



**KOMITE NASIONAL KESELAMATAN TRANSPORTASI  
REPUBLIC OF INDONESIA**

**FINAL**  
**KNKT.11.12.29.04**

**Aircraft Accident Investigation Report**

**Wings Flying School**

**Cessna 172P; PK-WTF**

**Karang Ampel, Cirebon, West Java**

**Republic of Indonesia**

**19 December 2011**



**2017**

This Final report was produced by the Komite Nasional Keselamatan Transportasi (KNKT), Transportation Building, 3<sup>rd</sup> Floor, 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

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ATPL	:	Airline Transport Pilot License
C of A	:	Certificate of Airworthiness
C of R	:	Certificate of Registration
DGCA	:	Directorate General of Civil Aviation
KNKT	:	<i>Komite Nasional Keselamatan Transportasi</i> (National Transportation Safety Committee)
LT	:	Local Time
Nm	:	Nautical Mile
POH	:	Pilot Operating Handbook
PSC	:	Pilot School Certificate
RFSS	:	Rescue and Fire Fighting Services
SPL	:	Student Pilot License
UTC	:	Universal Time Coordinated
VFR	:	Visual Flight Rules

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## SYNOPSIS

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On 19 December 2011, a Cessna 172P aircraft registered as PK-WTF was being operated by Wings Flying School on a flight training from Cakrabhuwana Airport (WICD), Cirebon to Karang Ampel training area with Visual Flight Rules. On board the aircraft consisted of one flight instructor and one student.

At 1233 LT (0533 UTC), the aircraft departed from Cirebon then flew via Suranengala to Karang Ampel area.

At 0545 UTC, the aircraft reached Karang Ampel area and conducted training exercises of climbing turn, steep turn, stall recovery, slow flight descend and engine failure exercise.

During the engine failure exercise, the student pilot performed clearing engine procedure several times. At altitude 700 feet, the student pilot made a go around and climbed to intended altitude of 1,500 feet for returning to Cirebon. During climbing, the pilots saw that the engine power indicated 1,800 rpm, and the pilot felt that the engine was hesitating. The flight instructor then took over the aircraft control performed forced landing to coastline area at approximately 3 Nm north of checkpoint Suranenggala.

The aircraft touched down on the muddy surface and flipped. The flight instructor and the student evacuated the aircraft and no one injured in this occurrence.

Investigation conducted examination to the engine to determine the cause of the engine failure. The engine examination did not find any abnormality. The examination of induction system found a piece of rubber at the inside of the throttle chamber of the carburetor with dimension of 12 cm length and 0.8 cm width that believed originated from the flapper valve of the induction box.

The detachment of the rubber presumably due to repeated bending action against the box wall at "CLOSE" position caused fatigue to the rubber.

The presence of the rubber in the throttle chamber interrupted the supply of fuel air mixture to the piston chamber and resulted in the improper combustion. The improper combustion was identified by the pilot as the engine hesitation.

Prior to this publishing of this report, the operator has stopped the training operation.

Following this accident, the Komite Nasional Keselamatan Transportasi (KNKT) had been informed safety actions taken by the Wings Flying School and the KNKT acknowledges the safety actions. However, there still remain safety issues that need to be considered and therefore, the KNKT issues safety recommendations addressed to the Directorate General of Civil Aviation.

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# 1 FACTUAL INFORMATION

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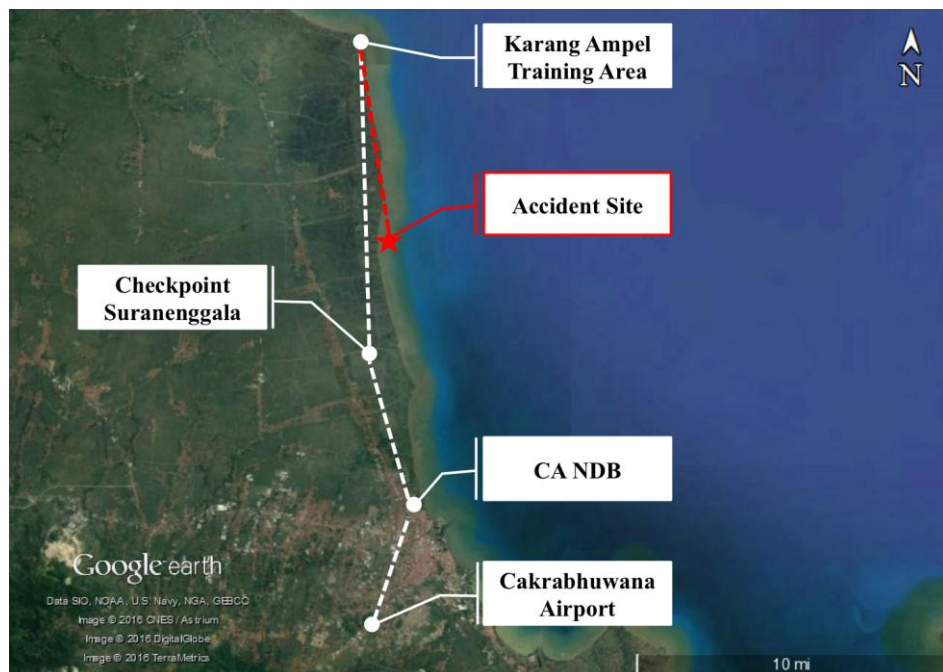
## 1.1 History of the Flight

