

**COMMAND OF AERONAUTICS**  
**AERONAUTICAL ACCIDENT INVESTIGATION AND**  
**PREVENTION CENTER**



**FINAL REPORT**  
**A - 109/CENIPA/2013**

<b><u>OCCURRENCE:</u></b>	<b>ACCIDENT</b>
<b><u>AIRCRAFT:</u></b>	<b>PT-MMX</b>
<b><u>MODEL:</u></b>	<b>PA-34 200T</b>
<b><u>DATE:</u></b>	<b>07 JUNE 2013</b>



## NOTICE

*According to the Law n° 7565, dated 19 December 1986, the Aeronautical Accident Investigation and Prevention System – SIPAER – is responsible for the planning, guidance, coordination and execution of the activities of investigation and prevention of aeronautical accidents.*

*The elaboration of this Final Report was conducted taking into account the contributing factors and hypotheses raised. The report is, therefore, a technical document which reflects the result obtained by SIPAER regarding the circumstances that contributed or may have contributed to triggering this occurrence.*

*The document does not focus on quantifying the degree of contribution of the different factors, including the individual, psychosocial or organizational variables that conditioned the human performance and interacted to create a scenario favorable to the accident.*

*The exclusive objective of this work is to recommend the study and the adoption of provisions of preventative nature, and the decision as to whether they should be applied belongs to the President, Director, Chief or the one corresponding to the highest level in the hierarchy of the organization to which they are being forwarded.*

*This Report does not resort to any proof production procedure for the determination of civil or criminal liability, and is in accordance with item 3.1, Annex 13 to the 1944 Chicago Convention, which was incorporated in the Brazilian legal system by virtue of the Decree n° 21713, dated 27 August 1946.*

*Thus, it is worth highlighting the importance of protecting the persons who provide information regarding an aeronautical accident. The utilization of this report for punitive purposes maculates the principle of “non-self-incrimination” derived from the “right to remain silent” sheltered by the Federal Constitution.*

*Consequently, the use of this report for any purpose other than that of preventing future accidents, may induce to erroneous interpretations and conclusions.*

**N.B.:** This English version of the report has been written and published by the CENIPA with the intention of making it easier to be read by English speaking people. Taking into account the nuances of a foreign language, no matter how accurate this translation may be, readers are advised that the original Portuguese version is the work of reference.

## CONTENTS

SYNOPSIS .....	4
GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS.....	5
1 FACTUAL INFORMATION .....	6
1.1 History of the occurrence.....	6
1.2 Injuries to persons .....	6
1.3 Damage to the aircraft .....	6
1.4 Other damage.....	6
1.5 Personnel information.....	6
1.5.1 Information on the crew .....	6
1.6 Aircraft information.....	7
1.7 Meteorological information.....	7
1.8 Navigational aids .....	7
1.9 Communications.....	7
1.10 Aerodrome information .....	7
1.11 Flight recorders.....	7
1.12 Wreckage and impact information .....	8
1.13 Medical and pathological information.....	8
1.13.1 Medical aspects.....	8
1.13.2 Ergonomic information.....	8
1.13.3 Psychological aspects .....	8
1.14 Fire .....	8
1.15 Survival aspects .....	8
1.16 Tests and research.....	8
1.17 Organizational and management information .....	9
1.18 Operational information .....	9
1.19 Additional information .....	11
1.20 Utilization of other investigation techniques.....	11
2 ANALYSIS.....	11
3 CONCLUSIONS .....	13
3.1 Facts.....	13
3.2 Contributing factors.....	14
3.2.1 Human Factor.....	14
3.2.2 Operational Factor.....	14
3.2.3 Material Factor.....	14
4 SAFETY RECOMMENDATION.....	14
5 CORRECTIVE/PREVENTATIVE ACTION ALREADY TAKEN.....	15
6 DISSEMINATION .....	15
7 APPENDICES .....	15

## **SYNOPSIS**

This is the Final Report of the accident involving the PA-34 200T aircraft, registration PT-MMX, on 7 June 2013. The accident was classified as inflight engine failure.

