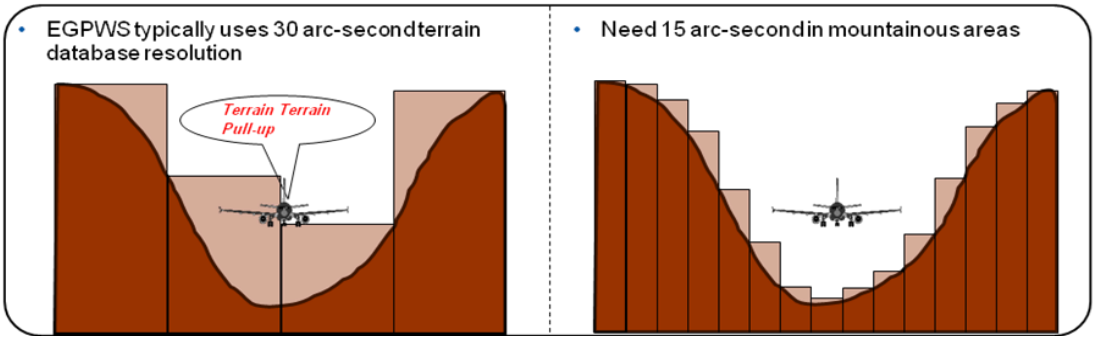


Figure 14: Terrain alerting coverage in low and high resolution

1.18.3 Situational Awareness (Endsley and Garland, 2000)[6]

Most simply put, SA *is knowing what is going on around you. Inherent in this definition is a notion of what is important. SA is most frequently defined in operational terms. While someone not engaged in a task or objective might have awareness (e.g. someone sitting under a tree idly enjoying nature), this class of individuals has been largely outside the scope of human factors design efforts. Rather, we have been concerned mostly with people who need SA for specific reasons. For a given operator, therefore, SA is defined in terms of the goals and decision tasks for that job. The pilot does not need to know everything (e.g. the co-pilot's shoe size and spouse's name), but does need to know a great deal of information related to the goal of safely flying the aircraft.*

A general definition of SA *that has been found to be applicable across a wide variety of domains describes SA as "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future"*

Long-term Memory & Working Memory Connection

To view SA as either a function of working memory or long-term memory would probably be erroneous, for instance, showed that experienced pilots could report on relevant SA information for five to six minutes following freezes in an aircraft simulation without the memory decay that would be expected from information stored in working memory.

Situation Awareness, Decision Making, and Performance Disconnect

Good situation awareness should increase the probability of good decisions and good performance, but does not guarantee it. Conversely, poor situation awareness increases the probability of poor performance, however, in many cases does not create a serious error. For instance, being disoriented in an aircraft is more likely to

6 Endsley and Garland. (2000). Situation Awareness Analysis and Measurement. Lawrence Erlbaum Associates.

lead to an accident when flying at low altitude than when flying at high altitude. Lack of situation awareness about one's opponent in a fighter aircraft may not be a problem if the opponent also lacks situation awareness. In relation to situation awareness measurement, these issues indicate that behavior and performance measures are only indirect indices of operator situation awareness.

1.18.4 Performance-based Navigation

ICAO Doc 9613: Performance-based Navigation (PBN) Manual

PBN terminology

Two fundamental aspects of any PBN operation are the requirements set out in the appropriate navigation specification and the NAVAID infrastructure (both ground- and space-based) allowing the system to operate.

A navigation specification is a set of aircraft and aircrew requirements needed to support a navigation application within a defined airspace concept.

1.1.2 Benefits

PBN offers a number of advantages over the sensor-specific method of developing airspace and obstacle clearance criteria. For instance, PBN:

a) reduces the need to maintain sensor-specific routes and procedures, and their associated costs. For example, moving a single VOR ground facility can impact dozens of procedures, as VOR can be used on routes, VOR approaches, missed approaches, etc. Adding new sensor-specific procedures will compound this cost, and the rapid growth in available navigation systems would soon make sensor-specific routes and procedures unaffordable;

b) avoids the need for development of sensor-specific operations with each new evolution of navigation systems, which would be cost-prohibitive. The expansion of satellite navigation services is expected to contribute to the continued diversity of RNAV and RNP systems in different aircraft. The original Basic GNSS equipment is evolving due to the development of augmentations such as SBAS, GBAS and GRAS, while the introduction of Galileo and the modernization of GPS and GLONASS will further improve GNSS performance. The use of GNSS/inertial integration is also expanding;

c) allows for more efficient use of airspace (route placement, fuel efficiency, noise abatement, etc.);

d) clarifies the way in which RNAV and RNP systems are used; and

e) facilitates the operational approval process for operators by providing a limited set of navigation specifications intended for global use.

The highlight of PBN implementation in Indonesia is shown in the table below as extracted from the Indonesia PBN report on January 2017 (public document here attached for courtesy).

	Short Term (2010-2013)	Medium Term (2013-2016)	Long Term (2016+)
En-Route	- RNAV5 on selected existing route(s). - Feasibility Study of RNAV2 Implementation.	- Implements RNAV5 airspace by 2015. - Implementation of RNAV 2 on selected Route(s).	Consider mandate better navigation specification in accordance with the ICAO regional roadmap.
Terminal	RNAV 1 STAR/SID on selected international airport	- Expands RNAV1 STAR/SID on international airports - Introduce RNAV1 on domestic airport(s)	Completes the implementation for both international and domestic airport
Approach	- RNP APCH at selected instrument runways - RNP AR at certain airport - Feasibility study of GBAS	- RNP APCH at all instrument runways. - RNP AR operation - Trial for GBAS	- Expands RNP APCH and or RNP AR - Expands GBAS application as a backup of the ILS.

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 ANALYSIS

Based on the factual data collected the investigation revealed several issues that may contribute to the accident. The analysis discuss safety issues which considered relevant related to the flight handling and profile and EGPWS operational.

The analysis will therefore discuss to the following issues:
- The rebuilt of predicted aircraft flight path
- Descend and approach procedures
- EGPWS terrain warning
- Organization oversight

2.1 The rebuilt of predicted aircraft flight path

The downloading process to retrieve data from the FDR did not succeed in identifying the accident flight. The FDR data of the accident flight could not be used for this investigation. The investigation determines the estimated flight path utilized the CVR data including the spectrum analysis, company visual guidance, aircraft performance, wreckage and impact information. The data was superimposed to Google Earth and the Geocontext profiler to visualize the terrain along the flight track.

The operator visual guidance was utilized to predict the flight path between point MELAM to Abmisibil.

The significant events recorded on the CVR were utilized to determine the significant point and the CVR time was utilized to estimate the timing during the aircraft descent towards the impact point.

The engine sound spectrum combined with the aircraft performance and procedure were utilized to estimate the descent profile.

The data calculation is as follow:

Time (UTC)	CVR Data	Time interval (min:sec)	Predicted airspeed (knots)	Conversion to True Airspeed	Distance interval (Nm)	Total Distance (Nm)
5:49:11	Position MELAM at 11,500 feet		200	246	0	0
5:55:00	First contact, position Abmisibil ready for descent, and intended to fly direct to left base runway 11	5:30	200	246	18.3	18.3

Time (UTC)	CVR Data	Time interval (min:sec)	Predicted airspeed (knots)	Conversion to True Airspeed	Distance interval (Nm)	Total Distance (Nm)
5:55:17	The torque started to decrease		200	244	0.9	19.2
5:55:55	The torque was recorded at the lowest value that possibly was on idle	0:38	160	189	1.7	20.9
5:56:46	Flaps 15 selected	0:55	160	189	2.4	23.3
5:56:57	The torque increased	0:11	160	189	0.5	23.8
5:57:13	Landing gear down selected	0:16	160	189	0.7	24.5
5:58:14	End of recording	1.01	160	189	2.7	27.2

The information of wind was not available therefore, True Airspeed assumed equal to ground speed.

Utilizing the Geocontext profiler, Google Earth, CVR data and the operator visual flight guidance, the investigation developed predicted flight path of the aircraft started from flight Jayapura to Oksibil. Assume the cruising speed was 200 knots therefore the figure below is to describe the predicted flight path from Jayapura to Oksibil.

Figure 15: Predicted flight path from Jayapura to aircraft final position

The CVR recorded at 5:49:11 UTC, the aircraft was passing point MELAM and the altitude was approximately 11,500 feet.

At 5:54:22 UTC the aircraft passing with another aircraft, departed from Oksibil. At this point the aircraft was maintained at altitude of 11,500 feet.

At 5:55:02 UTC, the pilot requested to initiate descent from 11,500 feet and at 5:55:17 UTC, the spectrum analysis which correlated with the engine torque showed there was step reduction of torque to the lowest value. Subsequently the pilot requested to fly direct to left base runway 11.

At 5:55:55 UTC, the spectrum analysis detected the lowest engine torque recorded. The torque maintained at lowest value recorded for approximately one minute indicated that the engine power had been achieved for the target schedule speed for descent. Subsequently, the torque slightly increased after landing gear and flap extended.

The estimated flight track from the point MELAM is as follows.