On 19 December 2011, a Cessna 172P aircraft registered as PK-WTF was being operated by Wings Flying School on dual flight training from Cakrabhuwana Airport (WICD)<sup>1</sup>, Cirebon to Karang Ampel training area<sup>2</sup> and conducted under Visual Flight Rules (VFR). On board the aircraft were one flight instructor and one student pilot.

At 1233 LT (0533 UTC<sup>3</sup>), the aircraft departed from Cirebon with intended altitude of 2,000 feet. The student pilot acted as pilot flying and the flight instructor acted as pilot monitoring.

At 0536 UTC, the student pilot reported to Cirebon Tower controller (controller) that the aircraft was over CA NDB<sup>4</sup> and passed altitude of 1,800 feet, and then 3 minutes later reported again that the aircraft was over Suranenggala that was a reporting point to Karang Ampel and was maintaining 2,000 feet.

At 0545 UTC, the student pilot reported the aircraft had reached Karang Ampel area, and requested to conduct training at altitude 3,000 feet and below. The controller acknowledged and approved the pilot request. The pilot performed exercises of climbing turn, steep turn, stall recovery, slow flight descend and engine failure exercise.



**Figure 1: The illustration of flight path**

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- 1 Cakrabhuwana Airport (WICD), Cirebon will be named as Cirebon for the purpose of this report.
  - 2 Karang Ampel training area is located north of Cakrabhuwana Airport, at approximate of 15 Nm on bearing 358°.
  - 3 The 24-hours clock in Universal Time Coordinated (UTC) is used in this report to describe the local time as specific events occurred. Local time is UTC+7 hours.
  - 4 CA NDB is a Non-Directional Beacon, a radio transmitter located at approximate of 4 Nm from Cakrabhuwana Airport on bearing 019° which used as an aviation navigational.

During the engine failure exercise, the student pilot performed clearing engine procedure several times. At altitude 700 feet, the student pilot made a go around and climbed to intended altitude of 1,500 feet for returning to Cirebon. During climbing, the pilots saw that the engine power indicated 1,800 rpm, and the pilot felt that the engine was hesitating. The flight instructor then took over the aircraft control and identifying the source of engine problem while trying to maintain the altitude.

At 0616 UTC, the aircraft went down to about 500 feet and the student pilot declared emergency situation due to engine failure and informed the intention to make force landing. The controller acknowledged and informed the Cirebon Rescue and Fire Fighting Services (RFFS) and search and rescue agency.

At 0619 UTC, the flight instructor performed forced landing to coastline area at approximately 3 Nm north of checkpoint Suranenggala. The aircraft touched down on the muddy surface and flipped. The flight instructor and the student evacuated the aircraft and no one injured in this occurrence.

## 1.2 Damage to Aircraft

The aircraft was upside down and substantially damaged. The damages found were on the nose and tail section wrinkle, the left engine cowling loose and broken, and the right-wing strut assembly curved.



**Figure 2: The aircraft condition after impact**





**Figure 3: Broken on the engine cowling**

### **1.3 Pilot Information**

The flight instructor pilot was 33 years old, Indonesian male pilot that held a valid Airline Transport Pilot License (ATPL) and valid first class medical certificate. The flight instructor had experience with total flying hours of 5,050 hours 40 minutes, including 810 hours 4 minutes on Cessna 172 type.

The student pilot was 19 years old of Indonesian male pilot that held a valid Student Pilot License (SPL) and valid second-class medical certificate. The student pilot had experience with total flying hours of 50 hours 1 minute.

### **1.4 Aircraft Information**

The Cessna 172P was manufactured by Cessna Aircraft Company in United States of America with serial number of 17276583. The aircraft was registered PK-WTF and had valid Certificate of Airworthiness (C of A) and Certificate of Registration (C of R). The total hour of the aircraft was 4,891 hours and the total cycle was 4,375 cycles.

The engine installed in the aircraft was a piston engine manufactured by Lycoming in United States of America with part number of 0-320-D2J and serial number of L10683-39A. The total hour of the engine since new was 14,706 hours 6 minutes.

