



**KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA**

FINAL

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Aircraft Accident Investigation Report

PT. Intan Angkasa Air Service

Piper Chieftain PA 31-350, PK-IWT

Tual, Maluku

Republic of Indonesia

19 January 2014

2018

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

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Jakarta, September 2018

**KOMITE NASIONAL
KESELAMATAN TRANSPORTASI
CHAIRMAN**



SOERJANTO TJAHHONO

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ABBREVIATIONS AND DEFINITIONS

AFIS	:	Aerodrome Flight Information Services
ARFF	:	Airport Rescue and Fire Fighting
ATC	:	Air Traffic Control
BASARNAS	:	<i>Badan Search and Rescue Nasional</i> (Indonesian Search and Rescue Agency)
C	:	Celcius
C of A	:	Certificate of Airworthiness
C of R	:	Certificate of Registration
CB	:	Cumulonimbus
CPL	:	Civil Pilot License
DGCA	:	Directorate General of Civil Aviation
ETA	:	Estimated Time Arrival
GPS	:	Global Positioning System
in Hg	:	Inch Mercury (Hydrargyrum)
Km	:	Kilo meters
KNKT	:	<i>Komite Nasional Keselamatan Transportasi</i> (National Transportation Safety Committee) is the Indonesia investigation authority.
Kts	:	Knots
m	:	Meter(s)
mb	:	millibars
MHz	:	Mega Hertz
mph	:	Mile per hour
NDB	:	Non-Directional Beacon
Nm	:	Nautical mile
QFE	:	indicating the atmospheric pressure and when this value is set on an aircraft's altimeter, will cause the altimeter to read altitude above the airfield elevation.
QNH	:	indicating the atmospheric pressure adjusted to mean sea level and when this value is set on an aircraft's altimeter, will cause the altimeter to read altitude above mean sea level within a certain defined region.
RPM	:	Rotation per Minute
TSN	:	Time Since New
UTC	:	Universal Time Coordinated
VHF	:	Very High Frequency
WIT	:	<i>Waktu Indonesia bagian Timur</i> (Eastern Indonesia Time)

SYNOPSIS

On 19 January 2014, a PA-31-350 Piper Chieftain, registered PK-IWT, was being operated by PT. Intan Angkasa Air Service, on positioning flight from Sentani Airport, Jayapura with intended destination of Juanda Airport, Surabaya for aircraft maintenance. The positioning flight was planned to transit at Dumatubun Airport Langgur of Tual, Maluku and Haluoleo Airport, Kendari at South East Sulawesi for refuelling.

On the first sector, the aircraft departed Sentani Airport at 2351 UTC (0851 WIT) and estimated arrival at Langgur was 0320 UTC. On board on this flight was one pilot, two company engineers and one ground staff.

At 0240 UTC the pilot contacted to the Langgur FISO, reported that the aircraft position was 85 Nm to Langgur Airport at altitude 10,000 feet and requested weather information. Langgur FISO acknowledged and informed that the weather was rain and thunderstorm and the runway in used was 09.

When the aircraft passing 5,000 feet, the pilot contacted the Langgur FISO and reported that the aircraft position was 50 Nm from langgur and informed the estimated time of arrival was 0320 UTC. The Langgur FISO acknowledged and advised the pilot to contact when the aircraft was at long final runway 09.

At 0318 UTC, the pilot contacted Langgur FISO, reported the position was 25 Nm to Langgur at altitude of 2,500 feet and requested to use runway 27. The Langgur FISO advised the pilot to contact on final runway 27.

At 0325 UTC, Langgur FISO contacted the pilot with no reply.

At 0340 UTC, Langgur FISO received information from local people that the aircraft had crashed.

The aircraft was found at approximately 1.6 Nm north east of Langgur Airport at coordinate 5° 38' 30.40" S; 132° 45' 21.57" E. All occupants fatally injured and the aircraft destroyed by impact force and post impact fire.

The aircraft was destroyed by impact forces and post impact fire, several parts of the remaining wreckage such as cockpit could not be examined due to the level of damage. The aircraft was not equipped with flight recorders and the communication between ATC and the pilot was not recorded. No eye witness saw the aircraft prior to impact. Information available for the investigation was limited. The analysis utilizes available information mainly on the wreckage information including the information of the wings, engines and propellers.

Based on the available evidences, the investigation concluded that the left engine failed during approach. The propeller did not set to feather resulted in significant asymmetric forces on the left and right side of the aircraft. The asymmetric forces created yaw and roll tendency and the aircraft became uncontrolled, subsequently led the aircraft to impact to the terrain.

Komite Nasional Keselamatan Transportasi (KNKT) had not been informed any safety action taken by related parties. KNKT issue safety recommendations to address safety issues identified on this investigation to aircraft operator and Directorate General of Civil Aviation (DGCA).

1. FACTUAL INFORMATION

1.1 History of the Flight

On 19 January 2014, a PA-31-350 Piper Chieftain, Registered PK-IWT, was being operated by PT. Intan Angkasa Air Service, on positioning flight from Sentani Airport Jayapura, Papua with intended destination of Juanda Airport, Surabaya for aircraft maintenance. The positioning flight was planned for refuel at Dumatubun Airport of Tual, Maluku (Langgur)¹ and Haluoleo Airport, Kendari at South East Sulawesi.

On the first sector, the aircraft departed Sentani Airport at 2351 UTC ² (0851 WIT) and on board on this flight were four persons consisted of one pilot, two company engineers and one ground staff.

At 0020 UTC, the pilot reported to company personnel at Jayapura via company radio frequency informed that the aircraft was at 62 Nm from Sentani and estimated to arrive at Langgur was 0310 UTC.

At 0240 UTC, the pilot made initial contact to the Langgur Flight Information Services Officer (FISO). The pilot reported that the aircraft position was 85 Nm from Langgur, cruised at altitude of 10,000 feet, the estimated time of arrival was 0310 UTC and requested weather information. Langgur FISO acknowledged the messages and informed that the wind was calm, visibility 7 – 8 Km, the weather was rain and thunderstorm and advised that the runway in use was runway 09.

A few minute later, the pilot contacted Langgur FISO requested for descend clearance and was approved by the Langgur FISO and advised to report at position five minutes out to Langgur.

When the aircraft position was 50 Nm from Langgur, the pilot contacted the Langgur FISO reported that the aircraft was descending passed 5,000 feet and revised the estimated time of arrival became 0320 UTC. The Langgur FISO acknowledged and advised the pilot to report when the aircraft position at long final to runway 09.

At 0318 UTC, the pilot contacted Langgur FISO reported the aircraft position was 25 Nm from Langgur at altitude of 2,500 feet and requested to use runway 27. The Langgur FISO acknowledged and advised the pilot to report when the aircraft position on final runway 27.

At 0325 UTC, Langgur FISO contacted the PK-IWT pilot with no reply.

At 0340 UTC, Langgur FISO received information from local people that the aircraft crashed.

The aircraft was found at approximately 1.6 Nm north east of Langgur Airport at coordinate 5° 38' 30.40" S; 132° 45' 21.57" E.