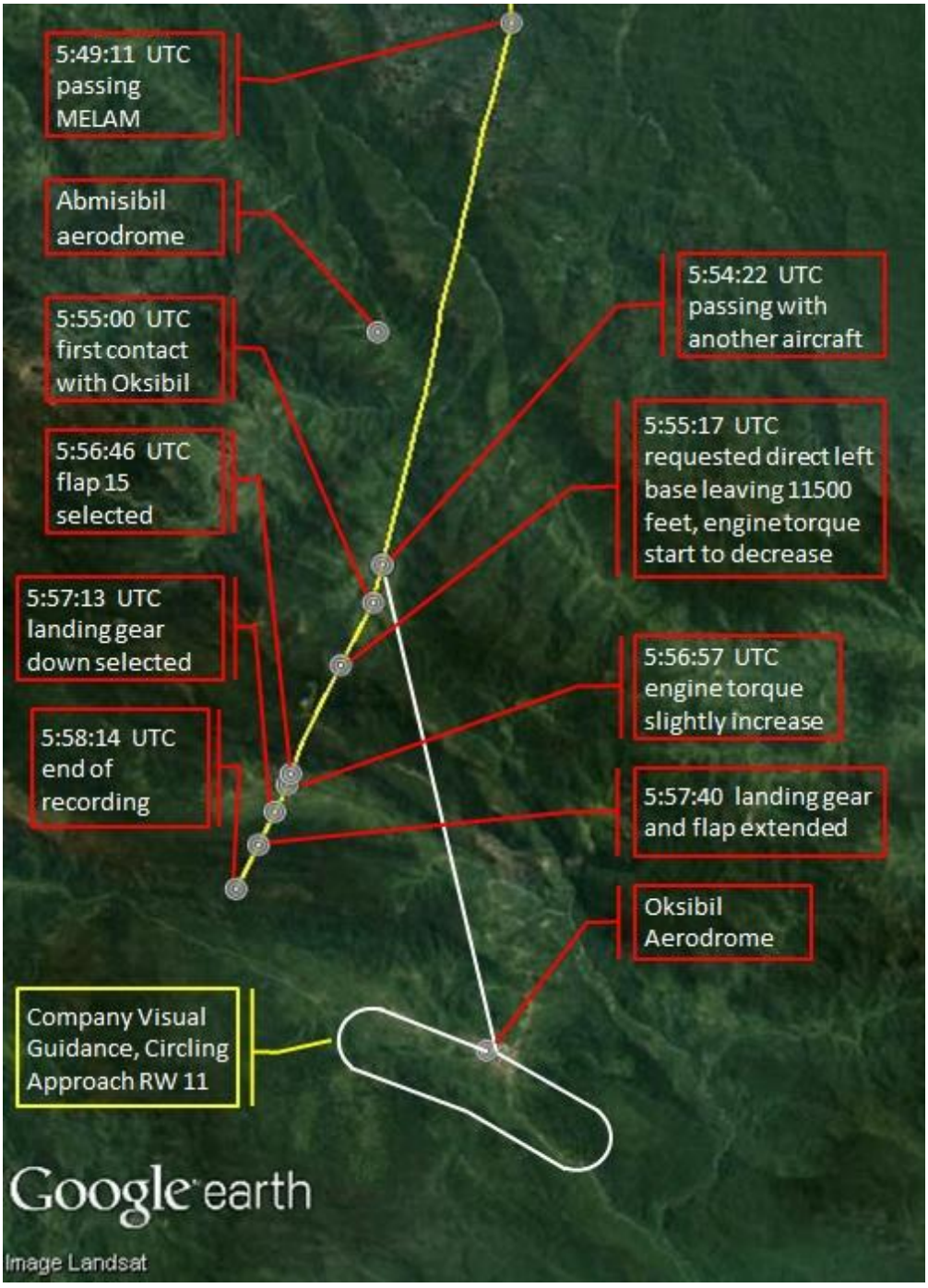


Figure 16: The predicted aircraft flight track after passing point MELAM

At 5:56:46, CVR recorded the pilot selected flap 15. Refer to ATR42-300 FCOM the maximum speed of flap and landing gear extension was 160 knots. Therefore, in 60 seconds, the aircraft would have travelled approximately 2.5 Nm.

Plotting this information into the Geocontext application (http://www.geocontext.org), resulting in the flight profile prior to impact as follows.

Figure 17: The estimated terrain utilized Geocontext profiler

The point A in the Geocontext profiler was the time at 5:57:40 UTC where the flap 15 and landing gear down was confirmed and the point B was the impact point at 5:58:14 UTC.

The Geocontext profiler provides the detail elevation of the terrain that can be used as terrain profile in excel worksheet.

The Geocontext profile prior to impact is as follows:

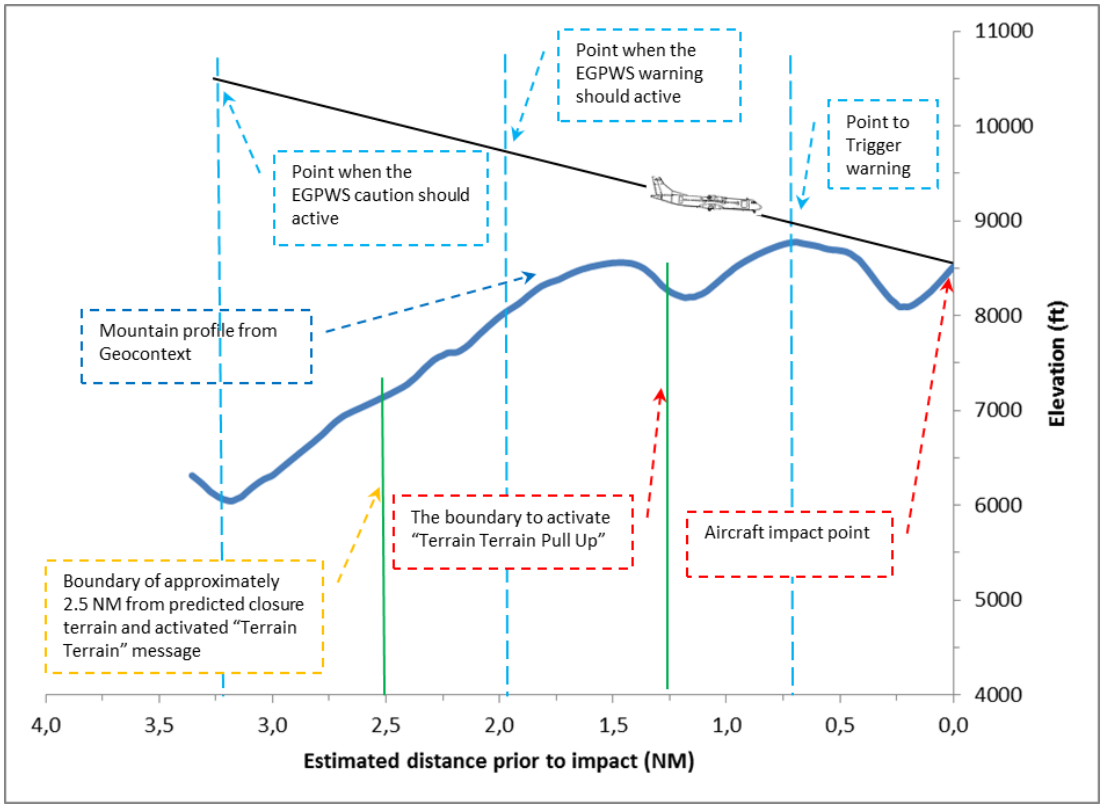


Figure 18: Approximation of descent profile prior to impact

Assuming that the aircraft speed was 160 knot or 2.5 Nm per minute, at 5:57:13 UTC the aircraft should have been entered the EGPWS caution envelope and call out "TERRAIN TERRAIN" activated.

At 5:57:33 UTC the aircraft should have entered warning envelope and call out "TERRAIN TERRAIN PULL UP" activated.

Based on the rebuilt of predicted flight track and the terrain condition refer to the Geocontext profiler, there were possibly two points that might trigger the EGPWS to provide terrain caution and warning. The terrain caution should active 2.5 Nm from the trigger points and the terrain warning should active at 1.2 Nm from the trigger points.

The CVR did not record activation of EGPWS caution and warning that enable the pilot to react accordingly.

2.2 Descent and Approach Procedures

The CVR data revealed that on the previous flight from Sentani to Oksibil, the approach was conducted by flying direct to a left base to runway 11. On the accident flight, the pilot reported to the Oksibil AFIS officer of the intention to descend from an altitude of 11,500 feet and to fly direct to a left base leg to runway 11. The CVR data indicated that the flight crew intended to perform the approach similar to the previous flight.

The investigation could not determine the weather differences between the previous and the accident flight. The weather information of Oksibil at the time of occurrence was the visibility between 4,000 m – 5,000 m and the cloud base was at 8,000 feet or 4,000 feet AGL and covering more than half of the sky (BKN/broken). The witnesses stated that the cloud covered the area of final approach path. This information was supported by the weather satellite image issued by BMKG.

The requirement of VFR flight below 10,000 feet stated that the visibility minimum of 5 km and distance from clouds minimum is 1,000 feet above or below. The opening on the forest indicated that the aircraft flew straight to the final position and the CVR did not record any pilot conversation related to the terrain condition. These indicated that the visibility was limited and the pilot could not see the surrounding terrain.

The COM chapter 3.4.21 describes the approach briefing should consist of minimum safe altitudes, and type of the approach, furthermore the pilot should maintain visual and special emphases must be placed on the familiarity with terrain. The CVR did not record an approach crew briefing or specific discussions concerning to the minimum safe altitude and existing weather conditions.

Situational Awareness can be defined as the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future. Good situational awareness requires understanding of a great deal of information related to the goal of safely flying the aircraft.

The decision to descend below the safe altitude, outside any published IFR route, without or with only limited visual reference and in the high terrain area was the key issue leading to the accident. The investigation could not determine the reasons supporting this crew decision. Two kinds of explanation could be considered:

1- The previous experience of a success landing by flying direct to left base runway 11 might have triggered the flight crew to perform similar approach. However, the weather condition could have been different and might not have been fully considered by the flight crew. Since not all available information was considered, this might have resulted in lack of Situational Awareness which requires understanding of a great deal of information related to the goal of safely flying the aircraft.

   The crew lack of situation awareness, while not being able to see the mountains that were covered by the clouds. However, it can be reasonably assumed that the crew was aware of the aircraft entering into the clouds, at least momentarily, despite the presence of significant terrain close to an airport they were familiar with. Their success in flying direct to the left base on the previous approach could let them think that this could be done again. According to the witness statement, most of the time the PIC did not follow the visual approach guidance while conducting approach at Oksibil. Although no other data was collected during the investigation to fully support the following hypothesis, it may not be excluded that a similar trajectory had already been performed in the past by this crew or by other crews, leading them to progressively take for granted the success of crossing the clouds and progressively lose awareness of the risks induced.

2- The crew had memorized the Minimum Safety Altitude published on the visual approach chart of 7,200 and 8,000 feet in the north-west sectors of the airport (see visual approach guidance chart in chapter 1.8 of this report) and intended to descent to 8,000 feet which was safe altitude according to the chart, hoping they could get sufficient visual reference to further descent in the final leg in the valley. The wreckage was found at elevation approximately 8,300 feet, higher than the 8,000 feet MSA published, which they may have believed they were safe.

In both cases, as the crew didn't make any reference to this situation during the descent, it is likely that it was not unusual, which indicated the operator's ability to monitor crew practices. The absence of any comment expressed by the flight crew during the last instants of the flight could be interpreted as overconfidence probably linked to habits and previous success in similar conditions.

The success of landing by flying direct to left base runway 11 on the previous flight might have triggered the flight crew to perform similar approach. Difference conditions between the previous and the accident flight might have not been considered by the flight crew and resulted in the lack of Situational Awareness since the weather information was not considered. Incorrect information of the minimum safe altitude in the visual approach guidance might have made the pilot consider it safe to descend. The EGPWS that intended to provide early warning to the pilot had failed or was inoperative and could not make the pilot aware of the immediate hazardous condition.

2.3 EGPWS terrain warning

The Oksibil Airport was not provided with the high-resolution terrain data in this database version installed on the accident aircraft.

The operator's management stated that some pilots within the air operator had experiences that the EGPWS warning became active in a condition that according to the pilots, the warning is not appropriate. These experiences led to the pilot behaviour of pulling the EGPWS circuit breaker to eliminate nuisance of EGPWS warning that considered unnecessary.

The air operator SOP stated that the warning may be regarded as a caution and the approach may be continued when flying under daylight VMC conditions, a warning threshold may be deliberately exceeded due to a good knowledge of the present terrain. A go-around shall be initiated if the cause of the warning cannot be identified immediately.