The aircraft was not fitted with a flight data recorder or cockpit voice recorder. Neither recorder was required by current Indonesian aviation regulations.

On 28 November 2011, the 200-hour inspection was performed when the aircraft flight hours 4,810.17 hours. The inspection task covered the inspection of the induction system, including the air box, valve, doors and control, air filter, alternate air system and the carburetor system. The inspection form did not indicate any abnormality to the induction system and carburetor.

There were no technical and/or aircraft system abnormalities reported or recorded in the maintenance logbook prior to the occurrence.

#### 1.4.1 Cessna 172P Service Manual

##### 11-44. INDUCTION AIR SYSTEM

11-45. DESCRIPTION. Ram air to the engine enters the induction airbox through the induction filter located in the forward part of the lower engine cowling. From the induction airbox the air is directed to the inlet of the carburetor, mounted on the lower side of the engine oil sump through the carburetor to the center zone induction system, which is an integral part of the oil sump. From the center zone system, the fuel-air mixture is distributed to each cylinder by separate intake pipes. The intake pipes are attached to the center zone risers with hoses and clamps and to the cylinder with a two-bolt flange, which is sealed with a gasket. The induction airbox contains a valve, operated by the carburetor heat control in the cabin, which permits air from an exhaust heated source to be selected in the event carburetor icing or filter icing should be encountered.

Typical schematic induction airbox or carburetor heater is as follow:

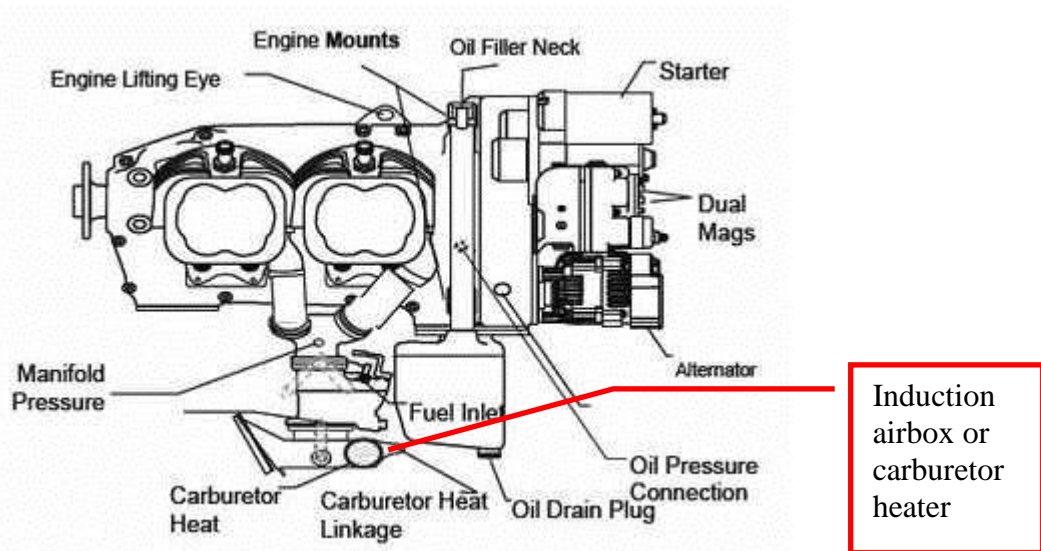


Figure 4: Typical schematic induction airbox or carburettor heater location

The inspection chart for the induction airbox is as follow:

### MODEL 172 SERIES SERVICE MANUAL

2-48	INSPECTION TIME LIMITS. (MODEL 172 AIRPLANES.)	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS	
					HOURS	YEARS
J	5 Firewall Structure - Inspect for wrinkles, damage, cracks, sheared rivets, etc. Check cowl shock mounts for condition and security.			•		
J	6 Engine Shock Mounts, Engine Mount Structure, and Ground Straps - Check condition, security, and alignment.			•		
J	7 Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	•				
J	8 Induction Airbox, Valves, Doors, and Controls - Remove air filter and inspect hinges, doors, seals, and attaching parts for wear and security. Check operation. Clean and inspect.		•			
J	9 Induction Air Filter - Remove and clean. Inspect for damage, and service per Paragraph 2-22 and 2-22A.		•		F	
J	10 Alternate Induction Air System - Check for obstructions, operation, and security.	•				
J	11 Alternator, Mounting Bracket and Electrical Connections - Check condition and security. Check alternator belts for condition and proper adjustment. Check belt tension per Section 16, Paragraph 16-38.	•				
J	12 Alternator - Check brushes, leads, commutator or slip ring for wear.					G
J	13 Starter, Starter Solenoid, and Electrical Connections - Check for condition of starter brushes, brush leads, and commutator.		•			H
J	14 Oil Cooler - Check for obstructions, leaks, and security of attachment.	•				
J	15 Exhaust System - Inspect for cracks and security. Special check in area of heat exchanger. Refer to Section 11, Paragraph 11-73 for inspection procedures.	•				
J	16 Auxiliary (Electric) Fuel Pump (172Q) - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).		•			
J	17 Engine-Driven Fuel Pump - Check for evidence of leakage, security of attachment, and general condition.		•			
J	18 Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.		•		I	
J	19 Magnetos - Check impulse coupling and stop pins for condition. replace as required.				J	
J	20 Magnetos - Inspection, lubrication, and overhaul procedures.				K	
J	21 Ignition Harness and Insulators - Check for proper routing, deterioration, and condition of terminals.		•			
J	22 Spark Plugs - Remove, clean, analyze, test, gap, and rotate top plugs-to-bottom and bottom plugs-to-top.		•			
J	23 Cylinder Compression - Perform differential compression test.			•		
J	24 Carburetor - Drain and flush carburetor bowl, clean inlet strainer, and drain plug. Check general condition and security.		•			
J	25 Engine Primer - Check for leakage, operation, and security.		•			