All occupants fatally injured and the aircraft destroyed by impact force and post-

1 Dumatubun Airport of Tual, Maluku will be named as Langgur 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 that be used in this report is *Waktu Indonesia Timur (WIT)* or Western Indonesia Standard Time which is UTC +9 hours.

impact fire.

1.2 Injuries to Persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	1	3	4	-
Serious	-	-	-	-
Minor/None	-	-	-	NA
TOTAL	1	3	4	-

1.3 Damage to Aircraft

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

1.4 Other Damage

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

1.5 Personnel Information

Pilot

Gender : Male
Age : 39 years
Nationality : Indonesia
Marital status : Married
Date of joining company : October 2011
License : CPL
Date of issue : 31 July 1998
Aircraft type rating : PA-31-350
Instrument rating validity : 28 February 2014
Medical certificate : First Class
Last medical : 26 November 2013
Validity : 26 May 2014
Medical limitation : None
Last line check : 14 February 2013
Last proficiency check : 14 February 2013

Flying experience

Total hours : 2,860 hours

Total on type : 1,045 hours
Last 90 days : 20 hours
Last 60 days : 20 hours
Last 24 hours : 3 hours 30 minutes
This flight : 3 hours 30 minutes

1.6 Aircraft Information

1.6.1 General

Registration Mark : PK-IWT
Manufacturer : Piper
Country of Manufacturer : United States of America
Type/ Model : PA-31-350
Serial Number : 31-7752090
Year of manufacture : 1977
Certificate of Airworthiness
Issued : 21 December 2013
Validity : 21 January 2014
Category : Normal
Limitations : None
Certificate of Registration
Number : 3022
Issued : 21 December 2011
Validity : 21 December 2014
Time Since New : 5,859 hours
Last Major Check : 12 April 2013
Last Minor Check : 17 January 2014

1.6.2 Engines

Piper PA31-350 Navajo Chieftain was installed with twin opposite engines, the type of the left engine and right engine was different.

Manufacturer : Lycoming

Left Engine

Type/Model : TIO-540-J2BD

Serial Number : L-11502-61A

Time Since New : 694 hours

Right engine

Type/Model : LTIO-540-J2BD

Serial Number-2 engine : L-1446-68A

Time Since New : 1655 hours

1.6.3 Propellers

Manufacturer : Hartzell

Type/Model : HC-C4YR-2

Serial Number left propeller : FH.381

- Time Since New : 129.5 hours

Serial Number right propeller : FH.1032

- Time Since New : 129.5 hours

1.6.4 Aircraft Maintenance Information

The operator informed that after the last major inspection on 12 April 2013, the aircraft served in Papua which was outside of the operation base. The maintenance record in the head office may not be updated.

The information of the last maintenance inspection was available only from the Aircraft Flight and Maintenance Log book that was recovered in the accident site as shown below.

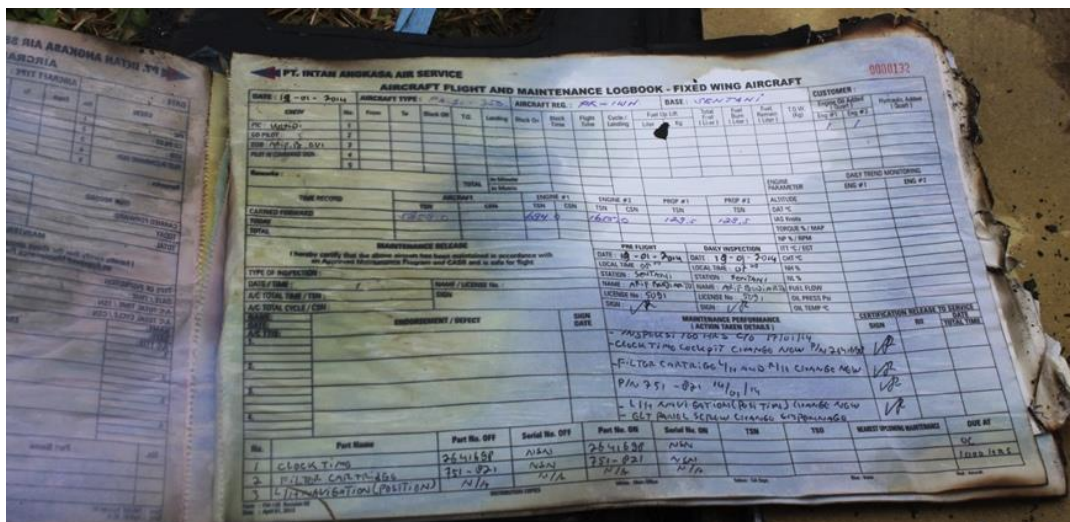


Figure 1: The recovered page of the Aircraft Flight and Maintenance Logbook

The logbook contained following information:

On 19 January 2014, or two days before the accident, the aircraft time since new (TSN) was 5859 hours, the left engine time was 694 hours and right engine time was 1655 hours, the left propeller time was 129.5 hours and the right propeller was 129.5 hours.

In the maintenance performance column, stated that the 100-hour inspection task had been performed on 17 January 2014 and there was no significant finding on the aircraft.

1.7 Meteorological Information

The weather information of Langgur Airport at 0300 UTC was reported:

Wind	:	300 / 04 knots
Visibility	:	7 Km
Weather	:	Thunderstorm/ Rain
Cloud ³	:	FEW 1800 CB, SCT 1500 feet
TT/TD	:	26°/ 25°C
QNH ⁴ (mb/in Hg)	:	1,007 mbs
QFE ⁵ (mb/in Hg)	:	1,007 mbs

The satellite image of the weather condition provided by Meteorological Service Singapore was as follow:

-
- 3 Cloud amount is assessed in total which is the estimated total apparent area of the sky covered with cloud. The international unit for reporting cloud amount for FEW is when the clouds cover 1/8 up to 2/8 area of the sky and scattered (SCT) is when the clouds cover 3/8 up to 4/8 area of the sky.
 - 4 QNH indicating the atmospheric pressure adjusted to mean sea level and when this value is set on an aircraft's altimeter, will cause the altimeter to read altitude above mean sea level within a certain defined region.
 - 5 QFE indicating the atmospheric pressure and when this value is set on an aircraft's altimeter, will cause the altimeter to read altitude above the airfield elevation.