The management had identified some pilots including the accident pilot of the pilot with behaviour of pulling EGPWS CB. The management had scheduled a briefing to the accident pilot related to this behaviour and other issues.

The investigation concludes that, most probably, the EGPWS power supply circuit breaker was pulled during the accident flight and the two previous flights, explaining the absence of altitude call out during the two previous approaches and warning prior to the impact.

2.4 Organization Oversight

The investigation identified several safety issues existed prior to the occurrence. The aircraft operator issued visual approach guidance chart to provide guidance for flight crew since there was no approach guidance published by authority in Oksibil.

The visual approach guidance chart stated that the minimum safe altitude was 8,000 feet while the aircraft impacted with terrain at approximately 8,300 feet. This indicated an incorrect information in the chart. The investigation considered that the pattern on the approach guidance chart was not easy to fly, as many altitudes and heading changes.

The CVR revealed that the flight crew deviated from the visual approach guidance while conducting the approach to Oksibil on the previous flight. The witness also stated that the pilot deviated from the visual approach guidance at most of the flight to Oksibil.. The deviation from the visual approach guidance was not identified by the aircraft operator.

The CVR did not record any crew briefing and checklist reading from cruising up to the impact. The aircraft operator COM required certain items to be briefed for flight and checklist should be performed minimum of two times during descend and approach, which consisted of descend checklist and approach checklist. The flight crew behaviour of performing flight without briefing and checklist reading did not identify by the aircraft operator. The investigation could not establish whether it was specific to this crew or frequent within the air operator.

The aircraft operator identified that several pilots including the accident pilot had behavior of pulling the EGPWS CB. However, correction to this behavior was not performed in a timely manner.

The investigation found that several maintenance records such as component status installed on the aircraft and installation of EGPWS was not well documented. This indicated that the maintenance management was not well performed.

These safety issues indicated that the organization oversight of the aircraft operator was not well implemented.

3 CONCLUSIONS

3.1 Findings[7]

The Komite Nasional Keselamatan Transportasi (KNKT) determines the findings of the investigation are listed as follows:

1. The aircraft had valid Certificate of Airworthiness and was operated within the weight and balance envelope.
2. All crew had valid licenses and medical certificates.
3. The flight plan form was filed with intention to fly under Instrument Flight Rule (IFR), at flight level 155, with route from Sentani to MELAM via airways W66 then to Oksibil. The MORA of W66 between Sentani to MELAM was 18,500 feet.
4. The flight was the 5th flight of the day for the crew with the same aircraft and the second flight on the same route of Sentani to Oksibil.
5. The CVR data revealed that the previous flight from Sentani to Oksibil the flight cruised at altitude of 11,500 feet and the approach was conducted by direct to left base runway 11.
6. The CVR data also revealed that on the accident flight, the flight cruised at altitude 11,500 feet and intended to direct left base leg runway 11 which was deviate from the operator visual guidance approach that described the procedure to fly overhead the airport prior to approach to runway 11.
7. The witness stated that most of the time, the flight crew deviated from the operator visual approach guidance. The deviation did not identify by the aircraft operator.
8. The downloading process to retrieve data from the FDR was unsuccessful due to the damage of the FDR unit that most likely did not record data during the accident flight. The repetition problems of the FDR unit showed that the aircraft operator surveillance to the repair station was not effective.
9. The CVR did not record any crew briefing, checklist reading and EGPWS altitude callout prior to land on two previous flights nor the EGPWS caution and warning prior to impact.
10. The spectrum analysis of the CVR determined that both engines were operating prior to the impact.
11. Several pilots, had behavior of pulling the EGPWS CB to eliminate the nuisance of EGPWS warning. The pilots stated that the reason for pulling the EGPWS CB was due to the pilots considered this warning activation was not appropriate for the flight conditions. The correction to this behavior was not performed prior to the accident.

7 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.

12. The investigation could not determine the actual EGPWS CB position during the accident flight.
13. The installation of EGPWS by the aircraft operator was not conducted according to the Service Bulletin issued by the aircraft manufacturer.
14. The terrain data base installed in the EGPWS of PK-YRN was the version MK_VIII_Worldwide_Ver_471 that was released in 2014. The Oksibil Airport was not included in the high-resolution update in this version of terrain database.
15. The information for Oksibil published in AIP volume IV (Aerodrome for Light Aircraft/ALA) did not include approach guidance. The operator issued visual guidance of circling approach runway 11 for internal use.
16. The visual approach guidance chart stated that the minimum safe altitude was 8,000 feet while the aircraft impacted with terrain at approximately 8,300 feet. This indicated an incorrect information in the chart. The investigation considered that the pattern on the approach guidance chart was not easy to fly, as many altitudes and heading changes.
17. Several maintenance records such as component status installed on the aircraft and installation of EGPWS was not well documented. This indicated that the maintenance management was not well performed.
18. The investigation could not find any regulation that describes the pilot training requirement for any addition or modification of aircraft system which affect to the aircraft operation.
19. There was no information related to the status of ZX NDB published on NOTAM prior to the accident.
20. Several safety issues indicated that the organization oversight of the aircraft operator by the regulator was not well implemented.

3.2 Contributing Factors[8]

1. The deviation from the visual approach guidance in visual flight rules without considering the weather and terrain condition, with no or limited visual reference to the terrain resulted in the aircraft flew to terrain.
2. The absence of EGPWS warning to alert the crew of the immediate hazardous situation led to the crew did not aware of the situation.

8 Contributing Factors are those events in which alone, or in combination with others, resulted in injury or damage. This can be an act, omission, conditions, or circumstances if eliminated or avoided would have prevented the occurrence or would have mitigated the resulting injuries or damages.

4 SAFETY ACTION

4.1 PT. Trigana Air Service

As a result of this accident, the aircraft operator had informed to the KNKT of safety actions that had been taken.

1. Briefed all pilot related to:
   a. Human factors, culture report, commitment to standard operational procedure, regulation, pilot instruction, visual guidance, company policy and controlled.
   b. Crew Resources Management (CRM) concept include with pre-flight, crew briefing, checklist reading and standard callout.
   c. Standardisation of filing of forms and flight documentations.
   d. Coaching to the crew with special performance remark.
   e. Conducted more objectives assessment during pilot proficiency check.
   f. The carrier path for the first officer will consider the hierarchy of seniority, professionalism and personal attitude
   g. Re-development of Duty Manager in charge in Jayapura to control the operation activity.
   h. Performed psychology test for all flight crew.
   i. Internal memorandum contained information of pilot training of Approach and Landing Accident Reduction (ALAR) and Controlled Flight into Terrain (CFIT) training including the EGPWS training consisted of ground and simulator trainings.
2. Review and updated the company visual guidance for several airports including Wamena, Dekai and Oksibil airports.
3. Conducted route check for all the pilot of ATR especially flight to Oksibil area according to company procedure and guideline.
4. Issued pilot instruction No. 10/OPS-PI/VIII/2015 subject to visual guidance to Oksibil which required all pilot to follow the current visual guidance and the Basic Visual Weather Minima for Approach.
5. Installed the flight tracking system (Spidertrack) including training and procedure for the pilots and operation control.
6. Reviewed the simulator training highlight on simulation exercise on mountainous area and some common difficulties include approach, go-around and landing IMC (using instrument approach chart) or VMC (using company visual guidance) also EGPWS and TCAS warning exercise.
7. Performed Production Planning Control training for engineering staff to improve the engineering knowledge and skill in maintenance data recording.
8. Issued internal memo No. 002/TAS-TD/I/2016 subject to replacement of the flight recorder in all aircraft with the solid stated flight recorder.
9. Developed the Technical Support Procedure Manual (TSPM) for the Technical Support Department personnel including maintenance planning procedure and maintenance record.

10. Issued internal memo to conduct read out the CVR and FDR of all Trigana Air aircraft. The CVR and FDR read out conducted in the GMF Aeroasia and Merpati Maintenance Facility.
11. Continues updating including requested for update to Honeywell the terrain database of the EGPWS with the revision appropriate for the area of operation. The last updated was revision 479 that was installed on 15 June 2016.
12. Issued Safety Notice referred to the Accident PK-YRN on 16 August 2015 to recommend as follow:
    a. Technical Department
        i. To evaluate the safety awareness system applicable to the aircraft
        ii. To check the serviceability of EGPWS periodically
    b. Operation Department
        i. Published the instruction for pilot to not pull the EGPWS/TCAS circuit breaker in flight except as instructed by SOP ATR 42/72 Abnormal Procedure terrain awareness warning chapter 6 EMER 03.40 page 9
        ii. Published the instruction for pilot to follow the visual guidance
13. Issue Notice to Pilot with subject of Pilot Actions During Failure. The highlight of the procedure is as follow:
    a. To identify the failure by referring to the SOP and QRH
    b. Not to pull the circuit breaker except instructed by the checklist
    c. To report the failure in Aircraft Maintenance Log (AML)
14. Issued Notice to Pilot with the subject Revision of Visual Guidance of Oksibil.
15. Issued Internal Memo on 20 August 2015 for flight operation officer on duty with highlight of procedure to file the ATC flight plan correctly.
16. Conduct the CRM training for pilots with highlight of Situational Awareness.
17. To enhance the oversight to the Approved Maintenance Organization, Quality Department published the Quality Instruction with subject of Good Judgement on Surveillance/Audit of AMO/MRO. The Quality Department also updated the Company Maintenance Manual (CMM) with subject of Surveillance and Analysis of Outside Agencies in Section 3.14 including the audit checklist and questionnaire.
18. The improve the maintenance record, the operator conducted training of Production Planning and Control (PPC) on 18 – 20 January 2016. The attendees were maintenance management and engineers. The highlight of the syllabus was the maintenance management control and the utilization of computerized maintenance management system.
19. The Quality Department updated the Planning and Technical Service Procedure Manual to highlight the improvement procedure of flight and maintenance record update including the aircraft status, component and inspection status.
20. Conduct EGWS training for maintenance engineer and flight crew with highlight of system description, operation and maintenance on 22 February 2017.

5 SAFETY RECOMMENDATIONS

The Komite Nasional Keselamatan Transportasi issued safety recommendations to address safety issues identified in this report.

DGCA requested to ensure that the recommendations addressed to the relevant parties are well implemented.

5.1 PT. Trigana Air Services

- **04.O-2015-17.1**

  The visual approach guidance contained incorrect information of terrain (MSA) and considered not easy to fly. KNKT recommends that approach guidance shall be reviewed to ensure contain correct information and easy to fly to minimise the pilot workload.

- **04.O-2015-17.2**

  The statement in the ATR SB number ATR42-34-0152 required the operator to communicate to the manufacture related to the modification. KNKT recommends that any modification to the aircraft especially when the modification was related to aircraft safety, shall be communicated to the manufacture and/or DGCA.