Revision 3 2-43

In the item number 8 on the inspection chart related to the inspection of induction airbox system there is no specific repair requirement for the unit. Therefore, it is not required special shop for repair.

## 1.5 Wreckage and Impact Information

The aircraft found on the coastline at approximately 12 Nm from Cirebon on heading of 320° and on upside down condition.

The wreckage was found on the following conditions:

- No damage or scratch found on both propellers.
- The left part of the engine cowling damaged.
- The tail section bent to the left.

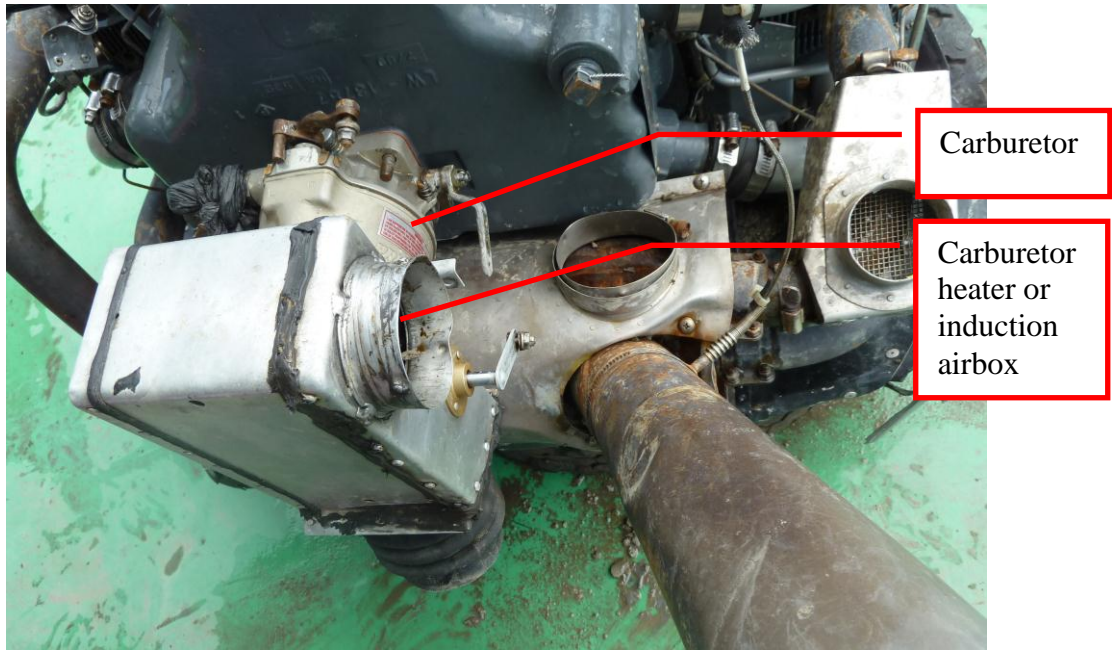


**Figure 5: The propeller condition**

## 1.6 Tests and Research

Investigation conducted examination to the engine to determine the cause of the engine failure. The engine examination did not find any abnormality. The investigation continued the inspection to the induction system and carburetor.

The following figure showed the condition of the induction airbox attached to the engine.