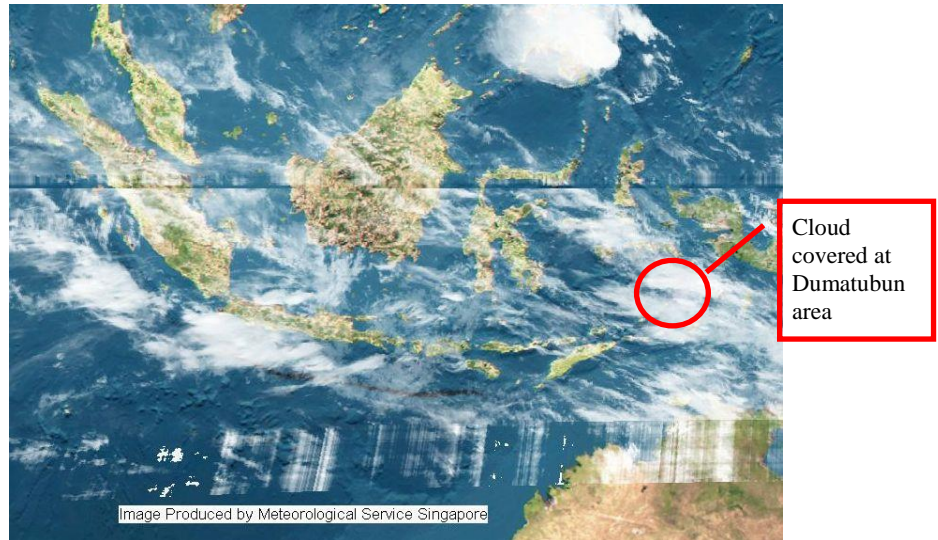


Figure 2: Weather report from Singapore Meteorological Service

1.8 Aids to Navigation

At the time of occurrence, the Langgur airport is operated by Air Force Indonesia. The Langgur Airport equipped with Non-Directional Beacon (NDB) station with identification of TL and broadcasted on frequency 335 MHz. The instrument approach chart of Langgur Airport issued by Air Force Indonesia was as follow:

INSTRUMENT
APPROACH CHART
NDB RWY 27

Elev : 10 FT
height related to
mean sea level

LANGGUR / dumatubun
INDONESIA
TWR : 122.6 MHZ

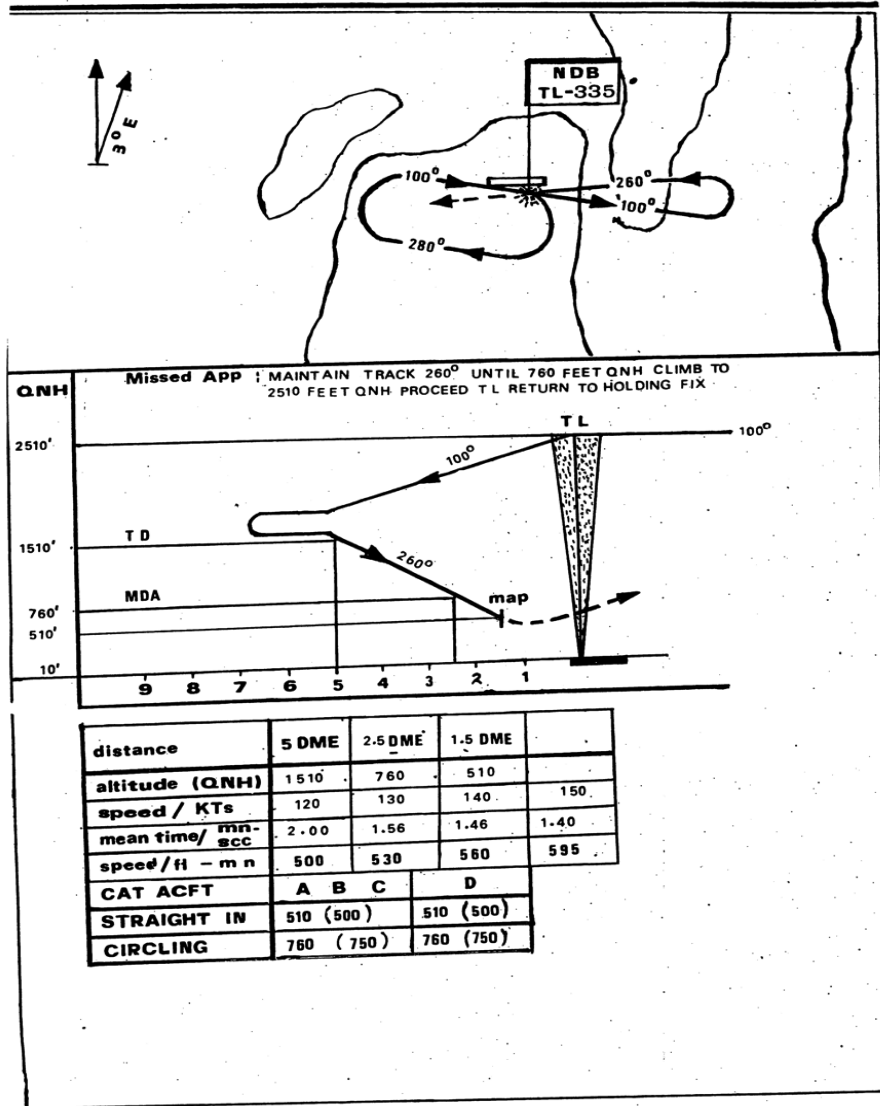


FIGURE I

Figure 3: Langgur Airport NDB instrument approach chart runway 27

1.9 Communications

The aircraft was equipped with Very High Frequency (VHF) radio communication systems and the VHF radio was reported serviceable.

The communications between FISO and the pilot were not recorded. The communication information used in this investigation was based on the FISO report and the times were estimated.

The communication between pilot and the ATS was reported by FISO and the excerpt communication is as follow:

TIME (UTC)	FROM	TO	DESCRIPTION
0240	Pilot	FISO	Informed that the aircraft position was 85 Nm from Langgur at altitude of 10,000 feet, ETA was 0310 UTC and the pilot requested the weather of Langgur airport.
	FISO	Pilot	Acknowledged the information and informed that the wind was calm, visibility 7 km, weather thunder storm, rain, cloud FEW 1800 ft CB and SCT 1500 ft, temperature 26 and dew point of 25, QNH 1007 mbs and QFE was 1007 mbs. The runway in used was runway 09 The FISO advised the pilot to report when the aircraft was about to leave altitude 10,000 feet.
	Pilot	FISO	Requested for descend clearance
	FISO	Pilot	Approved the aircraft for descend and advised the pilot to report when position at five minutes out to Langgur.
	Pilot	FISO	The pilot informed the aircraft was passing 5,000 feet at position of 50 Nm from Langgur.
	FISO	Pilot	Advised the pilot to continue descent and to report when position on long final runway 09.
0318	Pilot	FISO	The pilot reported the aircraft was at altitude of 2,500 feet and position at 25 Nm from Langgur and requested to use runway 27.
	FISO	Pilot	Approved to use runway 27 and advised the pilot to contact when position on final approach runway 27
0325	FISO	Pilot	AFIS controller attempted contacting the pilot with no reply

1.10 Aerodrome Information

Airport Name : Dumatubun, Langgur Tual
 Airport Identification : WAPL
 Airport Operator : Directorate General of Civil Aviation (DGCA)
 Airport Certificate :
 Coordinate : 132° 42' E 05° 40' S

Elevation : 10 feet
 Runway Direction : 09-27
 Runway Length : 1300 meters
 Runway Width : 300 meters
 Surface : Asphalt

The airport lay out was as follow:

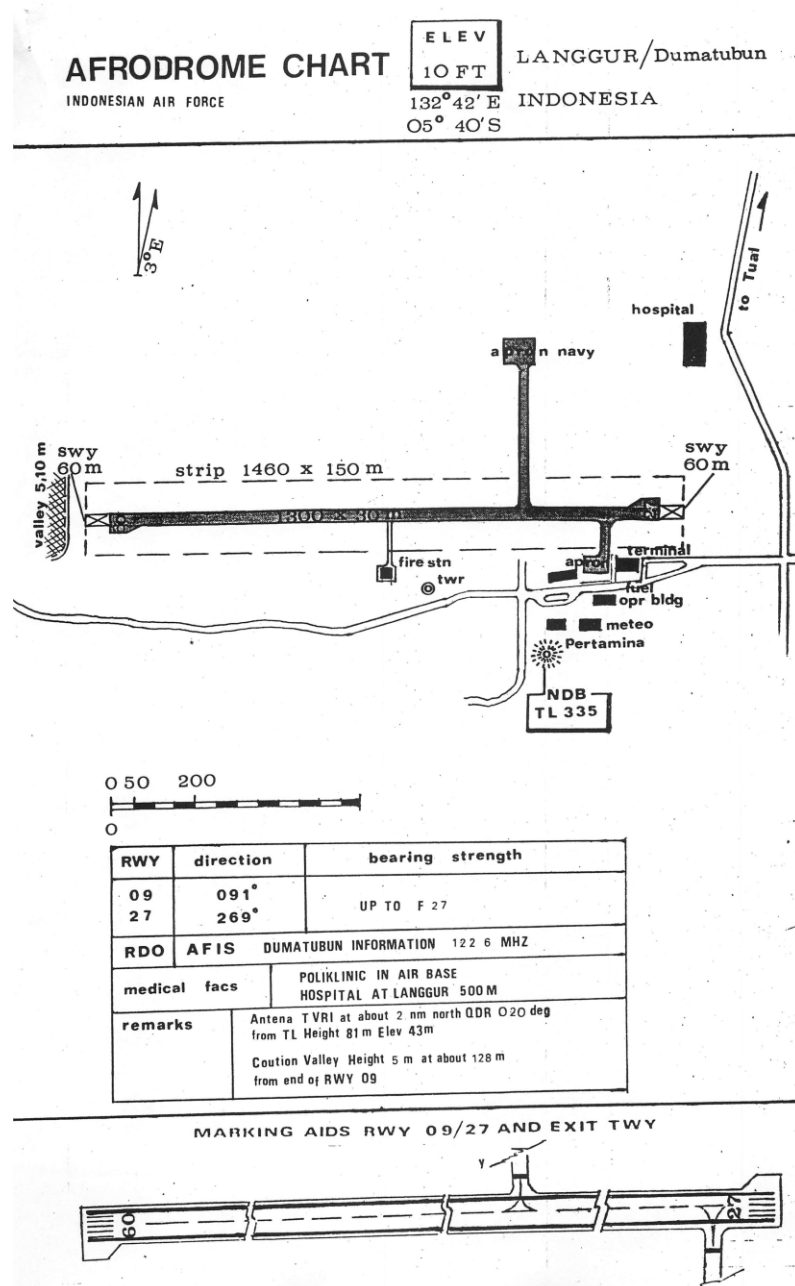


Figure 4: Langgur airport layout

1.11 Flight Recorders

The aircraft was not fitted with flight recorder. Neither recorder was required by current Indonesian aviation regulations for this type of aircraft.

1.12 Wreckage and Impact Information

The aircraft was found at approximately 1.6 Nm North East of Langgur Airport at coordinate $5^{\circ} 38' 30.40''$; S $132^{\circ} 45' 21.57''$ E. at elevation approximately of 40 feet. The location of the aircraft in relation to the runway marked on Google earth as follows:

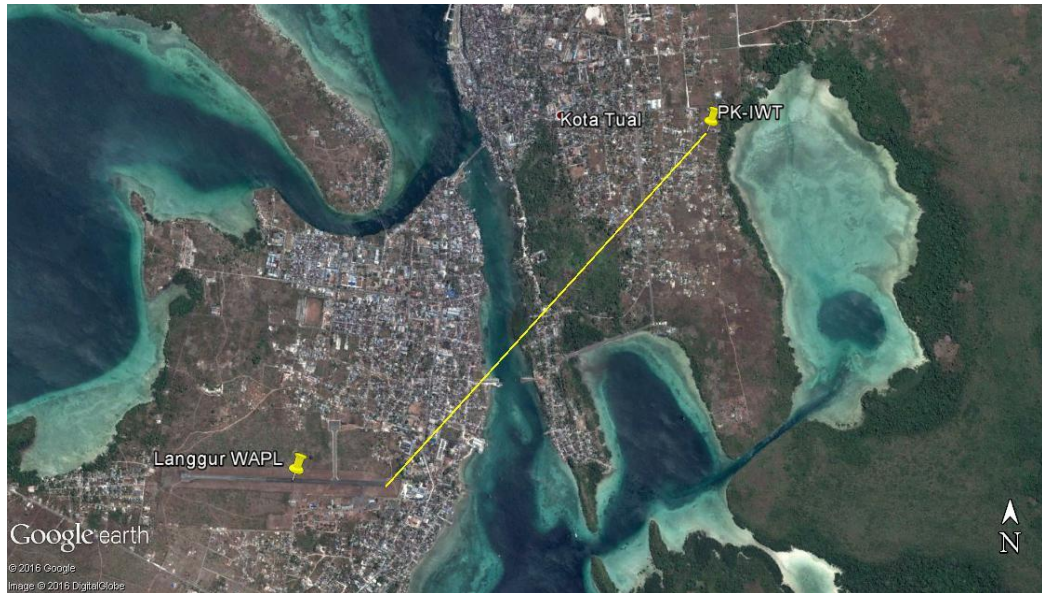


Figure 5: The aircraft position relative to runway 27 marked on Google earth

The aircraft heading was approximately 300° , the wreckage distributed on an area with radius of approximately 50 meters and the fuselage destroyed by the post-impact fire from the cockpit to the empennage.



Figure 6: The general view of wreckage distribution

The nose landing gear tire was still pressurized, and the gear was appeared to be extended and locked which subsequently collapsed forward most likely at impact. There was no sign of abnormality to the nose landing gear and tire.



Figure 7: Nose landing gear and nose wheel tire

Both main landing gears were still intact at the wing structure and appeared to be extended and locked. There was no indication of abnormality and it was appeared that landing gear had been extended.



Figure 8: Left landing gear and left wheel tire



Figure 9: Right landing gear and right wheel tire

The leading edge of the left wing bent upward at approximately 3 – 4 meters from the wing tip which was a sign of impact force at the left wing. The left wing root was destroyed by post-impact fire. The witnesses reported that the right wing was found at an angle of approximately 45° with the wing tip at the top, prior to collapse due to post impact fire.



Figure 10: The deformation of the left wing leading edge



Figure 11: Right view after crashed and after the fire was extinguished

There was no sign of fuel spill on the ground or remaining in the left wing tank most likely the fuel tank was broken after impact, the fuel leaked and burnt.

