



**KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA**

FINAL

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Aircraft Serious Incident Investigation Report

Indonesian Civil Aviation Institute

PK-AEE; Piper Warrior III

Tunggul Wulung Airport, Cilacap Central Java

Republic of Indonesia

08 March 2014



2016

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

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

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ABBREVIATIONS AND DEFINITIONS

CASR	: Civil Aviation Safety Regulation
DGCA	: Directorate General of Civil Aviation
ft	: Feet
ITB	: <i>Institut Teknologi Bandung</i> / Institute Technology of Bandung
KNKT	: <i>Komite Nasional Keselamatan Transportasi</i> / National Transportation Safety Committee
kts	: Knots
POH	: Pilot Operating Handbook
STPI	: <i>Sekolah Tinggi Penerbangan Indonesia</i> / Indonesia Civil Aviation Institute
USA	: United States of America
UTC	: Universal Time Coordinate

INTRODUCTION

SYNOPSIS

On 8 March 2014 a Piper Warrior III aircraft registered PK-AEE was operated by Sekolah Tinggi Penerbangan Indonesia (STPI - Indonesia Civil Aviation Institute), was performing a mutual flight exercises over Nangun area at Cilacap. On board the aircraft were two student pilots and the pilot flying occupied the left control seat.

The aircraft departed Tunggul Wulung Airport at 0151 UTC, and after airborne at 1,500 ft the aircraft turned left proceed to Nangun area and maintain 2,500 ft. The weather at about 5 minutes after the occurrence was meeting the criteria for visual flight with the wind direction from 300° at 6 kts.

After performing some exercises, the aircraft returned to Tunggul Wulung airport and the non-flying pilot requested to Tunggul Wulung controller to join the right downwind of runway 13 at 1,000 ft and intended to join right base. At short final, the pilot performed the approach with slightly above the glide due to an obstacle surround the area. According to the pilot report, the pilot flew the aircraft at approach speed of 70 Kts when over the threshold, leveling the wings and close throttle. After the main wheels touched the runway and while the pilot expecting the nose wheel touching the runway, the propeller hit the ground and the nose landing gear collapsed.

The aircraft stop at 181 meters from the point of the main wheel touched the runway and approximate 35 meters before the aircraft stop there were several marks of propeller and the nose landing gear contacted the runway.

The analysis discussed the landing technique and the broken of the nose landing gear and concluded that:

- The aircraft landed in the normal landing technic and procedure.
- There was fatigue crack propagated from internal, but the crack could not be detected visually.
- This initial fatigue crack might be suspected from manufacturing pipe failure, and the failure will rarely occur.

As a result of this investigation, the Komite Nasional Keselamatan Transportasi issued safety recommendations to address issues identified in this report and addressed to:

Sekolah Tinggi Penerbangan Indonesia (STPI) / Indonesia Civil Aviation Institute:

- a. to ensure that all the nose gear sliding member of the similar aircraft to be inspected to ensure that there was no fatigue crack.
- b. to review the current inspection method to enable detecting specific crack that could not be detected visually.

Directorate General of Civil Aviation (DGCA):

Consider to the recommendations address to STPI, the Komite Nasional Keselamatan Transportasi recommends the DGCA has to ensure that the aforesaid recommendations are well implement.

1 FACTUAL INFORMATION ---

1.1 History of the Flight

On 8 March 2014, a Piper Warrior III aircraft registered PK-AEE was being operated by Sekolah Tinggi Penerbangan Indonesia (STPI - Indonesia Civil Aviation Institute). The flight departed Tunggul Wulung Airport and performed a mutual flight exercises over Nangun area at Cilacap.

On board the aircraft were two student pilots and the pilot flying occupied the left control seat.

The aircraft departed at 0151 UTC, and after airborne at 1,500 ft the aircraft turned to the left proceeding to Nangun area and maintain 2,500 ft. After performing some exercises, the aircraft returned to Tunggul Wulung Airport and the non-flying pilot requested to the Tunggul Wulung controller (controller) to join the right downwind of runway 13 at 1,000 ft and then to join right base.

The aircraft departed at 0151 UTC, and after airborne at 1,500 ft the aircraft turned to the left proceeding to Nangun area and maintain 2,500 ft. After performing some exercises, the aircraft returned to Tunggul Wulung Airport and the non-flying pilot requested to the Tunggul Wulung controller (controller) to join the right downwind of runway 13 at 1,000 ft and then to join right base.