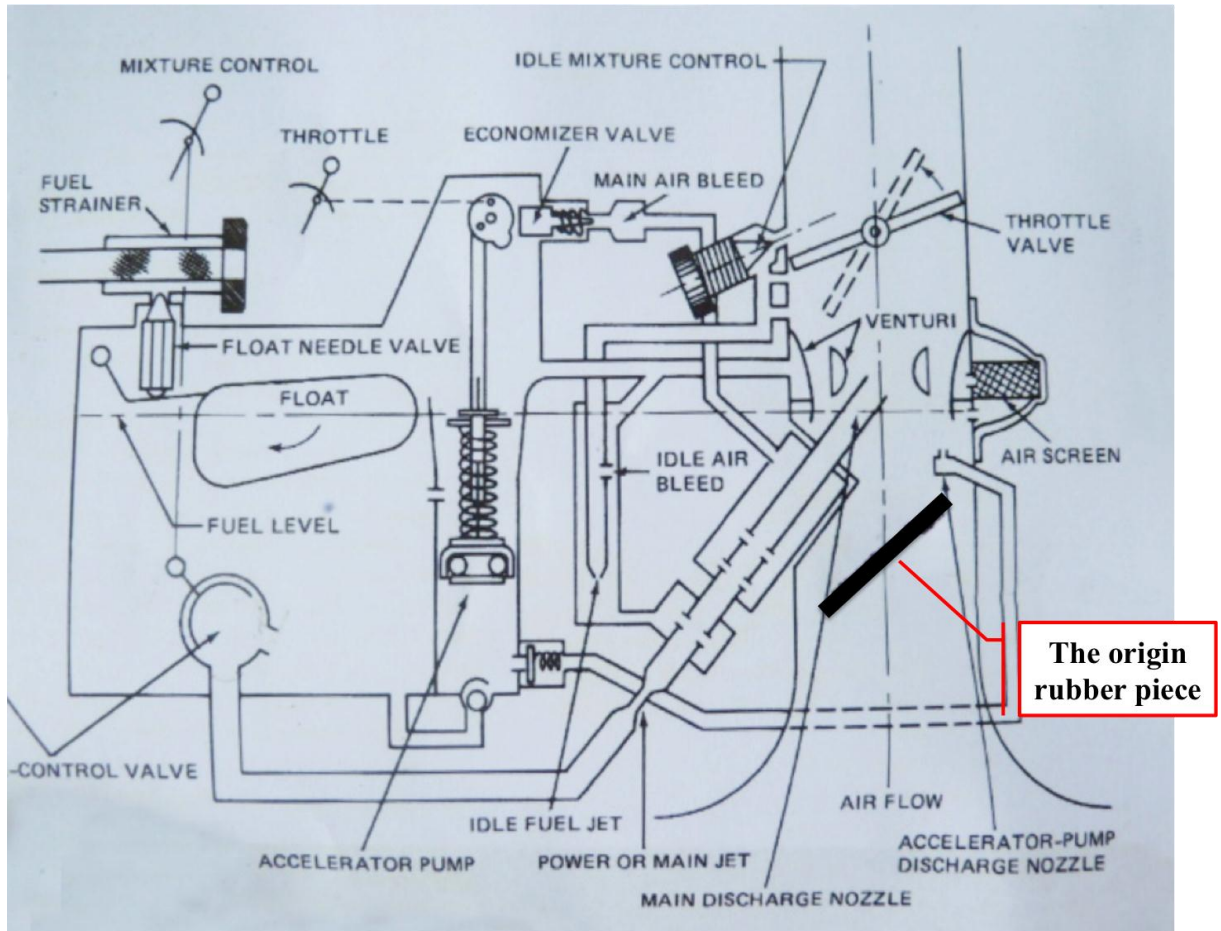


**Figure 6: Actual carburetor and carburetor heater installation**

The inspection revealed there was a piece of rubber in the carburetor heater or induction airbox with dimension of 12 cm length and 0.8 cm width (figure 7) in the throttle chamber of the carburetor.