All the wing flaps were not in the fully retracted position however, the angle of the flap extension could not be determined.



Figure 12: Wing flap found not on up position

The left and right engines detached from its mountings and the propeller assemblies detached from its engines. The left engine was found in upside down position and faced about 60° to the left from its original position, compared to the position of the left wing. There was no sign of fire on the left engine.



Figure 13: Left engine condition



Figure 14: Right engine condition

The left engine propeller detached and found at approximately 8 meters in front of the left engine. The spinner submerged in the mud and damage. The propeller blades were in the low pitch angle and several scratch marks on the propeller leading edges and the blades. The propeller blades were not bent in any position.



Figure 15: Left propeller

The right engine propeller assembly detached from the engine and separated at approximately 4 meters in front of the engine. Two blades were found bent backward with scratch marks and two blades were relatively less damage. The propellers were at low pitch angle. The spinner detached from the propeller unit.



Figure 16: Right propeller

Most part of the cockpit including the control column, engine control and flap control were melted and unable to be examined due to impact and post impact fire.

The tail section was found not significantly damaged. The aircraft was equipped with airborne magnetic mapping survey and the antenna boom was installed on the tail section. The antenna of airborne magnetic mapping survey was detached and separated approximately 6 meters behind the tail section.



Figure 17: Tail section and the antenna of airborne mapping survey

1.13 Medical and Pathological Information

No medical or pathological examinations were conducted as a result of this accident.

1.14 Fire

The witnesses state that the fire started after the impact. The cockpit through the empennage was destroyed due to post-impact fire. The source of the fire was unable to be determined.



Figure 18: The exposure of fire after crash. The photo was taken by local witness

1.15 Survival Aspects

After received the report of aircraft accident, the Airport Rescue and Fire Fighting (ARFF) deployed to the accident site. The aircraft was found at approximately 1.6 Nm North East of Langgur Airport. When the ARFF team arrived at the accident site, immediately extinguished the fire.

All the occupants were fatally injured. The evacuations of the deceased victims were conducted by Indonesian search and rescue (BASARNAS) assisted by local people after the fire had been extinguished.

1.16 Tests and Research

No test or research conducted in this investigation.

1.17 Organizational and Management Information

1.17.1 Aircraft Operator General Information

Aircraft owner and operator : PT. Intan Angkasa Air service
Komplek KIMU
Jalan Pintu Gerbang Tol Cibitung
Bekasi 17520

Air operator certificate : AOC 135-019

The operator had operation base in Balikpapan, East Kalimantan. The operator operated total of nine aircraft including the accident aircraft and eight helicopters consist of one Bell 212, one Bell 206 L, two SA315B Alouette III Lama, four MD Helicopters MD.

1.17.2 Flight Following System

The operator established a flight-following system for the purpose of monitoring aircraft using Sure Track Global Positioning System (GPS) tracking device. The device transmitted data from aircraft to the Sure Track server every 5 minutes.

The total flight times as recorded in the flight following was approximately 3 hours

30 minutes. Detail of the Sure Track recorded data described in the Appendices of this report and the data transmitted to the server are as follows:

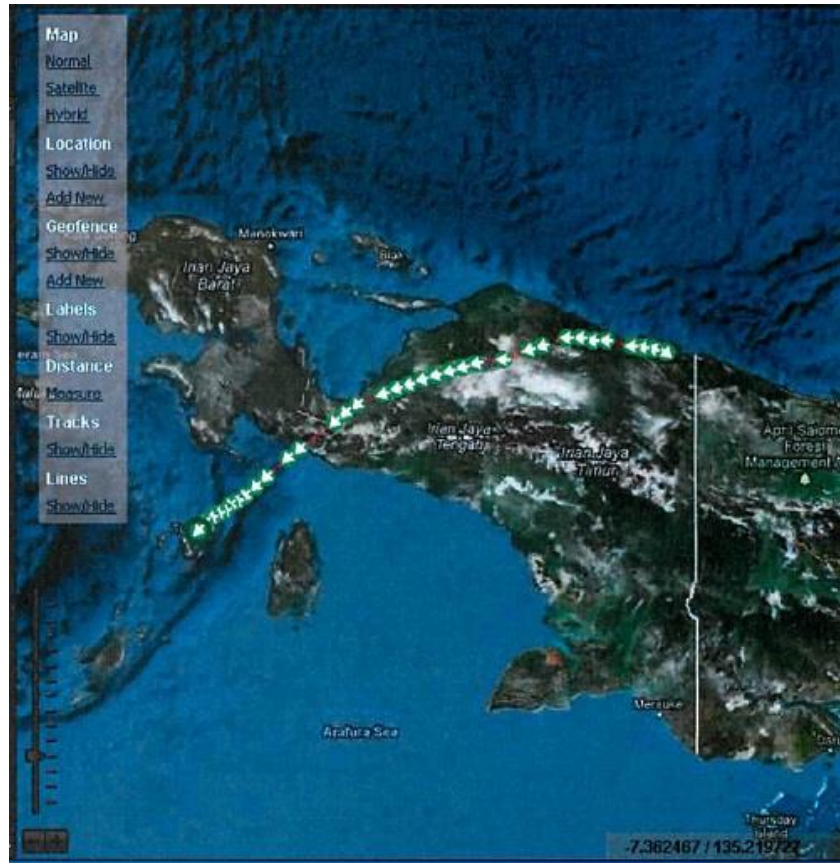


Figure 19: Sure Track flight following system

Based on the movement report, the investigation reconstructed the movement into the google map to enhance the flight path as shown below.

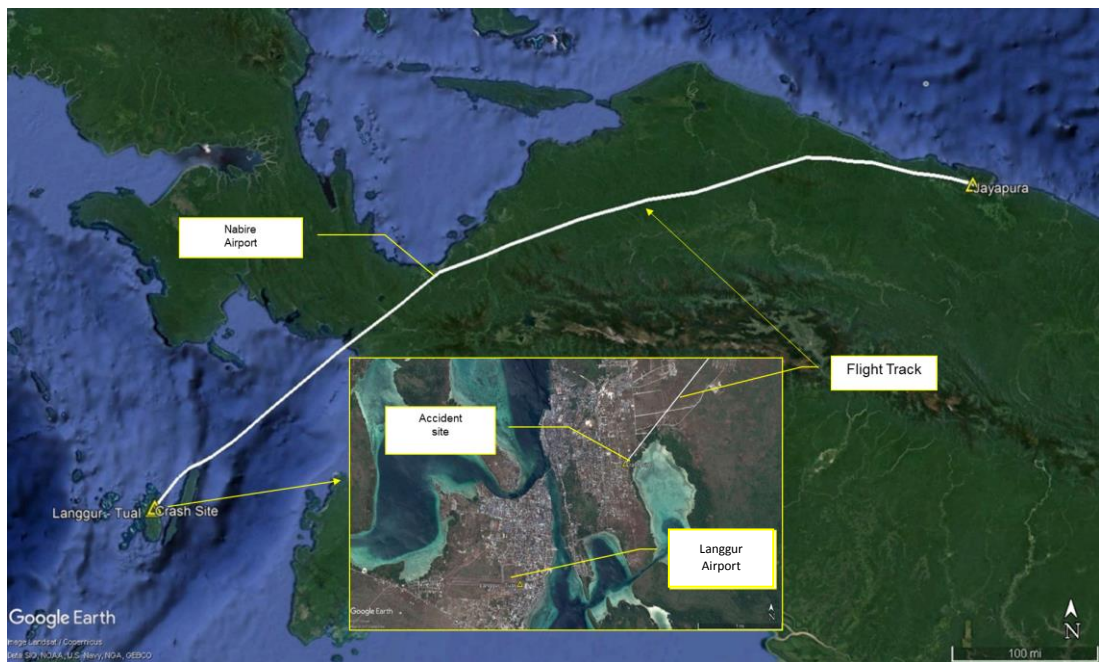


Figure 20: Flight path from Sentani Airport up to end of the flight based on Sure Track Global Positioning System