5.2 AirNav Indonesia

- **04.A-2015-17.3**

  There was no information related to the status of ZX NDB published on NOTAM prior to the accident. KNKT recommends to ensure the status of the navigation aids disseminates to the air navigation user in timely manner.

- **04.A-2015-17.4**

  The flight plan form was filed with intended to fly under instrument flight rule (IFR), at flight level 155, with route from Sentani to MELAM via airways W66 then to Oksibil. The MORA of W66 between Sentani to Oksibil was 18,500 feet. KNKT recommends to ensure filing the flight plan and flight execution is accordance with the regulation.

5.3 Directorate General of Civil Aviation (DGCA)

- **04.R-2015-17.5**

  The investigation could not find any regulation required for training of any addition or system modification which affect to the aircraft operation. KNKT recommends to develop regulation requirement for training of any additional or modification to equipment that affected to safety of aircraft operations.

- **04.R-2015-17.6**

  The information for Oksibil published in AIP volume IV (Aerodrome for Light Aircraft/ALA) did not include approach guidance. The operator issued visual guidance of circling approach runway 11 for internal use. KNKT recommends to publish the visual route guidance for airport without instrument approach procedure.

- **04.R-2015-17.7**

  PBN offers a number of advantages over the sensor-specific method of developing airspace and obstacle clearance criteria. KNKT recommends to consider the application of Performance Based Navigation (PBN) approach for compatible aircraft to fly in area with ground-based navigation system implementation is limited.

- **04.R-2015-17.8**

  There was no information related to the status of ZX NDB published on NOTAM prior to the accident. KNKT recommends to ensure aeronautical information for air navigation is updated in accordance with the current condition, including the serviceability of the navigation aids.

- **04.R-2015-17.9**

  EGPWS has worldwide terrain coverage in low resolution terrain data including several airports with significant traffic movements. The Oksibil Airport was not provided with the high-resolution terrain data in this database version. KNKT recommends to coordinate with the manufacturer to provide several airports in Indonesia with EGPWS high resolution terrain database.

6 APPENDICES

6.1 Bureau d'Enquêtes et d'Analyses (BEA) Comments

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
MC1 (ATR1)	Synopsis Page vi	Both recorders were transported to KNKT recorder facility. The downloading of FDR was unsuccessful. The investigation analyzed the spectrum of the CVR that was conducted by BEA to determine engine torque	Both recorders were transported to KNKT recorder facility. ~~The downloading of FDR was unsuccessful. The accident flight was not identified in the FDR data. The investigation analyzed the spectrum of the CVR that was conducted by BEA to determine engine torque.~~	Accuracy of the information regarding the DFDR data. Although CVR spectrum analysis effectively enables to obtain the engine torque trends (not accurate torque values) , this relates to an investigation technique and not to the accident scenario, therefore we suggest to remove this sentence from the synopsis	Accepted
MC2 (ATR4)	Synopsis Page vi	The investigation considers the contribution factors of this accident were: • The deviation from the approach procedure without proper consideration to the weather and terrain condition led the pilots had lack of situational awareness. • The nuisance generated by EGPWS caution or warning in area with low resolution EGPWS terrain database	See other comment MC38 about contributing factors	Modify synopsis according to the contributing factors section.	

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
		data during the flight led to the pilot behavior of pulling EGPWS CB resulted in the totally not functioning of the EGPWS.			
MC3 (ATR5)	§1.6.4 Operator EGPWS installation Page 12	The pre-requisite SBs were previously performed by the operator to comply with requirement of SB ATR42-34-0152 including the installation of separate Global Positioning System (GPS) KLN 94, since the EGPWS part number 965-1206-011 was not equipped with a GPS to provide the aircraft position.	The pre-requisite SBs were previously performed by the operator to comply with requirement of SB ATR42-34-0152. The operator reported having installed a ~~including the installation of~~ separate Global Positioning System (GPS) KLN 94. This installation is not certified per any manufacturer design change and no documentation enables to connect KLN94 with since the EGPWS part number 965-1206-011. This EGPWS P/N was not equipped with an internal GPS function to provide the aircraft position. The EGPWS P/N 965-1216-01, which includes internal GPS board to provide aircraft position to EGPWS predictive modes, shall be installed when HT1000 GNSS is not fitted, as per the SB ATR42-34-0153.	Accuracy of the technical information. KLN 94 is not a GPS model referred to by SB ATR42-34-0152. EGPWS part number 965-1206-011 does not include an internal GPS card and has to be installed in combination with HT1000 GNSS as per SB ATR42-34-0159. The other solution for aircraft not fitted with HT1000 is to install the EGPWS P/N 965-1216-011 which includes a GPS card and can be connected to an antenna as per SB ATR42-34-0153 complementary to SB ATR42-34-0152.	Accepted
MC4 (ATR7)	§1.6.4 Operator EGPWS installation	In completion to the installation, the operator issued document EI-002/I/2012 which referred to the ATR	In completion to the installation, the operator issued document EI-002/I/2012 which referred to the ATR	Accuracy and completeness of information	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
	Page 12	SB number ATR42-34-0159 to perform the operational and functional test to the EGPWS system.	SB number ATR42-34-0159 to perform the operational and functional test to the EGPWS system. This SB is applicable only to aircraft fitted with GPS HT1000 which was not the case of the PK-YRN.		
MC5 (ATR8)	§1.6.4 Operator EGPWS installation Page 12	"The investigation did not find the result of the functional test. Referring to the operator statement, the operational test indicated successful EGPWS installation. The operator provided a video recording of the functional test of the EGPWS on the PK-YRN. The operator stated that the video was not taken prior to the completion of the EGPWS installation."		This video includes "GPWS INOP" and "TERRAIN INOP" messages indicating that the installation is not fully successful. Either the video was taken prior to the completion of the EPGWS or the operator misinterpreted the result of the test. This contradiction should be clarified.	Accepted
MC6 (ATR10)	§1.11.1 Flight Data Recorder Page 19	*Since 2013 until the occurrence date showed that the FDR had several problems. The operator stated that the FDR was sent to the same repair station. The cause of the problem was not detected. The investigation could not find any evidence the maintenance action related to the aircraft system.*	*Since 2013 until the occurrence date showed that the FDR had repetitive failures ~~several problems~~. The operator stated that the FDR was sent to the same repair station. The cause of the problem was not detected. ~~The investigation could not find any evidence the maintenance action related to the aircraft system.~~*	The last sentence is misleading and implies there was an issue with the aircraft system while the FDR failed on all the different aircraft it was installed.	Accepted
MC7	§1.11.2 Cockpit Voice Recorder	*The process successfully downloaded 2 hours of good quality voice recording*	*During the flight of the accident the crew didn't use their headset ; thus crew speeches were not recorded with*	Accuracy and completeness of	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
	Page 20	*data*	*high quality on their dedicated CVR channels. Only the Cockpit Area Microphone (CAM), which captures the ambient sounds into the cockpit, was able to catch and record some crew discussions and/or oral procedure. However the quality of the recording of the CAM channel was found with a very bad quality*. Some in-depth filtering processes were applied on the original audio recording to reach an acceptable level of understanding allowing some transcription of the crew speeches.* ** the CAM recording was severely polluted by a high level noise due to the presence in the audio band of several frequencies generated by the Aircraft power supply (ACWild generator).*	information	
MC8 (ATR14)	§1.16.1 Spectrum Analysis Page 25	*Figure 9: Torque versus time extracted at last five minutes of the flight*	*Figure 9: Torque trends (derived from spectrum analysis) versus time extracted at last five minutes of the flight.* *Add Hz unit on the y-axis.*	The graph extracted from the CVR spectrum analysis is representative of the engine torque trend but does not provide engine torque absolute values.	Accepted
MC9 (ATR15)	§1.17.1.2 Operator FCOM ATR42 volume 1 Page 28	*FCOM extract 3.05.02 P12 CRUISE – MAX CRUISE*	*Replace by the appended FCOM 3.05.02 P12 page*	The page included in the report is valid for aircraft fitted with PW121 engines while PK-YRN was fitted with PW120 engines.	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
MC10 (ATR16)	§1.17.1.2 Operator FCOM ATR42 volume 1 Page 30	*FCOM extract 3.07.02 P1 DESCENT – NORMAL CONDITIONS*	*Replace by the appended FCOM 3.07.02 P1 page*	The page included in the report is valid for aircraft fitted with design change Mod. 1739 while PK-YRN was not fitted with this design change.	Accepted
MC10bis	§1.17.2 directorate General Civil Aviation			If enough information is available, an additional paragraph 1.17.2.3 describing DGCA oversight of the airline could bring additional information (issue of AOC ? results and dates of last audits ?)	Accepted
MC11 (ATR19)	§1.17.1.6 Flight crew behavior Page 35		*Add the following after existing paragraph :* *From system architecture, when the EGPWS circuit breaker is pulled, "GPWS" amber light illuminates on the Crew Alerting Panel (CAP) and the "FAULT" lights illuminate on the TERRAIN and GPWS pushbutton located in the cockpit.*	There are some effects of EGPWS C:B being pulled that could be highlighted.	
MC11bis	§1.17.1.6 Flight crew behavior Page 35	*Furthermore, the management stated that several pilots, including the accident pilot, had the behaviour of pulling the EGPWS CB.*		As there were two pilots, it should be clarified if this statement relates to the captain or the first officer.	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
MC12 (ATR22)	§1.18.2 Terrain Data Coverage Page 38	*Honeywell is continually striving to improve the EGPWS databases. New terrain, obstacle, or runway data is obtained by many different means, evaluated and verified, before it is processed into an EGPWS database. When sufficient or significant new data is available, Honeywell will release a database update. Honeywell is committed to investigating reported nuisance alerts. When nuisance alerts result from database problems (accuracy or resolution) Honeywell will make corrections to the database.*	~~*Honeywell is continually striving to improve the EGPWS databases. New terrain, obstacle, or runway data is obtained by many different means, evaluated and verified, before it is processed into an EGPWS database.*~~ *When sufficient or significant new data is available, Honeywell will release a database update.* ~~*Honeywell is committed to investigating reported nuisance alerts. When nuisance alerts result from database problems (accuracy or resolution) Honeywell will make corrections to the database.*~~	Those sentences look like they are taken from a technical or commercial Honeywell document. They may give the simplistic impression that every database change request will be rapidly satisfied. Not sure database update is free of charge. If not suppressed, and if it is confirmed that those sentences come from an Honeywell document, their origin should be made explicit and sentences written as a quote.	Accepted
MC13 (ATR23	§1.18.3 Situational Awareness Page 39		*Other human factors elements, relevant to this accident investigation, should be added in the report, such as routine, overconfidence, fatigue, continuation bias.*	Completeness of the different human factors relevant to this accident investigation.	
MC14 (ATR24)	§1.18.4 Performance based Navigation Page 40		*The report could highlight what is the status of PBN implementation in Indonesia, by taking some extracts from the ICAO Indonesia PBN report dated January 2017 (public document here attached for courtesy)*	provide further information related to PBN implementation in Indonesia.	Accepted
MC15	§2.1The aircraft	*The Aircraft Predicted Flight path*	*The Aircraft* ~~*Predicted*~~ *rebuilt Flight*	Wording suggestion.	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
(ATR25 and 27)	predicted flight path Page 41		*path*	"Estimated" should also be a possible word in this title and in the whole paragraph instead of "predicted".	
MC16 (ATR26)	§2.1The aircraft predicted flight path Page 41	*The downloading process to retrieve data from the FDR was unsuccessful due to the damage of the FDR unit that most likely did not record during the accident flight.*	*The downloading process to retrieve data from the FDR was unsuccessful due to the damage of the FDR unit that most likely did not record during the accident flight. did not succeed in identifying the accident flight.*	Accuracy of the information regarding the DFDR data.	Accepted
MC17	§2.1The aircraft predicted flight path Page 41 and 42	*Refer to the table supporting Distance Interval and Total Distance computations.*	*1) Check timing (see also our AC7 comment)* *2) Aircraft Speed should be Aircraft Indicated Airspeed 3) The array should include an additional column to convert IAS to TAS* *4) Adjust Distance interval and total Distance values accordingly* *5) It should be indicated that wind effect is not taken into account in this estimation. Therefore TAS = Ground Speed*	For better accuracy the difference between IAS and TAS should be taken into account. Between FL 80 to FL 120 the difference between IAS and TAS is about 40 knots (see ATR FCOM 3.05.02 P12).	Accepted
MC18	§2.1The aircraft predicted flight path Page 41, 42 and 43	*Table page 41 and 42, Figure 14 and 15.*	*Correct timing inconsistencies such as:* *- End of recording (5:58:14 in Figure 14 and 5:58:31 in Figure 15 and 05:58:40 in the transcript produced by BEA)* *- Landing gear down selection (5:57:33 in Figure 15 but 5:57:13 in the array page 42and 5:57:39 in the*	Check timings consistency (see also our AC7 comment)	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
			transcript produced by BEA) *- Flaps 15 selection (5:57:05 in Figure 15 but 5:56:46 in the array page 42 and 5:57:11 in the transcript produced by BEA)*		
MC19	§2.1The aircraft predicted flight path Page 44	*"Refer to ATR 42-300 FCOM the scheduled speed of flap and landing gear extension was 160 knots"*	*"Refer to ATR 42-300 FCOM the ~~scheduled~~ maximum speed of flap and landing gear extension was 160 knots"*	Correction	Accepted
MC20	§2.1The aircraft predicted flight path Page 44	*"… the point B was the impact point at 5:58:14 UTC"*	*Check timing consistency with Figure 15*	Check timing (see also our AC7 comment)	Accepted
MC21 (ATR 29)	§2.1The aircraft predicted flight path Page 45	*"Assumed that the aircraft speed was 160 knot or 2.5 Nm per minute, at 5:57:14 UTC the aircraft should have been entered the EGPWS caution envelope and call out "TERRAIN TERRAIN" activated.* *At 5:57:44 UTC the aircraft should have entered warning envelope and call out "TERRAIN TERRAIN PULL UP" activated.* *Refer to the predicted flight track and the terrain condition refer to the Geocontext profiler, there were minimum of two points that might trigger the EGPWS to provide terrain caution and warning. The first point was located approximately 0.7 Nm from the impact point and the second*	*"Assumed that the aircraft speed was xxx knot or xx Nm per minute, at 5:yy:yy UTC at the latest the aircraft should have been entered the EGPWS caution envelope and call out "TERRAIN TERRAIN" activated.* *At 5:zz:zz UTC at the latest the aircraft should have entered warning envelope and call out "TERRAIN TERRAIN PULL UP" activated.* *~~Refer to the predicted flight track and the terrain condition refer to the Geocontext profiler, there were minimum of two points that might trigger the EGPWS to provide terrain caution and warning. The first point was located approximately 0.7 Nm from the impact point and the second~~*	Adjust values according to IAS to TAS conversion. The approximated aircraft trajectory is based on a number of assumptions. It enables to assess approximately when EGPWS audio alerts should have triggered regarding to the impact point. However, estimating if other points of the mountain relative to the trajectory should have triggered any GPWS or EGPWS	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
		was the impact point. The terrain caution should active 2.5 Nm from the trigger points and the terrain warning should active at 1.2 Nm from the trigger points. "	*~~was the impact point. The terrain caution should active 2.5 Nm from the trigger points and the terrain warning should active at 1.2 Nm from the trigger points.~~ "*	mode appears to be to difficult due to the lack of precise flight track data. We believe indications regarding the activation of "Terrain, Terrain" and "Terrain, Terrain, Pull up" messages are enough. Going further into assessing other EGPWS modes would not be adequate due to the lack of accurate data.	
MC 22 (ATR28)	§2.1The aircraft predicted flight path Page 45	*Figure 17: Predicted descend profile prior to impact* *In figure 17 :* *- point when the EGPWS caution should active* *- point when the EGPWS warning should active* *- point to trigger warning*	*Figure 17: ~~Predicted~~ Approximation of descend profile prior to impact* *In figure 17, either remove these three points or clarify which EGPWS cautions and warnings were expected*	The attempt to rebuild aircraft trajectory enables to assess approximately when EGPWS audio alerts should have triggered at the latest. We believe the indications in the figure 17, related to activation of "Terrain, Terrain" and "Terrain, Terrain, Pull up" are sufficient.	Accepted
MC23	§2.2 Descend an Approach Procedure	*The flight crew prediction of the near future during approach did not come as expected. This indication of lack of situational awareness.*	*Suggestion to Replace by: "The decision to descend outside of any published IFR trajectory without (or with only limited) visual reference to*	Suggestion for an other structure for this part of the analysis. It contains the same	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
		The Situational Awareness can be defined as the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future. Good situational awareness requires understanding of a great deal of information related to the goal of safely flying the aircraft. *The previous experience of a success landing by flying direct to left base runway 11 might have triggered the flight crew to perform similar approach. However, the weather condition could have been different and might not have been fully considered by the flight crew. Since not all available information was considered, this might have resulted in lack of Situational Awareness which requires understanding of a great deal of information related to the goal of safely flying the aircraft.* *The success landing by flying direct to left base runway 11 on the previous flight might have triggered the flight crew to perform similar approach. Difference conditions between the previous and the accident flight might have not been considered by the flight crew and resulted in the lack of Situational Awareness. since the weather information was not*	*the high terrain was the key decision leading to the accident. The investigation could not determine the reasons supporting this crew decision. Two kinds of explanation could be considered :* *1- The crew had an incomplete situation awareness as defined in 1.18.3, while not being able to see the mountains hidden by the clouds. However, it can be reasonably assumed that the crew was aware of the aircraft entering into the clouds, at least momentarily, despite the presence of significant terrain close to an airport they were familiar with. Their success in flying direct to the left base on the previous approach could let them think that this could be done again. Although no sufficient data was collected during the investigation to fully support the following hypothesis, it may not be excluded that a similar trajectory had already been performed in the past by this crew or by other crews, leading them to progressively take for granted the success of crossing the clouds and progressively lose awareness of the risks induced. Or,* *2- The crew had memorized the Minimum Safety Altitude published on the visual approach chart of 7200 and 8000 ft in the north-west sectors of the airport (see chart page 15) and*	ideas, based on situation awareness aspects but also on other probable human factors (routine, habits, drift in practices). We also suggest to complete this paragraph by the hypothesis that they could have considered the uncorrect MSA.	