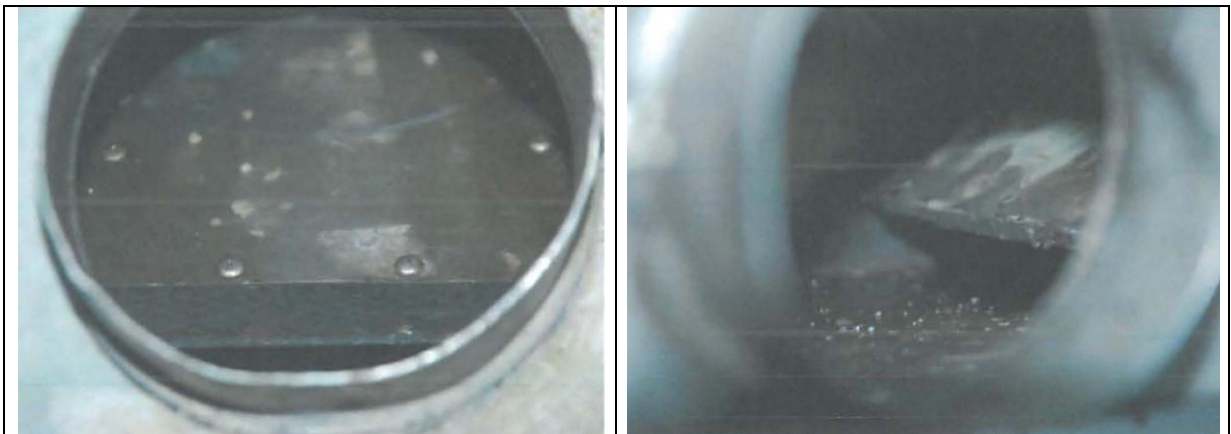


**Figure 7: The rubber in the carburetor**



**Figure 8: The rubber location in the carburetor**

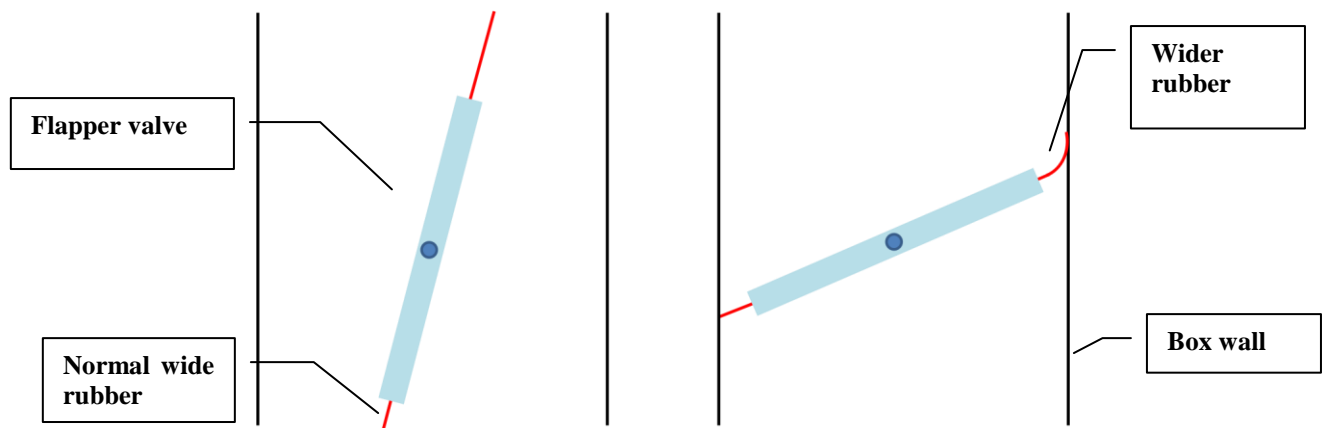
The investigation found that the origin of the rubber was the part of flapper valve of the carburetor heater or induction airbox. The induction system equipped with a flapper valve that was fitted with rubber on both sides. The examination of the flapper valve found that one of the rubbers was still intact and the other had detached.



**Figure 9: Flapper valve side with the rubber still intact (left picture) and the side with detached rubber (right)**

The flapper valve of the induction air box regulates the hot air to the carburetor with controllable position. At close position the flapper valve will close the hot air supply to the carburetor and when on open position the flapper valve will tilt to regulate the hot air to the carburetor.

The investigation found that the detached rubber was wider than the attached rubber. Asymmetric size of the rubber on the flapper valve would have no effect on full open position. On close position, the correct size of the rubber would touch the box wall, while the wider side would hit the box wall and bent the rubber.



**Figure 10: Illustration of the flapper valve and the rubber position on open position (left picture) and close position (right picture)**

The detachment of the rubber of the flapper valve was presumably due to repeated bending action against the box wall at the position close and caused fatigue of the rubber.

## **1.7 Organizational and Management Information**

### **1.7.1 Aircraft Operator**

Aircraft Owner and Operator : Wings Flying School  
Address : Lion Air Tower  
Jalan Gajah Mada No 7, Jakarta Pusat  
Republic of Indonesia  
Certificate Number : PSC 141/008  
Date of Issuance : 27 May 2011

Prior to this publishing of this report, the operator has stopped the training operation.