1.17.3 Piper PA31-350 Chieftain Information Manual

The normal procedure for the landing in section 4, Normal Procedure was as follow:

**SECTION 4
NORMAL PROCEDURES**

**PIPER AIRCRAFT CORPORATION
PA-31-350, NAVAJO CHIEFTAIN**

<p>CLIMB</p> <p>85% Power - (when safely clear of obstacles or terrain)..... establish Mixturelean as required Cowl flaps as required Emergency fuel pumps..... OFF Air conditioner as desired Seat belts and no smoking sign ON Oxygen as required</p> <p>CRUISE</p> <p>Fuel selectors OUTBOARD OR INBOARD Power set Cowl flaps as required Mixture leaned</p> <p>DESCENT</p> <p>Mixtures min. 1350° EGT Fuel selectors INBOARD Power as required Oxygen (below 10,000 ft.) OFF Pitot and windshield heat as required</p>	<p>(162 KIAS max. 15° S/N 31-7852001 and up) (162 KIAS max. 25° S/N 31-7952001 and up) (132 KIAS max. full flaps) Landing lights as required</p> <p>BALKED LANDING</p> <p>Props full forward Power as required Wing flaps 15° Gear UP Wing flaps UP Airspeed 98 KIAS min.</p> <p>AFTER LANDING (CLEAR OF RUNWAY)</p> <p>Radar OFF Cowl flaps OPEN Wing flaps UP Emerg. fuel pumps OFF Heater switch (if used) FAN Prop controls forward Strobes OFF</p>
<p>BEFORE LANDING</p> <p>Seat belts and no smoking sign ON Emergency fuel pumps ON Air conditioner OFF Mixture RICH Prop sync OFF Prop controls 2400 RPM Gear DOWN (below 128 KIAS in S/N 31-7752001 thru 7752201) (below 153 KIAS in S/N 31-7852001 and up) Gear lights 3 green Gear mirror checked Brake pressure checked Autopilot OFF Wing flaps as required down in steps (154 KIAS max. 15° S/N 31-7752001 thru 7752201)</p>	<p>SHUTDOWN</p> <p>Parking brake set Avionics OFF AP/FD OFF Throttles IDLE Mag grounding checked Throttles 1000 RPM Lights OFF Heater switch OFF Electrical equipment OFF Mixture (1st eng. started) IDLE CUT-OFF Gear handle DOWN Gear handle (hydraulic check) returned to neutral Mixture (2nd eng.) IDLE CUT-OFF Mags OFF Master switch OFF</p>

REPORT: 2046
4-8

ISSUED: NOVEMBER 1, 1976
REVISED: MARCH 15, 1982

Figure 21: Section 4 Normal Procedures

Refer to the description of this manual, the applicable flap selection for this aircraft are 0°, 15° and 25° which can be selected via motorized flap selector at the right

panel in the main instrument panel. Typical flap selector of this aircraft prior accident is as follow:

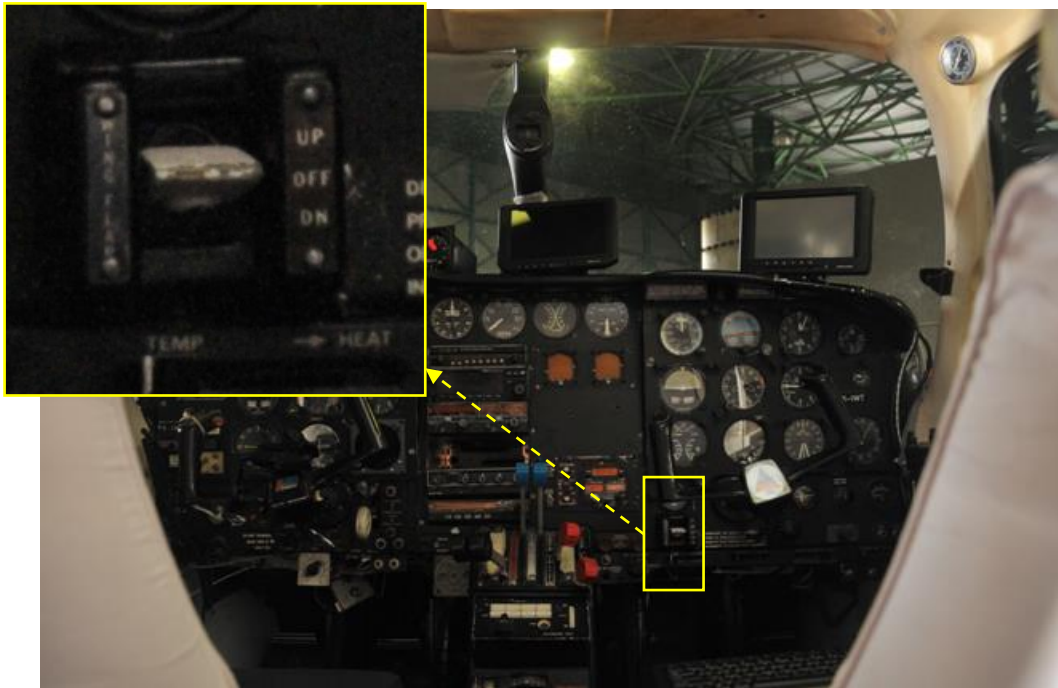


Figure 22: Typical flap selector

1.17.4 Pilot Operating Manual

Emergency Procedure

8. SINGLE ENGINE LANDING

a. Complete feathering procedure.

b. Before landing check list.

(1) Do not drop gear until sure of making field. Maintain 125 mph (109 Kts).

(2) Do not lower flaps until sure of making runway. Maintain 110 mph (96 Kts).

9. SINGLE ENGINE GO-AROUND

a. Throttle - open

b. Flaps - retract

c. Landing gear - retract

d. Airspeed - "One Engine Inoperative Best Rate-of-Climb Speed" is 125 mph (109 Kts), climb at 130 mph (113 Kts) for high ambient temperature.

e. Trim - set

f. Cowl flap - as required (operating engine)

NOTE

Aircraft will not climb with gear and flaps extended.