Figure 1: The aircraft condition after the occurrence

At short final, the pilot performed the approach with slightly above the glide to avoid obstacle surround the area. The controller issued the landing clearance and the pilot continued the approach for landing.

According to the pilot report, the aircraft at approach speed of 70 kts when over the threshold, the pilot then leveling the wings and closed the throttle. After the main wheels touched the runway and while the pilot expecting the nose wheel touching the runway, the propeller hit the ground and the nose landing gear collapsed.

The aircraft stopped at about half of the runway and the pilot shutdown the engine then evacuated the aircraft through the doors. No one injured in this occurrence.

The weather at about 5 minute after the occurrence was good with the wind direction from 300° at 6 kts.

1.2 Personnel Information

The pilot flying was 19 years old and had total flight hours of 147 hours 14 minutes, consisted of dual flight of 46 flight hours and solo flight of approximately 101 hours.

1.3 Aircraft Information

General

PK-AEE was a Piper Warrior III aircraft with serial number 2842369 manufactured by Piper Aircraft Inc. USA and has recorded total flight time since new was 305 hour 54 minutes

The engine installed on the aircraft was manufactured by Lycoming type/model Lycoming O-320-D3G with the serial number L-20478-39E. The engine has recorded the total time of 305 hour 54 minutes since new. The installed propeller was manufactured by Sensenich Propeller.

The aircraft was not equipped with flight recorder.

Operational approach and landing speeds

Refer to Warrior III Pilot Operating Handbook (POH) Section 4. Normal Procedure for Approach and landing describes that Final Approach Speed for Flap 40° was 63 kts.

Maintenance related

On the 100 hours inspection performed STPI maintenance on 19 January 2014, showed that there was no finding related to the aircraft systems. This inspection performed at 299.44 flight hours. The next 100 inspection scheduled at 399.44 hours.

1.4 Wreckage and Impact Information

Distance from the main wheel touchdown until the aircraft stop was 181 meters and approximate 35 meters before the aircraft stop there were several marks on the runway and illustrated on the figure below;

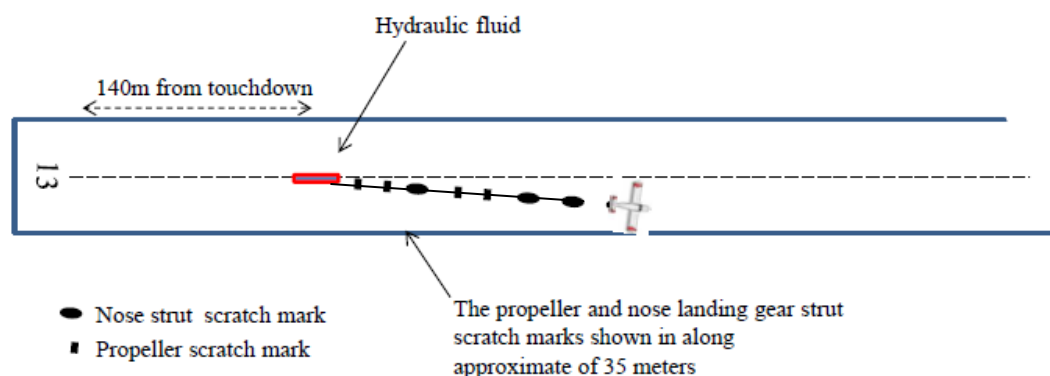


Figure 2: Propeller and nose strut scratched and impact illustration

Observation on the runway and aircraft after the occurrence showed that the nose wheel was collapsed backward, propeller blade tips bend, hydraulic residue on both side nose tire fork and also the scratch line of the nose strut on the runway.



Figure 3: The scratch mark and nose strut collapsed

1.5 Airport Information

The Tunggul Wulung Airport is operated by Directorate General of Civil Aviation which is located at Cilacap Central of Java. The airport serves for the passengers and flight training.

The runway data is shown as follow:

- Runway length /width 1400/30m
- Direction 13-31
- Elevation 80 ft above sea level.
- Runway surface Asphalt

1.6 Tests and Research

Concerning to the broken of the nose wheel strut, the investigation sent the nose landing gear sliding member to the Institute Technology of Bandung (ITB) metallurgy laboratory at Bandung for further failure examination.