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
		considered.	*intended to descent to 8000 ft, hoping they could get sufficient visual reference to further descent in the final leg in the valley. This MSA being uncorrect (the crash site elevation was 8 300 ft, higher than the 8 000 ft MSA published), they may have believed they were safe.* *In both cases, as the crew didn't make any reference to this situation during the descent, it is likely that it was not unusual, which raises the question of the operator's ability to monitor its crew practices. The absence of any comment expressed by the flight crew during the last instants of the flight could be interpreted as overconfidence probably linked to habits and previous success in similar conditions."*		
MC24	§2.2 Descend an Approach Procedure Page 46	*The EGPWS that intended to provide early warning to the pilot had failed and made the pilot did not aware of the condition.*	*The EGPWS that intended to provide early warning to the pilot had failed or was inoperative and and could not make the pilots aware of the immediate hazardous conditions.*	Aspects relating to CB being pulled to make EPGWS inoperative tend to exclude an EGPWS failure.	Accepted
MC25 (ATR33)	§2.3 EGPWS terrain warning Page 47	*The Ground Proximity Warning System (GPWS) Mode 2 provides alerts to the pilot in preventing the aircraft impact the terrain when rapidly rising terrain with respect to the aircraft is detected.[…..] The terrain data base installed in the EGPWS of accident aircraft was MK_VIII_Worldwide_Ver_471 version*	~~*The Ground Proximity Warning System (GPWS) Mode 2 provides alerts to the pilot in preventing the aircraft impact the terrain when rapidly rising terrain with respect to the aircraft is detected. […..] The terrain data base installed in the EGPWS of accident aircraft was MK_VIII_Worldwide_Ver_471 version that was released 2014. Refer to the*~~	This information is already detailed in the first part of the report. We suggest to make this part shorter.	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
		that was released 2014. Refer to the Terrain Database Release Forecast Ver_471 published by Honeywell on 13 August 2014, the Oksibil Airport did not provide with the high resolution terrain data in this database version.	*~~Terrain Database Release Forecast Ver_471 published by Honeywell on 13 August 2014~~, the Oksibil Airport did not provide with the high-resolution terrain data in the is database version installed on the accident aircraft.*		
MC26 (ATR34)	§2.3 EGPWS terrain warning Page 47	*The air operator had successfully installed EGPWS onto three aircraft including two ATR. The investigation considered that the installation of the EGPWS to the accident aircraft was success.* *The CVR did not record any of EGPWS warning or altitude callout on the first flight to Oksibil, to Sentani and the accident flight. This indicated that the EGPWS was totally not functioning. This symptom might indicate that the CB was pulled resulted in the EGPWS totally not functioning. The investigation could not determine the actual EGPWS CB condition on the accident site.* *The low-resolution terrain data base had triggered EGPWS caution and warning in a flight condition that considered by the pilot the warning was unnecessary. This resulted in pilot behavior to pull the EGPWS CB. The investigation could not determine the absence of the EGPWS warning prior to impact however, it is possible that this due to the EGPWS CB was pulled.*	*Delete and replace by :* *The investigation concludes that, most probably, the EGPWS power supply circuit breaker was pulled during the accident flight and the two previous flights, explaining the absence of altitude call out during the two previous approaches and warning prior to the impact.*	This information is already detailed in the first part of the report. We suggest to make this part shorter.	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
MC27 (ATR35)	§2.4 Organization Oversight Page 48	*The aircraft operator issued visual approach guidance chart to provide guidance for flight crew since there was no approach guidance in Oksibil.*	*The aircraft operator issued visual approach guidance chart to provide guidance for flight crew since there was no approach guidance published by authorities in Oksibil.*	clarification	Accepted
MC27bis (ATR36)	§2.4 Organization Oversight Page 48	*Similar display without reminder that this was a visual approach, might create a sense that flight crew performs instrument approach while following the visual approach guidance which has less safety margin compare to an instrument approach.*	*Similar display ~~without reminder that this was a visual approach~~, might create a sense that flight crews performs instrument approach while following the visual approach guidance which has less safety margin compared to an instrument approach.* *The visual approach guidance chart also displays erroneous MSA.*	Completeness and accuracy of the information : - Actually "Visual Guidance" is clearly written in the top right corner of the chart, - Inclusion of the uncorrect MSA.	Accepted
MC28 (ATR37)	§2.4 Organization Oversight Page 48	*The flight crew deviated from the visual approach guidance while conducted the approach to Oksibil on the previous flight. The deviation was not the first time for the pilot. The deviation from the visual approach guidance was not identified by the aircraft operator.*	*Add a comment regarding the capacity and ease to fly the recommended approach flight path.*	It would be valuable to add whether the flight pattern recommended in the visual approach guidance was "easy to fly". Did the investigation collect any pilot feedback on that?	Accepted
MC29 (ATR38)	§2.4 Organization Oversight Page 48	*The flight crew behaviour of performing flight without briefing and checklist reading was not identified by the aircraft operator.*	*The flight crew behaviour of performing flight without briefing and checklist reading was not previously identified by the aircraft operator. The investigation did not establish whether it was specific to this crew or frequent within the air operator.*	Completeness and accuracy of the information	Accepted
MC30	§2.4 Organization			Did the investigation	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
(ATR40)	Oversight Page 48			establish if there was any mean put in place within the air operator to identify these deviations and if some of these deviations were identified by the DGCA? As the paragraph title refers to organisation oversight, it would be valuable to highlight if the deviations evidenced through the investigation were previously evidenced or what are the means put in place, within the air operator, or by the oversight authority, to detect them.	
MC31	§3.1 Findings Page 49	*10. The CVR did not record any crew briefing, checklist reading and EGPWS warning prior to impact. The flight crew behavior of performing flight without briefing and checklist reading was not identified by the operator.*	*10. The CVR did not record any crew briefing, checklist reading ~~and EGPWS warning prior to impact. The flight crew behaviour of performing flight without briefing and checklist reading was not identified by the operator~~.*	The operator could not detect the absence of briefing and checklist during the accident flight. They could have done that only for previous flights but the investigation did not clearly determine if it was a characteristic of this crew or of other crews, which makes it	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
				difficult to say that those poor practices were detectable. EGPWS aspects are included in finding 12.	
MC32 (ATR41)	§3.1 Findings Page 49	*11. The CVR spectrum analysis of the CVR was conducted by BEA to determine engine torque. The investigation utilizes the spectrum analysis to perform flight profile analysis.*	*11. The CVR spectrum analysis of the CVR was conducted by BEA to and determined that both engines were operational prior to the impact ~~engine torque. The investigation utilizes the spectrum analysis to perform flight profile analysis.~~*	the use of CVR spectrum analysis to determine torque trend is relevant to investigation technique but is not a finding. Confirming the proper operation of both engines is a finding.	Refected
MC33 (ATR42)	§3.1 Findings Page 50	*12. The CVR did not record EGPWS altitude call out prior to land on two previous flights and EGPWS caution and warning prior to impact. This symptom indicated the EGPWS was totally not functioning and most likely due to the CB was pulled.*	*12. The CVR did not record EGPWS altitude call out prior to land on two previous flights and EGPWS caution and warning prior to impact. ~~This symptom indicated the EGPWS was totally not functioning and most likely due to the CB was pulled.~~*	The wording used may imply the EGPWS was failed. ~~We suggest to add the assumption of CB being pulled in finding #15~~	Accepted
MC34 (ATR43)	§3.1 Findings Page 50	*14. Several pilots, including the accident pilot had behavior of pulling the EGPWS CB to eliminate the nuisance of EGPWS warning. The pilots stated that the reason for pulling the EGPWS CB was due to the pilots considered this warning activation was not appropriate for the flight conditions. The correction to this behavior was not performed in timely*	*14. Several pilots, ~~including the accident pilot~~ had behavior of pulling the EGPWS CB to eliminate the nuisance of EGPWS warning. The pilots stated that the reason for pulling the EGPWS CB was due to the pilots considered this warning activation was not appropriate for the flight conditions. The correction to this behavior was not performed prior to*	Correction proposed to stay factual. “in a timely manner” implies it may have change the outcome of this event. Proposition to remove “including the accident pilot” as it is not clear which one of	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
		manner.	*the accident ~~in timely manner~~.*	the two pilots it is referring to. Additionally this information probably comes from their colleagues' statements which, as human statements, may not be fully considered as a finding.	
MC35 (ATR45)	§3.1 Findings Page 50	*17. The information for Oksibil published in AIP volume IV (Aerodrome for Light Aircraft/ALA) did not include approach guidance. The operator issued visual guidance of circling approach runway 11 for internal use.*	*17. The information for Oksibil published in AIP volume IV (Aerodrome for Light Aircraft/ALA) did not include approach guidance. The operator issued visual guidance of circling approach runway 11 for internal use. The visual approach guidance chart displayed erroneous MSA.*	completeness of the information	Accepted
MC36	§3.1 Findings Page 50	*18 The visual approach guidance was displayed similar to the instrument approach without reminder that this was a visual approach, and might create a sense that flight crew performs instrument approach while following the visual approach guidance.*	*Delete this finding.*	Similar" and "might create" are not indisputable terms. Therefore this sentence should not be considered as a finding but only as an aspect of the analysis. Additionnaly the chart includes a clear reminder that it is a "visual guidance"	Accepted
MC36bis	§3.1 Findings	*19. Several maintenance records such*	*19. Several maintenance records such*	Maintenance records	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
(ATR46)	Page 50	*as component status installed on the aircraft and installation of EGPWS was not well documented. This indicated that the maintenance management was not well performed.*	*as component status installed on the aircraft and installation of EGPWS was not well documented. This indicated that the maintenance management was not well performed. In particular, EGPWS installation was not compliant with any of the ATR certified configuration.*	are unclear and seems to show that KLN-94 has been connected to EGPWS which is not a certified configuration for ATR.	
MC37 (ATR47)	§3.1 Findings Page 50	*20. The investigation could not find any regulation required for training of any addition or system modification which affect to the aircraft operation.*	*consider deleting or clarifying*	We don't understand the meaning of this sentence or what it refers to in the content of the report.	Rejected
MC38	§3.2 Contributing factors Page 50	*§3.2 Contributing factors The deviation from the visual approach guidance without considering the weather and terrain condition, and the absence of the EGPWS warning led the flight crew had lack of situational awareness.*	*Suggestion to replace by :* *"The accident directly resulted from two factors :* *-The decision to fly direct to left base, outside of any published IFR trajectory, with no, or only limited, visual reference to the terrain,* *-The EGPWS being inoperative didn't fulfil its role as a safety net to alert the crew of the immediate hazardous situation.* *Those factors may have resulted from the combination of the following ones : At least one previous deviation from the airline visual guidance trajectory, The absence of any official approach leading the operator to issue its own visual guidance mixing an erroneous Minimum Safety Altitude and a GPS*	Additionally, a factor linked to the quality oversight of the airline by the authorities could be added if sufficient information is available.	