1.18 Other Information

1.18.1 Filed ATC Flight Plan

The filed (Air Traffic Control) ATC flight plan stated the aircraft was planned to depart Sentani Airport at 2330 UTC with intended destination was Langgur Airport (WAPL) via KUBIA waypoint and over Nabire Airport, with the alternate airport was Benjina Airport (WAPK) which was approximately 95 Nm at radial 104° from the Dumatubun. The cruising altitude was planes at 10,000 feet and the cruising speed was 150 knots. The flight estimated would take 3 hours and 30 minutes. The fuel endurance was six hours however the actual fuel onboard was unknown.

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

The aircraft was destroyed by impact forces and post impact fire, several parts of the remaining wreckage such as cockpit could not be examined due to the level of damage. The aircraft was not equipped with flight recorders and the communication between Langgur FISO and the pilot was not recorded. No eyewitness saw the aircraft prior to impact. Information available for the investigation was limited. The analysis utilizes available information mainly on the wreckage information including the information of the wings, engines and propellers.

The flight following system provides information that the accident site was close to the airport. The filed flight plan stated that the elapse time of the flight was 3 hours 30 minutes and the total fuel endurance was 6 hours. The information indicated that the fuel was sufficient to conduct the flight, even though the actual fuel uplift to each wing tank could not be determined. This also supported by the evidence of post impact fire intensity that indicated significant amount of fuel remain after the impact. This information indicated that fuel shortage was unlikely to be occurred.

The aircraft was found at approximately 1.6 Nm North East of the airport while the last communication stated that the pilot requested to land on runway 27 which previously the runway in use was 09. The investigation could not determine the reason of the pilot requested runway 27 however, considering the wind condition that was from North West with velocity of 4 knots, and the aircraft was arriving from North East, runway 27 was more appropriate for landing.

The wreckage provided evidence that all the landing gears appeared down and locked, the wing flaps were not in the fully retracted position however, the angle of the flap extension could not be determined. Referred to the Piper Navajo Information Manual, the normal procedure checklist stated the landing gear down selected after the flap selection to 15°. Assumed that the procedure was performed and information of the wreckage that the landing gear had been extended, it can be concluded that the flap was minimum at 15° positions. This condition indicated that the aircraft was in preparation for landing.

The left wing leading edge was found bending upward up to 4 meters, indicated that the left wing was the first part impacted to the ground. This indicated that the aircraft rolled to the left during impact. This supported by the evidence of the aircraft was tilted to the left prior to rest on the final position after the fire extinguished. The impact to the ground with position rolled to the left most likely resulted to the left propeller impacted to the ground prior to detach from the engine.

Examination of the right propeller found that two blades bent backward and spinner damage, these evidences showed that the engine completed about a half revolution when contacted with the ground before propeller detached. The damage on the right engine showed high rotational energy at impact. It was likely that the engine may have been operating prior to impact.

In contrary with the right propeller, the evidence of left propeller showed less damage without any bending blade. The left propeller most probably was also rotating at impact indicated by the several scratch marks at the blade leading edges and the blades, the unbending propeller indicated less rotational energy compared to the right propeller.

In some circumstances, there is possibility of propeller rotates with the less energy from the engine whenever the engine is at low power or completely ceases during flight. During engine failure in flight, the propellers shall be feathered, which means moved the propeller blades at approximately 90 degrees to the flight direction to reduce the drag from the propellers. In the case of the engine ceases during flight and the propellers are not set to feather, the propeller will automatically move to feather however, it will take longer time. When the propeller has not reached the feather position, the forward speed of the aircraft drives the propeller or consistence with wind-milling situation.

The wind-milling situation of unfeather propellers creates drag (backward force). In the case of two engines wing mounted aircraft, the ceased engine will create drag while on to the other engine creates forward force. The drag on ceased engine and forward force of the operating engine created significant asymmetric force followed by yaw and roll tendency toward the fail engine. Significant asymmetric force might have been made the aircraft difficult to control.

Differential rotation of both engines intentionally made by the pilot was unlikely because normally during approach both engines should rotate with the same power and rotation to ease the aircraft operation. It can be concluded that the low propeller rotation was not intentionally done by the pilot.

The left wing leading edge bending upward indicated that the aircraft rolled to the left prior to impact. The roll most likely was the results of the left engine had ceased and result in asymmetric forces. The ceased on the left engine was indicated by the less damage on the left propeller.

The evidence of the left engine found facing to the left relative to the wing position, indicated the dominant impact forces were downward and to the left. This situation was consistent with the possibility of wind-milling condition on the left engine while the propeller was not set to feather subsequently created drag followed by yaw and roll tendency to the left.

The engine failure which occurs on low power such as aircraft on descend might have been difficult to be noticed as the asymmetric power was not significant. As the engine ceasing, the power will reduce and followed by decreasing aircraft speed. The pilot will tend to open both engines power to maintain the speed. The opening both engines power will result in only one engine power increasing as the other engine had failed. Increasing one engine power while the other engine ceasing, creates significant asymmetric power including the yaw and roll tendency.

In the case of engine failure and followed by asymmetric power occurs during approach at low altitude, it may be difficult to control by the pilot especially single pilot aircraft. The pilot requires to perform emergency procedure for engine failure which include procedure to feather the propeller that will reduce the asymmetric power. Simultaneously, the pilot shall maintain the safe flight including maintain the

flight path.

The last maintenance record from the recovered aircraft flight and maintenance logbook showed that there was no significant finding on the aircraft. The investigation could not determine the reason of the left engine ceased.

The evidences of the left wing leading edge bending angle indicated that the aircraft rolled to the left during impact. The propellers of left engine were found at low angle and with no significant damage these evidences consistence with the propeller was not set to feather and wind-milling situation (rotation at low speed). The wind-milling propeller created drag and led to the aircraft uncontrolled. The aircraft was found at 1.6 Nm from the airport and was on preparation for landing indicated that the aircraft was close to the airport which most likely at low altitude.

Based on the available evidences, the investigation concluded that the left engine failed during approach. The propeller did not set to feather resulted in significant asymmetric forces on the left and right side of the aircraft. The asymmetric forces created yaw and roll tendency and the aircraft became uncontrolled, subsequently led the aircraft to impact to the terrain.