### **1.7.2 Cessna 172P Pilot Operating Handbook (POH)**

The Cessna 172P Pilot Operating Handbook (POH) described the procedure related to the operation of carburetor heater. The carburetor heater is set to COLD at the flight phase of Starting Engine, Normal Take Off, Short Field Take Off, Balked Landing and After Landing. Setting the carburetor heater to COLD means the flapper valve close to prevent hot air supply to the carburetor. The carburetor heater was set to ON or as required depend on the flight phases as follows:

#### ***DESCENT***

- 1. Fuel Selector Valve -- BOTH.*
- 2. Mixture -- ADJUST for smooth operation (full rich for idle power).*
- 3. Power -- AS DESIRED.*
- 4. Carburetor Heat -- FULL HEAT AS REQUIRED (to prevent carburetor icing).*

#### ***BEFORE LANDING***

- 1. Seats, Seat Belts, Shoulder Harnesses -- SECURE.*
- 2. Fuel Selector Valve -- BOTH.*
- 3. Mixture -- RICH.*
- 4. Carburetor Heat -- ON (apply full heat before reducing power).*
- 5. Autopilot (if installed) -- OFF.*
- 6. Air Conditioner (if installed) -- OFF.*

### **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.



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## 2 ANALYSIS

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During the training, the student pilot performed engine failure exercises including the procedure of clearing engine. After completed the exercise, the student pilot performed go around and climbed to intended altitude of 1,500 feet. Prior to reached the intended altitude a real engine failure occurred and the aircraft went down. Force landing performed and the aircraft landed on the coastline on the muddy surface and the aircraft flipped after touched down.

The wreckage examination found no damage the propeller, which indicated that the propellers were not rotating during impact. This condition was consistent, with the information that the engine was producing low power when impacted the ground.

The engine examination did not find any abnormality. The detail examination of induction system found a piece of rubber at the inside of the throttle chamber of the carburetor. The rubber found in the carburetor had dimension of 12 cm length and 0.8 cm width. The investigation believed that the rubber was originated from the flapper valve of the induction airbox. The detachment of the rubber presumably due to repeated bending action against the box wall at “CLOSE” position caused fatigue to the rubber.

The detached rubber of the induction airbox while the engine was running would be sucked into the carburetor air intake. The presence of the rubber in the throttle chamber interrupted the supply of fuel air mixture to the piston chamber and resulted in the improper combustion. The improper combustion was identified by the pilot as the engine was hesitating.

Refer to Cessna 172P Service Manual, the condition of the rubber flapper might have been identified during the 200-hour inspection that was performed 21 days prior to the accident. The last 200-hour inspection that also covers the 100-hour inspection items which was including the inspection to the induction system. The inspection did not find any abnormality on the induction system and carburetor. The engine failure that was caused by the detached rubber of the flapper valve was occurred approximately 81 hours after the inspection of the induction system.

The investigation found that the detached rubber was wider than the attached rubber. Asymmetric size of the rubber on the flapper valve would have no effect on full open position.

The finding of the detached rubber was wider that the attached rubber indicated that the installation of the rubber did not consider the consequences of the asymmetry rubber. The service manual related to the inspection of induction box did not describe the requirement special shop for repair the induction airbox unit. The investigation could not reveal the last installation record of the rubber however it was possible that the installation was performed by the aircraft operator maintenance division.

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## 3 CONCLUSIONS

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### 3.1 Findings<sup>5</sup>

- The flight instructor and the student pilot held valid licenses and medical certificates.
- The aircraft had a valid Certificate of Airworthiness (C of A) and Certificate of Registration (C of R).
- The aircraft was airworthy when dispatched for the flight.
- The training exercise was performed including engine failure exercise
- During climbing, the pilots monitored that the engine power indicated 1,800 rpm, and the pilot felt that the engine hesitating.
- The forced landing was performed at coastline area on the muddy surface and the aircraft flipped after touched down.
- Propeller blade condition was consistent with the engine producing low power at impact.
- The engine examination did not find any abnormality.
- The examination of induction system found a piece of rubber at the inside of the throttle chamber of the carburetor with dimension of 12 cm length and 0.8 cm width that believed originated from the flapper valve of the induction box.
- The detachment of the rubber presumably due to repeated bending action against the box wall at “CLOSE” position caused fatigue to the rubber.
- The presence of the rubber in the throttle chamber interrupted the supply of fuel air mixture to the piston chamber and resulted in the improper combustion. The improper combustion was identified by the pilot as the engine was hesitating.
- Refer to the Cessna 172P Service Manual, the inspection interval of the induction airbox or carburetor heater was 100-hour.
- The engine failure that was caused by the detached rubber flapper was occurred approximately 81 hours after the inspection of the induction system.

### 3.2 Contributing Factors<sup>6</sup>

- The improper rubber dimension of the flapper valve in the induction airbox led to fatigue during the operation which subsequently broken and detached.
- The detached rubber restricted the flow of the fuel air mixture to the engine resulted in the improper combustion and led to the engine hesitating.

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<sup>5</sup> 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.

<sup>6</sup> 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.