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
			track. *The use of a low resolution EGPWS database generating alarms perceived as unnecessary by the crews, leading some of them to de-activate the EGPWS by pulling its circuit breaker.* *The limited tools available to the operator to monitor crews' practices"*		
MC39 (ATR49)	§4.1 PT Trigana Air Service Page 51	*b. Operation Department* *i. Published the instruction for pilot to not pull the EGPWS/TCAS circuit breaker in flight except as instructed by SOP ATR 42/72 Abnormal Procedure terrain awareness warning chapter 6 EMER 03.40 page 9*	*b. Operation Department* *i. Published the instruction for pilot to not pull the EGPWS/TCAS circuit breaker in flight except as instructed by SOP ATR 42/72 Abnormal Procedure terrain awareness warning chapter 6 EMER 03.40 page 9*	In ATR documentation, there is no EMER procedure calling for EGPWS circuit breaker to be pulled.	Rejected
MC40	Safety recommendations 5.1 Trigana Air Services	*"The visual approach guidance was displayed similar to the instrument approach without reminder that this was a visual approach. KNKT recommends to include a reminder in the visual approach guidance that the guidance is for visual flight."*	*Delete this safety recommendation*	The chart already clearly includes "Visual Guidance" in its top right corner. The recommendation should rather focus on the validation of internal documents to avoid erroneous information (referring to the MSA, for example).	Accepted
MC41	Safety Recommendations 5.3 DGCA	*"There was no information related to the status of ZX NDB published on NOTAM prior to the accident. KNKT recommends to ensure aeronautical information for air navigation user is*		This recommendation seems to be redundant with the one addressed to AirNav Indonesia	Rejected