3. CONCLUSIONS

3.1 Findings⁶

1. The pilot in command held valid licenses and medical certificates.
2. The aircraft had a valid Certificate of Airworthiness (C of A) and Certificate of Registration (C of R).
3. The recovered aircraft flight and maintenance log showed that there was no significant finding on the aircraft during the last maintenance.
4. The filed flight plan stated that the endurance flight was 3 hours 30 minutes and the total fuel endurance was 6 hours. The actual fuel onboard could not be determined. The information indicated that the fuel was sufficient to conduct the flight, which also supported by the evidence of post impact fire intensity that indicated significant amount of fuel remain after the impact. The investigation concluded that fuel shortage was unlikely to be occurred.
5. The weather at Langgur was raining and thunderstorm.
6. The aircraft was significantly damage due to impact force and post-impact fire. Several parts of the remaining wreckage such as cockpit could not be examined due to the level of damage.
7. The evidence showed that the flap was found not up which likely more than 15 degrees, all the landing gears appeared down and locks indicated that the aircraft was configured for landing.
8. The aircraft was found approximately 1.6 Nm from the runway 27 indicated that the aircraft was on approach and at most likely at low altitude.
9. The damage to the right engine propeller blades and spinner showed the engine completed about a half revolution when impacted to the ground before propeller separated it was most likely the right engine had high rotational energy which indicated that the engine was operating at impact.
10. The evidence of left propeller showed minor damage without any bending of all blades. The left propeller most probably was also rotating at impact indicated by the several scratched at the blade surface but with less rotational energy compare with the right propeller. It was most likely that the left engine had ceased during impact.
11. The damage on the left wing and the engine was found facing left compare to the position of the wing indicated the dominant impact forces were downward and to the left.
12. Based on the available evidences, the investigation concluded that the left engine failed during approach. The propeller did not set to feather resulted in significant asymmetric forces on the left and right side of the aircraft.

⁶ 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.

The asymmetric forces created yaw and roll tendency and the aircraft became uncontrol, subsequently led the aircraft to impact to the terrain.

3.2 Contributing Factors⁷

The investigation concluded that the left engine most likely failed during approach and the propeller did not set to feather resulted in significant asymmetric forces. The asymmetric forces created yaw and roll tendency and the aircraft became uncontrolled, subsequently led the aircraft to impact to the terrain.

⁷ Contributing factors is defined as events that might cause the occurrence. In the case that the event did not occur then the accident might not happen or result in a less severe occurrence.

4. SAFETY ACTION

At the time of issuing this Draft Final report, the Komite Nasional Keselamatan Transportasi had not been informed of any safety actions resulting from this occurrence. The aircraft operator stated that operation of fix wing aircraft was terminated and continues the operation of helicopter only.

5. SAFETY RECOMMENDATIONS

As a result of this investigation, the Komite Nasional Keselamatan Transportasi (KNKT) issue safety recommendations to address safety issue identify in this investigation.

5.1 PT. Intan Angkasa Air Service

- **04.O-2018-01.1**

The investigation concluded that the left engine failed during approach. The propeller did not set to feather resulted in significant asymmetric forces on the left and right side of the aircraft. KNKT recommend to review pilot training in handling engine failure including during critical phase.

5.2 Directorate General of Civil Aviation

- **04.R-2018-01.2**

The investigation concluded that the left engine most likely failed during approach. The propeller did not set to feather resulted in significant asymmetric forces on the left and right side of the aircraft. KNKT recommend to ensure the pilot training in handling engine failure is adequate.

6. APPENDICES

1.20 Sure Track Report



Movement Report

Unit name : PK-IWT

Period : 2014-01-19 00:00:00 to 2014-01-19 17:36:00

Report Time	Status	Speed	Direction	Latitude	Longitude
2014-01-19 06:39:07	Normal D+	0	355.00	-2.5693330	140.5092000
2014-01-19 06:39:17	Normal D+	0	86.00	-2.5691670	140.5090000
2014-01-19 06:39:47	Normal D+	0	88.00	-2.5691670	140.5090000
2014-01-19 06:43:07	Normal D+	0	116.00	-2.5691670	140.5090000
2014-01-19 06:48:47	Normal D+	14	131.00	-2.5805000	140.5237000
2014-01-19 06:58:08	Normal D+	111	292.00	-2.5250000	140.3027000
2014-01-19 07:05:57	Normal D+	137	275.00	-2.4990000	140.1342000
2014-01-19 07:07:47	Normal D+	138	277.00	-2.4820000	139.9487000
2014-01-19 07:18:07	Normal D+	138	267.00	-2.3855000	139.5378000
2014-01-19 07:22:57	Normal D+	138	281.00	-2.3755000	139.3262000
2014-01-19 07:27:57	Normal D+	138	275.00	-2.3473330	139.1183000
2014-01-19 07:33:47	Normal D+	138	267.00	-2.3490000	138.9042000
2014-01-19 07:43:57	Normal D+	138	253.00	-2.4731670	138.4987000
2014-01-19 07:48:37	Normal D+	138	242.00	-2.5471670	138.2922000
2014-01-19 07:58:47	Normal D+	138	266.00	-2.6836670	137.8707000
2014-01-19 08:08:57	Normal D+	138	256.00	-2.7555000	137.4188000
2014-01-19 08:12:27	Normal D+	138	255.00	-2.8211670	137.2035000
2014-01-19 08:17:17	Normal D+	138	251.00	-2.8808330	136.9832000
2014-01-19 08:23:57	Normal D+	138	253.00	-2.9465000	136.7652000
2014-01-19 08:27:27	Normal D+	138	247.00	-3.0250000	136.5547000



Movement Report

Unit name : PK-IWT

Period : 2014-01-19 00:00:00 to 2014-01-19 17:36:00

Report Time	Status	Speed	Direction	Latitude	Longitude
2014-01-19 08:32:57	Normal D+	138	253.00	-3.1041670	136.3385000
2014-01-19 08:38:07	Normal D+	138	247.00	-3.1795000	136.1272000
2014-01-19 08:43:07	Normal D+	138	251.00	-3.2711670	135.9173000
2014-01-19 08:53:07	Normal D+	138	227.00	-3.4288330	135.4858000
2014-01-19 08:57:57	Normal D+	138	227.00	-3.5750000	135.3028000
2014-01-19 09:03:57	Normal D+	138	236.00	-3.7295000	135.1207000
2014-01-19 09:18:57	Normal D+	138	227.00	-4.1630000	134.5443000
2014-01-19 09:23:27	Normal D+	138	231.00	-4.3150000	134.3627000
2014-01-19 09:33:37	Normal D+	138	232.00	-4.6135000	134.0012000
2014-01-19 09:38:27	Normal D+	138	231.00	-4.7658330	133.8178000
2014-01-19 09:42:17	Normal D+	138	226.00	-4.9185000	133.6407000
2014-01-19 09:47:37	Normal D+	98	238.00	-5.0148330	133.5228000
2014-01-19 09:52:37	Normal D+	93	234.00	-5.0898330	133.4132000
2014-01-19 09:57:27	Normal D+	86	237.00	-5.1603330	133.3137000
2014-01-19 10:02:37	Normal D+	84	242.00	-5.2170000	133.2108000
2014-01-19 10:07:47	Normal D+	92	252.00	-5.2666670	133.1020000
2014-01-19 10:12:17	Normal D+	130	214.00	-5.3591670	132.9882000
2014-01-19 10:17:17	Normal D+	117	218.00	-5.4920000	132.8802000

KOMITE NASIONAL KESELAMATAN TRANSPORTASI REPUBLIK INDONESIA

Jl. Medan Merdeka Timur No.5 Jakarta 10110 INDONESIA

Phone : (021) 351 7606 / 384 7601 Fax : (021) 351 7606 Call Center : 0812 12 655 155

website 1 : <http://knkt.dephub.go.id/webknkt/> website 2 : <http://knkt.dephub.go.id/knkt/>

email : knkt@dephub.go.id