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## **4 SAFETY ACTION**

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On 22 December 2011, the Komite Nasional Keselamatan Transportasi (KNKT) had been informed of safety actions from the Wings Flying School as result of this accident as follows:

- Amended the Standard Operating Procedure of force landing exercise to be conducted only at overhead airport with minimum altitude of 3,000 feet and the throttle on idle position with the mixture control on full rich.
- Reviewed the fuel handling procedure including conducted a frequent fuel sampling check and water contamination inspection.
- Reviewed the implementation of the maintenance program including frequent calibration of maintenance tools and frequent cleaning of aircraft fuel tank.

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## **5 SAFETY RECOMMENDATIONS**

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The Komite Nasional Keselamatan Transportasi issued safety recommendations to address safety issues identified in this report to the Directorate General of Civil Aviation (DGCA) as follows:

- **04.R-2011-29.01**

The detachment of the rubber flapper was presumably due to repeated bending action against the box wall at the position of “CLOSE” caused fatigue of the rubber, therefore the KNKT recommends the DGCA to prevent detachment of the flapper valve rubber, the mechanism should be adjusted so that when the flapper is set to CLOSE position, the rubber edge is not bent against the wall.

- **04.R-2011-29.02**

The installed rubber dimension was improper which subsequently broken and detached. The installation of the rubber was not required special shop for repair, therefore the KNKT recommends the DGCA to oversight the quality assurance system of the maintenance facility to ensure the product meets the part specification.

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## 6 APPENDICES

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### 6.1 Wings Flying School Safety Action

Tanggal : 22 Desember 2011  
Nomor : 086 /WFS/XII/2011  
Perihal : **Safety Action terhadap Accident PK-WTF**  
Lampiran :-

Dengan hormat,

Bersama ini kami sampaikan Safety Action Wings Flying School (WFS) terhadap accident pesawat latih Cessna 172P PK-WTF yang mengalami accident pada tanggal 19 Desember 2011 pukul 06.20UTC di Pantai Bungko Kecamatan Kapetakan Kabupaten Cirebon Jawa Barat sebagai berikut:

1. Melakukan preventive grounding terhadap kegiatan flight training selama 6 hari terhitung sejak tanggal 19 Desember s/d 25 Desember 2011 dengan mengirimkan surat pemberitahuan preventive grounding tersebut ke Direktorat Kelaikan Udara dan Pengoperasian Pesawat Udara tertanggal 20 desember 2011.
2. Melakukan review terhadap "force landing exercise" di training area yang ada di dalam Standard Operating Procedures (SOP) WFS dan merevisinya menjadi sbb:
  - Force Landing exercise dilaksanakan di overhead airport (runway);
  - Minimum altitude 3.000 feet;
  - Throttle idle dengan posisi mixture control tetap full rich;

#### ***Wings Flying School***

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FORM WFS/SA/ Jan 20, 2007 / 0.0



3. Melakukan review terhadap "Fuel Handling Procedures" yang sudah ada, termasuk tetapi tidak terbatas kepada:
  - Pengecekan fuel sampling secara regular;
  - Inspeksi terhadap kontaminasi air di dalam fuel secara regular;
  - Prosedur penyimpanan fuel;
  - Prosedur refuelling;
  
4. Melakukan review terhadap implementasi "maintenance program", termasuk tetapi tidak terbatas kepada:
  - Kalibrasi terhadap "maintenance tools" secara regular;
  - Pembersihan fuel tank pesawat secara berkala;

Demikian kami sampaikan, atas perhatiannya kami ucapkan terima kasih.

## 6.2 AirNav Indonesia Branch Office Cirebon Comments

No	Reference Chapter, Page, Paragraph	Proposed Amendment	Reason For Proposed Change	Remarks
1.	Synopsis, page iv, paragraph 1	On 19 December 2011, a Cessna 172P aircraft registered as PK-WTF was being operated by Wings Flying School on a flight training from Cakrabhuwana Airport ( <del>WICB</del> ) ( <b>WICD</b> ), Cirebon to Karang Ampel training area with Visual Flight Rules. On board the aircraft consisted of one flight instructor and one student.	Correction of ICAO airport code or location indicator.	<b>Accepted</b>
2.	History of Flight, page 1, paragraph 1	On 19 December 2011, a Cessna 172P aircraft registered as PK-WTF was being operated by Wings Flying School on dual flight training from Cakrabhuwana Airport ( <del>WICB</del> ) ( <b>WICD</b> ), Cirebon to Karang Ampel training area and conducted under Visual Flight Rules (VFR). On board the aircraft were one flight instructor and one student pilot.	Correction of ICAO airport code or location indicator.	<b>Accepted</b>
3.	Footnote number 1, page 1	Cakrabhuwana Airport ( <del>WICB</del> ) ( <b>WICD</b> ), Cirebon will be named as Cirebon for the purpose of this report.	Correction of ICAO airport code or location indicator.	<b>Accepted</b>

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