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
		updated in accordance with the current condition, including the serviceability of the navigation aids."			
AC1 (ATR2)	Synopsis Page vi	*The CVR also did not record EGPWS altitude call out on two previous flights indicated that the EGPWS was totally not functioning that most likely due to the EGPWS circuit breaker was pulled.*	*The CVR also did not record EGPWS altitude call out on two previous flights. The investigation concluded ~~indicated~~ that the EGPWS was probably ~~totally~~ not functioning. A possible explanation is that ~~that most likely due to~~ the EGPWS circuit breaker was previously pulled.*	Proposition of rewording. The circuit breaker being pulled is a probable scenario.	Accepted
AC2 (ATR3)	Synopsis Page vi	*The aircraft was descending in limited visibility without prior briefing which include minimum safe altitude might have made the pilot did not aware of the terrain condition.*	*The aircraft was descending in limited visibility without prior briefing ~~which include~~ as such there is no reference made to the minimum safe altitude ~~might have made the pilot did not aware of the terrain condition~~ This would have led to pilot not being aware of terrain proximity.*	Suggested rewording for clarification	Accepted
AC3 (ATR6	§1.6.4 Operator EGPWS installation Page 12	*The modification of the EGPWS including the pre-requisite SBs did not communicate by the aircraft operator to the aircraft manufacturer.*	*The modification of the EGPWS including the pre-requisite SBs did were not communicated by the aircraft operator to the aircraft manufacturer.*	correction	Accepted
AC4	§1.11.1 Flight Data Recorder Page 18	*On October 2015, the FDR was transported to BEA facility in Paris, France for downloading process. The downloading process recovered the flight data which was not relevant with the flights compare to the route as recorded in the aircraft log. The accident flight was not recorded."*	*On ~~October~~ September 2015, the FDR was transported to BEA facility in Paris, France for downloading process. The downloading process recovered some flight data which was not consistent with the previous flights ~~compare to the route as~~ recorded in the aircraft log. The accident flight was not recorded."*	FDR was sent to BEA in september 2015. We suggest to rephrase to second sentence.	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
AC5 (ATR9)	§1.11.1 Flight Data Recorder Page 19	*The following table shows the FDR historical data.*	*The following table shows the FDR maintenance records ~~historical data~~.*	Suggestion of re-wording	Accepted
AC6 (ATR11	§1.11.2 Cockpit Voice Recorder Page 20	*On the flight from Oksibil to Sentani, the PIC acted as PM and the SIC acted as PF. The CVR did not record activation of EGPWS call out "FIVE HUNDRED" prior to land.* *The excerpt of the accident flight voice recorded data is described in the table below.*	*On the flight from Oksibil to Sentani, the PIC acted as PM and the SIC acted as PF. The CVR did not record activation of EGPWS call out "FIVE HUNDRED" prior to land.* *During the accident flight,* *The CVR did not record EGPWS warning up to the impact nor any any crew briefing and checklist reading, from cruise up to the impact.* *Except the absence of EGPWS warning, no evidence of any other malfunction was obtained from CVR data.* *The excerpt of the accident flight voice recorded data is described in the table below.*	Move of the last two bullets from page 21 for ease and consistency of the reading.	Accepted
AC7	§1.11.2 Cockpit Voice Recorder Page 20 & 21	*Times in the first row of the array are not fully consistent with CVR transcript sent to you in November 2015 after works in the BEA in September 2015*		Check times. See transcription attached.	
AC8 (ATR12)	§1.11.2 Cockpit Voice Recorder Page 21	*The significant events recorded in the CVR are as follows:* ---	*Remove this part as it is redundant with the content of the table and of the paragraph before already highlighting the significant events*	redundancy	Accepted
AC9 (ATR13	§1.16.1 Spectrum Analysis	*Since no data available from FDR, the investigation analyzed the spectrum of the CVR to determine engine torque.*	*Since no data is available from FDR, the investigation analyzed the spectrum of the CVR ~~to~~ and determined engine*		Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
	Page 24	*The analysis was conducted by BEA.*	*torque. The analysis was conducted by BEA.*		
AC 10 (ATR17)	§1.17.12 Operator FCOM ATR42 volume 1 Pages 31, 32, 33	*FCOM extracts :* *- 2.01.04 P1 LIMITATIONS – POWERPLANT* *- 1.17.40 P5 POWERPLANT – CONTROLS* *- 1.17.40 P7 POWERPLANT - CONTROLS*	*Remove these three pages*	Not relevant to the investigation	Accepted
AC11 (ATR18)	§1.17.1.5 Training Page 34	*The operator conducted all the mandatory training for pilot including Crew Resource Management (CRM) and Controlled Flight into Terrain (CFIT) as required by Civil Aviation Safety Regulation (CASR) requirements.*	*The operator conducted all the mandatory training for pilot including Crew Resource Management (CRM) and Controlled Flight into Terrain (CFIT) prevention as required by Civil Aviation Safety Regulation (CASR) requirements.*	Avoid confusion	Accepted
AC12 (ATR20)	§1.17.2.2 Civil Aviation Safety Regulations Part 91 Page 36		*Add what Oksibil airspace class is.*	Completeness of the information. Oksibil airspace class could also be mentioned in 1.10 Aerodrome Information page 18.	Accepted
AC13	§1.17.2.2 Civil Aviation Safety Regulations Part 91 Page 36		*In the "Distance from clouds" column, it should be "1,000 feet above" and "1,000 feet above below" for Class C to Class G airspace, unless it is a specificity in Indonesia.*	This might be a copy paste error	Accepted
AC14 (ATR21)	§1.18.2 Terrain Data Coverage Page 38	*However, some en-route area which included high terrain, the low-resolution terrain database generated nuisance to the flight crew by the*	*However, some en-route area which included high terrain, the low-resolution terrain database may generated nuisance to the flight crew*	Correction suggested unless it has been formaly reported by the airline that their	Accepted

No	Report page and paragraph	Extract of the Report	Proposed Change	Rationale	KNKT Response
		EGPWS warning of "TERRAIN TERRAIN PULL-UP".	*by the EGPWS warning of "TERRAIN TERRAIN PULL-UP".*	crew experienced nuisance warnings.	
AC15 (ATR39)	§2.4 Organization Oversight Page 48	*The aircraft operator identified that several pilots including the accident pilot had behavior of pulling the EGPWS CB. However, correction to this behavior was not performed in timely manner.*	*The aircraft operator identified that several pilots including the accident pilot had behavior of pulling the EGPWS CB. However, correction to this behavior was not performed prior to the accident ~~in timely manner~~.*	Correction proposed to stay factual. "in a timely manner" implies it may have change the outcome of this event.	Accepted

6.2 DGCA Special Audit and Safety Evaluation to PT. Trigana Air Services

AUDIT STATUS FINDING RECORDS
OPERATOR/COMPANY: PT. TRIGANA AIR SERVICE
DATED: 1-6 SEPTEMBER 2015

FINDING NO	DESCRIPTION	REF	TYPE OF FINDING	COMPLETION DATE		OPERATOR ACTIONS	STATUS	EVIDENCE
				TARGET	ACTUAL			
TGN-121-OPS-001	Trigana belum mempunyai independent two way communication system yang memadai untuk menunjang fasilitas flight following	CASR 121.99 dan CASR 121.125	NCP	31 Okt 2015	25 Sep 2015	PT. Trigana Air telah membuat kesepakatan dengan Spidertrack untuk install Flight Following system pada pesawat ATR dan DHC-6. Instalasi akan dilakukan sesuai dengan Timeframe terlampir untuk masing-masing pesawat.	CLOSED	Korespondensi antara PT. Trigana Air dengan Spidertracks Purchase order Bukti pembayaran
TGN-121-OPS-002	Load sheet pada flight IL-229 pesawat PK-YRI tanggal 5 Juli 2015 menggunakan data DOW yang tidak update (12.795 kg) sesuai dengan hasil terkahir Weight and Balance Report tanggal 30 November 2014 yaitu 12.753 kg	CASR 121.665	NCP	21 Sep 2015	17 Sep 2015	Dibuat Summary Aircraft Weight and Balance and CG Determination berikut Crew composition Index table. Sudah di sosialisasikan kepada seluruh FOO pada tanggal 17 September 2015.	CLOSED	Summary Weight and Balance per type of Aircraft berikut crew composition index. Absensi dan notulen sosialisasi kepada FOO
TGN-121-OPS-003	Terdapat inkonsistensi terhadap pengisian flight log oleh Pilot Trigana, contoh: Flight IL-261 tanggal 4 September 2015 PK-YRR	COM Ch. 3.1.2.	NAD	21 Sep 2015	10 Sep 2015	Mengadakan call up meeting seluruh Pilot Trigana Air tangal 8 September 2015, dengan salah satu agendanya Review tata tertib pengisian Flight Log	CLOSED	Absensi dan notulen sosialisasi kepada Pilot Record Flight Log tanggal 10 September 2015

Page **1** of **2**

AUDIT STATUS FINDING RECORDS
OPERATOR/COMPANY: PT. TRIGANA AIR SERVICE
DATED: 1-6 SEPTEMBER 2015

FINDING NO	DESCRIPTION	REF	TYPE OF FINDING	COMPLETION DATE		OPERATOR ACTIONS	STATUS	EVIDENCE
				TARGET	ACTUAL			
TGN-121-OPS-004	Proses loading pesawat di station Sentani tidak menggunakan loading checklist dan loading instruction	SM Ch. 4.6.3.	NAD	21 Sep 2015	21 Sep 2015	Membuat Loading Instruction Form. Sudah di sosialisasikan kepada seluruh FOO dan Ramp officer tanggal 17 September 2015.	CLOSED	Loading Instruction Form. Absensi dan notulen sosialisasi kepada FOO. Record Loading instruction tanggal 19 September 2015.
TGN-121-OPS-005	FOO Trigana an. Anton tanggal 4 September 2015 duty time melebihi 10 jam	CASR 121.465	NCP	21 Sep 2015	21 Sep 2015	Diadakan Meeting Operations Department dengan Agenda menambah FOO. Memformulasi ulang schedule FOO menjadi 2 shift terutama untuk FOO onboard	CLOSED	Absensi dan Notulen Meeting Ops Department tanggal 17 September 2015. Duty Roster FOO Sentani bulan September 2015.
TGN-121-OPS-006	Tidak terdapat approval dalam duty roster FOO di station Sentani	Standard Practice	NAD	21 Sep 2015	21 Sep 2015	Membuat Duty Roster yang di approved oleh Chief Flops untuk station Sentani.	CLOSED	Duty Roster FOO Sentani bulan September 2015.

Page **2** of **2**

AUDIT STATUS FINDING RECORDS
OPERATOR/COMPANY: PT. TRIGANA AIR SERVICE
DATED: 1-6 SEPTEMBER 2015

FINDING NO	DESCRIPTION	REF	TYPE OF FINDING	COMPLETION DATE		OPERATOR ACTIONS	STATUS	EVIDENCE
				TARGET	ACTUAL			
TGN-121-AIR-001	Ditemukan pengerjaan repair FDR P/N. 17M800-251, S/N. 3612 menggunakan AMO yang tidak valid sertifikatnya (PT. Sigar Dirgajaya Utama 145/58700)	CMM chapter 3.13 & Appendix A-9	NCF	21/09/2015	16/09/2015	Penerbitan surat perintah penghentian pengiriman FDR dan CVR kepada AMOyang tidak berlaku lagi izin operasinya	CLOSED	Internal Memo No.041/TAS-TD/IX/2015 Delivery Note Shiping Dokument
TGN-121-AIR-002	Ditemukan pengisian pengerjaan VOR System Test PK –YRN dengan WO No : 043/YRN/VIII/2015 tanggal 14 Agustus 2015 tidak lengkap	CMM Chapter 4	NCF	21/09/2015	16/09/2015	Perketat assessment dalam pemberian Authorization dengan menambahkan materi pada program recurrent training	CLOSED	Jadwal Training Work order Maintenance Program
TGN-121-AIR-003	Hasil pengerjaan up dating Navigational Database GPS 165 tanggal 21 Juli 2015 baru dikerjakan pada tanggal 28 Juli 2015	CMM Chapter 4	NCF	21/09/2015	18/09/2015	Penambahan navigation data base card untuk memudahkan distribusi update navigation data base	CLOSED	Korespondensi dengan Jeppesen Shipping label Invoice payment Jeppesen mobile flitedeck VFR Shift turn over report Maintenance log
TGN-121-AIR-004	Approved AMO List tidak up date	CMM appendix A-9 & Chapter 3.13	NCF	21/09/2015	21/09/2015	Update AMO List sesuai dengan data terkini	CLOSED	CMM Approved AMO List