The examination result concluded that:

1. The failure of the nose landing gear was caused by the fatigue crack.
2. The crack initiation was from the inside and begun from two locations, it indicated on the figure 4 and 5.
3. Such fatigue crack propagated out, it went up and down to approximately 2 cm, and continuing by static failure mode. These indicated by an area which orientated in about 45°, it included in a circular failure.
4. Due to such fatigue crack propagated from internal, as such the crack could not be detected visually, it could be worsen if the area covered by the dirt or oil. As a suggestion to identify this particular crack the operator should perform the Eddy Current Technique.
5. This internal fatigue crack initiated from the internal, as such it can be concluded that the cause was not from the operation and maintenance side, and as well as this fatigue crack might be suspected from manufacturing pipe failure. Base on the initial crack location which was likely a point (not a line), so this manufacturing failure will not occur often.



Figure 4: Nose sliding member

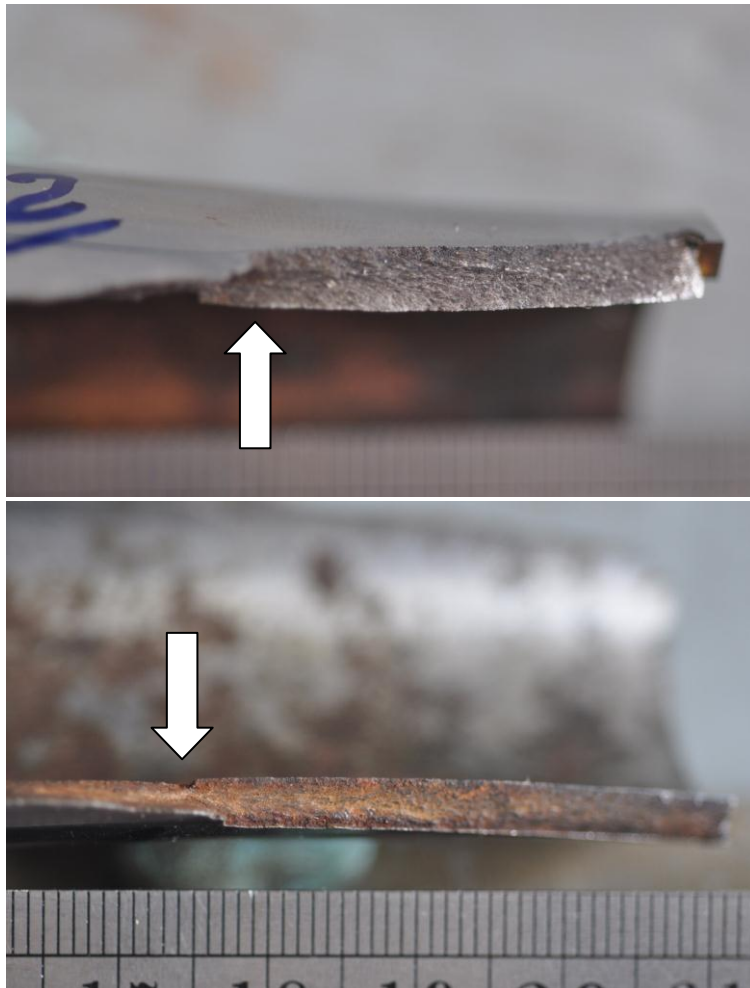


Figure 5: The arrow indicated the location(s) of fatigue crack initiation

1.7 Organizational and Management Information

1.7.1 Indonesian Civil Aviation Institute

Aircraft Owner : Indonesian Civil Aviation Institute
(*Sekolah Tinggi Penerbangan Indonesia/STPI*)

Aircraft Operator : Indonesian Civil Aviation Institute
(*Sekolah Tinggi Penerbangan Indonesia/STPI*)

Address : Budiarto Airport, Curug Tangerang
Republic of Indonesia

The operator was an approved Pilot School organization under CASR Part 141 and held Pilot School Certificate Number 141/001.

The operator operates 18 of Piper Warrior III since 2013 and the maintenance program was conducted by the STPI maintenance located at Budiarto Airport of Curug, Tangerang.

The air traffic at Budiarto Airport had become condensed and STPI management decided to conduct some of the flight training at Tunggul Wulung Airport in Cilacap.