AUDIT STATUS FINDING RECORDS
OPERATOR/COMPANY: PT. TRIGANA AIR SERVICE
DATED: 1-6 SEPTEMBER 2015

FINDING NO	DESCRIPTION	REF	TYPE OF FINDING	COMPLETION DATE		OPERATOR ACTIONS	STATUS	EVIDENCE
				TARGET	ACTUAL			
TGN-121-AIR-005	Ditemukan data tertulis mengenai informasi due calibration weighing kit di form salah tetapi tetap di release	CMM Chapter 10.2	NCF	21/09/2015	21/09/2015	Endorsement data dengan equipment tag pada alat yang dimaksud dan briefing Authorize personal terkait kegunaan dan validasi form	CLOSED	Aircraft Weight & CG Determination Sertifikat Kalibrasi Meeting Attendant
TGN-121-AIR-006	Ditemukan ada beberapa form yang tidak adanya tandatangan antara kedua belah pihak dalam penggunaan form shift turn over report.	CMM Appendix	NCF	21/09/2015	18/09/2015	Briefing engineer sebelum pemberangkatan dan merevisi form yang lebih komunikatif serta dapat memberikan penjelasan lebih detail	CLOSED	Shift turn over report Revisi Appendix CMM New Shift turn over report
TGN-121-AIR-007	Tidak ada kontrol terhadap penggunaan personel tool box	Standard Practice	NAD	21/09/2015	21/09/2015	Melengkapi setiap personil tools kit dengan list yang selalu update	CLOSED	Tool Inventory List Photo personal Tools Kit
TGN-121-AIR-008	Tidak ditemukan data pengecekan crane di hangar	CMM Appendix A-8	NCF	21/09/2015	17/09/2015	Crane di non aktifkan dan di lepas dari dudukannya sebelum ada pengecekan untuk sertifikasi.	CLOSED	Photo penururan Crane di Hanggar Sentani
TGN-121-AIR-009	Floor Marking di hangar telah banyak yang pudar	CMM Chapter 3.11	NCF	21/09/2015	16/09/2015	Mengecat kembali marking floor area secara menyeluruh	CLOSED	Photo progress pengecatan marking

DIRECTORATE GENERAL OF CIVIL AVIATION
DIRECTORATE OF AIRWORTHINESS AND AIRCRAFT OPERATION

EVALUATION NTSC SAFETY RECOMMENDATIONS SUMMARY
PRELIMINARY REPORT KNKT.15.08.17.04

OPERATOR/COMPANY: PT.TRIGANA AIR SERVICE
DATE : 28-30 MARCH 2016

NO.	SAFETY RECOMMENDATIONS	SAFETY ACTIONS	CORRECTIVE ACTION PLAN	TARGET COMPLETION DATE	STATUS	EVIDENCE	REMARKS
1.	PT. Trigana Air Service to emphasis the flight crew to comply with the company procedures such as crew briefing, checklist reading, approach procedure and visual flight rules (VFR) minima and provide monitoring system.	**A. Flight crew briefing and company procedures** 1) Implement special briefing to the entire flight crew to always comply to company procedures. 2) Emphasizing COM to All Flight Crew contained in Pilot Instruction No: 10/OPS-PI/XII/2015 or less containing the following : a) Always do departure, take-off and arrival briefing as it is written as well as referring to The COM section 2.4.2.2.a, section 3.2.7.L.e, and referring to the standard operation procedure (SOP) and F.C.O.M Aircraft type b) Always do reading check list "challenge and reply".	Implemented	Implemented	CLOSED	The detail data is provided in Appendix 10	
		B. Visual flight rules and approach procedures Review the visual guidance implemented by the Board of instructor (B.O.I), including discussing: 1) Oksibil Final procedure 2) Oksibil Final recalculation performance 3) Create procedure for other area not yet provided Visual guidance 4) Fuel supply refer to C.A.S.R 121 amdt.10 From the results of the board of instructor has generated new	Implemented	Implemented	CLOSED	The detail data is provided in APPENDIX 12.	

DIRECTORATE GENERAL OF CIVIL AVIATION
DIRECTORATE OF AIRWORTHINESS AND AIRCRAFT OPERATION

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OPERATOR/COMPANY: PT.TRIGANA AIR SERVICE
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NO.	SAFETY RECOMMENDATIONS	SAFETY ACTIONS	CORRECTIVE ACTION PLAN	TARGET COMPLETION DATE	STATUS	EVIDENCE	REMARKS
		visual guidance, which replaces the previous visual guidance. Contained in the notice to pilots NO: 02/OPS-NTP/II/2016 " New visual guidance',.					
		C. Monitoring System To be able do flight watch to the aircraft during operating and has installed spider track system for 8 aircraft (PK-YRX, PK-YRR, PK-YRV, PK-YRF, PK-YRU, PK-YPX, PK-YSJ, PK-YSF).	Implemented	Implemented	CLOSED	The detail data is provided in APPENDIX 13.	
2.	PT. Trigana Air Service to ensure the maintenance data record up date includes the installed component.	**A. PPC TRAINING** a. Description training PPIC To create a product that has superior criteria in Quality, Cost, Delivery, Flexibility and Safety required planning activities and production and inventory control (PPIC). PPIC activities begins with the determination of the amount of market requirements and targeting production, followed by production scheduling, material and inventory planning and control activities of the production floor. Monitoring and Controlling is done to ensure the implementation of production according to plan. This training will discuss about the	Implemented	Implemented	CLOSED	The detail data is provided in APPENDIX 22.	

DIRECTORATE GENERAL OF CIVIL AVIATION
DIRECTORATE OF AIRWORTHINESS AND AIRCRAFT OPERATION

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NO.	SAFETY RECOMMENDATIONS	SAFETY ACTIONS	CORRECTIVE ACTION PLAN	TARGET COMPLETION DATE	STATUS	EVIDENCE	REMARKS
		strategies, techniques and methods that are efficient in planning and production control (PPC) accompanied by a monitoring method, Controlling well as auditing in production. Various case studies, and trouble shooting in the PPIC will be discussed along with practical application of the methods used in the PPIC. b. Training goals PPIC Providing an understanding of PPIC strategic functions in relation to the company competitive advantage. Explain in a comprehensive on matters of a technical nature of operational and managerial PPIC. Equip participants with techniques, methods and applications of production, planning and control, auditing applicative Train the participants to apply the different methods of PPIC, can identify the leak and troubleshooting in the PPIC. c. Training materials PPIC Demand Management: 1. Forecasting (Forecasting): basic concepts, and assumptions, 2. Types of forecasting 3. Methods of forecasting and					

DIRECTORATE GENERAL OF CIVIL AVIATION
DIRECTORATE OF AIRWORTHINESS AND AIRCRAFT OPERATION

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OPERATOR/COMPANY: PT.TRIGANA AIR SERVICE
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NO.	SAFETY RECOMMENDATIONS	SAFETY ACTIONS	CORRECTIVE ACTION PLAN	TARGET COMPLETION DATE	STATUS	EVIDENCE	REMARKS
		tracking signal. 4. Practice Software forecasting Preparation Techniques Production Planning 1. Aggregate Planning (AP) 2. Master Production Schedule (MPS) 3. Rough Capacity Planning (RCP) 4. Capacity Requirements Planning (CRP) 5. Material Requirement Planning (MRP) and inventory planning with Economic order quantity (EOQ) 6. Shop floor scheduling and line balancing 7. Practice software PPIC Monitoring and controlling 1. Input output control 2. Production monitoring techniques 3. auditing production 4. Reporting case studies, and troubleshooting in the PPIC d. Training methods PPIC Presentation, discussion, brain storming, software applications and case study e. PPIC training participants All the PPC and Tech Record Personnel from main office and all					

DIRECTORATE GENERAL OF CIVIL AVIATION
DIRECTORATE OF AIRWORTHINESS AND AIRCRAFT OPERATION

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OPERATOR/COMPANY: PT.TRIGANA AIR SERVICE
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NO.	SAFETY RECOMMENDATIONS	SAFETY ACTIONS	CORRECTIVE ACTION PLAN	TARGET COMPLETION DATE	STATUS	EVIDENCE	REMARKS
		the branch office. f. Training methods PPIC Presentation, discussion, brainstorming, practice and case study					
		B. AIRCRAFT INVENTORY COMPONENT a. Introduction PT Trigana Air Service operated aircraft as follows: L.B737-300SF: 3 unit PK-YSY MSN 23597; PK-YSZ MSN 23451 and PK-YSG MSN 23930 operated for cargo carrier 2.B737-400: 1 unit PK-YSF MSN 23869 operated for passenger carrier 3. B737-300: 1 unit PK-YSH MSN : 27925 operated for passenger carrier 4. ATR72-202: 1 unit PK-YRX MSN: 342 operated for passenger carrier 5. ATR42-300: 1 unit PK-YRR MSN: 2t4 operated for passenger carrier 6. ATR 42-320:1 unit PK-YRV MSN: 190 operated for passenger carrier 7. Twin Otter DHC 6-300: 3 Unit	Inventory the aircraft need more time and man hours, because to make valid data, this process required to open access all the aircraft panel and structure. This process has been scheduled by PPIC.	Dec 2017	OPEN	The detail Airframe Schedule for Inventory is provided in page 22	

DIRECTORATE GENERAL OF CIVIL AVIATION
DIRECTORATE OF AIRWORTHINESS AND AIRCRAFT OPERATION

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		MSN 462 with reg PK-YRF ; MSN 684 with reg PK-YRU: MSN 685 with reg PK-YPX operated for passenger carrier b. Purpose of the Inventory aircraft component This Inventory action to make sure the data record valid with the actual installed component on aircraft. c. Preparation data The data that subject for inventory as follow: 1. Control Component By life time reference by CAMP 2. OC Component from aircraft reference by Maintenance log book for removal and installation process during operated by Trigana Air Service 3. CM Component reference by Maintenance log book for removal and installation process during operated by Trigana Air Service d. Monitoring and controlling Monitoring this process by experienced PPC personnel that familiar with the aircraft type and controling this process by quality control engineering and chief inspector					

DIRECTORATE GENERAL OF CIVIL AVIATION
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NO.	SAFETY RECOMMENDATIONS	SAFETY ACTIONS	CORRECTIVE ACTION PLAN	TARGET COMPLETION DATE	STATUS	EVIDENCE	REMARKS
		e. Result and Conclusion The aircraft that has been done for inventory is ATR 42-320, MSN 190 reg PK-YRV, Control component by life time found no deviation between actual and the aircraft record. CM Component found no deviation between actual and the aircraft record, OC Component found some of pafts not well records for the TSN, CSN, TSO and CSO Emergency Equipment found no deviation, but not match with the LOPA.					