1.8 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 investigation examined the nose strut scratch mark on the runway, the fracture parts of the nose strut and residue of the hydraulic on the nose tire fork which shown after the occurrence. The analysis will therefore interest to discuss the relevant landing technique and the broken of nose landing gear.

2.1 The landing technique

The investigation could not determine the actual of flight path and the approach speed, however according to the pilot report, the aircraft approach at speed of 70 kts and was slightly above the normal glide on short final. The Pilot Operating Handbook (POH) stated that the normal approach speed with flaps 40° was 63 kts.

Refer to the weather report, during the approach the aircraft was in a slight tailwind (about 5 kts) and the aircraft landed with the main wheel first within the normal touchdown zone.

Despite the high angle and speed during the approach, the aircraft was landed in the normal landing technique and procedure.

2.2 The broken of nose landing gear

Examination on the maintenance record showed that the 100 hours inspection performed at 299.44 flight hours and the result was no finding. The accident occurred when the aircraft at 305.54 flight hours, of just about 6 hours after the inspection. It can be concluded that there was no issue from maintenance aspects.

The examination at metallurgy laboratory concludes that the failure was initiated from a fatigue crack. The fatigue crack initiated from two locations at the inside part and propagated up and down to approximately 2 cm. After the development of the fatigue and continued by static failure mode then the landing gear collapsed. These indicated by an area which orientated in about 45°, it included in a circular failure. Due to such fatigue crack propagated from internal, it could not be detected visually and could be worsen if the area covered by the dirt or oil.

Refer to the condition that the aircraft accumulated 305.54 flight hours which relatively new and the initiation of the fatigue crack which was from the inside part of the landing gear. It is most likely that the initial fatigue crack suspected from manufacturing pipe failure. Base on the initial crack location which was like a point (not a line), so this manufacturing failure will rarely occur.

3 CONCLUSIONS

3.1 Findings

According to factual information gathered during the investigation, the KNKT founded any findings were listed as follows:

- a. The aircraft was airworthy prior to the occurrence and was operated within the weight and balance envelope.
- b. On board two pilots where both were student pilots and had valid licenses and medical certificates.
- c. The pilot flying has accumulated flight hours of 147 hours 14 minutes.
- d. There was no report or record that the aircraft had system abnormality during the flight from take-off until the time of the occurrence.
- e. The weather at about 5 minutes after the occurrence was good with the wind was from 300° at 6 kts.
- f. The POH describes the final approach speed for flap 40° was 63 kts while the aircraft speed was 70 kts while crossing the threshold.
- g. The aircraft landed in the normal landing technique and procedure.
- h. The 100 hours inspection performed on 19 January 2014, showed that there was no finding related to the aircraft systems and the next 100 inspection scheduled at 399.44 hours.
- i. Observation on the runway found some marks of hydraulic fluid, propeller and nose wheel scratch marks.
- j. Distance from the main wheel touchdown until the aircraft stop was 181 meters and approximate 35 meters before the aircraft stop there were several marks shown on the runway.
- k. The hydraulic residue shown on both side nose tire fork.
- l. The crack initiation was from the inside and begun from two locations.
- m. The fatigue crack propagated from internal, therefore the crack could not be detected visually.

Base on the initial crack location which was likely a point (not a line), this fatigue crack might be suspected from manufacturing pipe failure, this manufacturing failure is rarely occur.

3.2 Contributing Factors¹

The failure of the nose landing gear was suspected most likely from manufacturing pipe failure that could not be detected visually by the current inspection system.

¹ “Contributing Factors” is defined as events that might cause the occurrence. In the case that the event did not occur then the accident might not happen or result in a less severe occurrence.

4 SAFETY ACTION

At the time of issuing this final investigation report, the Komite Nasional Keselamatan Transportasi had not been informed of any safety actions resulting from this occurrence.

5 SAFETY RECOMMENDATIONS

As a result of this investigation, the Komite Nasional Keselamatan Transportasi issued safety recommendations to address issues identified in this report.

The Directorate General of Civil Aviation is responsible for the implementation of these recommendations addressed to the relevant parties.

5.1 Sekolah Tinggi Penerbangan Indonesia (STPI)

- **04.O-2016-5.1**

To ensure that all the nose gear sliding member of the similar aircraft to be inspected to ensure that there was no fatigue crack.

- **04.O-2016-6.1**

To review the current inspection method to enable detecting specific crack that could not be detected visually.

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