While the aircraft was taking off, its left engine sustained loss of power.

The attempt of the pilot to return to the runway was not successful, and the aircraft ditched on the River Tarauacá in the State of Amazonas.

The aircraft was substantially damaged.

The pilot was seriously injured and one of the occupants was considered as missing. The five passengers suffered minor injuries.

An accredited representative of the National Transportation Safety Board was designated for participation in the investigation.

**GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS**

ANAC	(Brazil's) National Civil Aviation Agency
ATS	Air Traffic Services
CA	Airworthiness Certificate
CMA	Aeronautical Medical Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CHT	Technical Qualification Certificate
DCTA	Department of Science and Airspace Technology
Lat	Latitude
Long	Longitude
MLTE	Airplane Multi-Engine Land (AMEL) rating
MNTE	Airplane Single-Engine Land (ASEL) rating
PCM	Commercial Pilot (Airplane category)
PMD	Maximum Takeoff Weight
PPR	Private Pilot (Airplane category)
RAB	Brazilian Aeronautical Register
RBHA	Brazilian Aeronautical Homologation Regulation
SERIPA	Regional Aeronautical Accident Investigation and Prevention Service
SIPAER	Aeronautical Accident Investigation and Prevention System
TPP	Aircraft Registration Category – Private Air Services
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VMC	Minimum Control Speed
VYSE	Single engine best rate-of-climb speed

<b>AIRCRAFT</b>	<b>Model:</b> PA-34 200T <b>Registration:</b> PT-MMX <b>Manufacturer:</b> <i>Piper Aircraft</i>	<b>Operator:</b> Private
<b>OCCURRENCE</b>	<b>Date/time:</b> 07JUN2013 / 14:20 UTC <b>Location:</b> outside of aerodrome <b>Lat.</b> 07°26'21"S - <b>Long.</b> 070°01'31"W <b>Municipality - State:</b> Envira - Amazonas	<b>Type:</b> Inflight engine failure

## 1 Factual information

### 1.1 History of the occurrence

The aircraft was on a day-time charter flight, between the municipalities of Envira and Eirunepé in the Brazilian State of Amazonas.

The aircraft was climbing after departure, and began to have problems with its left engine. The pilot decided to return to the aerodrome and made a turn to the right.

Noticing that he would not make it to the runway, and due to the fact that the right engine also began to lose power, the pilot decided to make a ditching on the River Tarauacá.

After crashing into the water, the aircraft sank.

### 1.2 Injuries to persons

Injuries	Crew	Passengers	Third parties
Fatal	-	-	-
Serious	01	-	-
Minor	-	05	-
Unhurt	-	-	-
Missing	-	01	-

### 1.3 Damage to the aircraft

There was substantial damage to the aircraft structure.

### 1.4 Other damage

Nil.

## 1.5 Personnel information

### 1.5.1 Information on the crew

HOURS FLOWN	
	PILOT
Total	9,000:00
Total in the last 30 days	32:00
Total in the last 24 hours	06:00
In this type of aircraft	1,000:00
In this type in the last 30 days	32:00
In this type in the last 24 hours	06:00

NB.: Data provided by the pilot.

### **1.5.1.1 Professional formation**

The pilot did his Private Pilot Course in 1989, and the Commercial Pilot Course in 1990, both of them in the Flying School of the city of Sorocaba, State of São Paulo.

### **1.5.1.2 Validity and category of licenses and certificates**

The Pilot had a Commercial Pilot License, but his MNTE (ASEL) and MLTE (AMEL) ratings had expired more than a year before the accident.

### **1.5.1.3 Qualification and flight experience**

The pilot had qualification and enough experience for the type of flight.

### **1.5.1.4 Validity of the medical certificate**

The pilot had a valid Aeronautical Medical Certificate.

## **1.6 Aircraft information**

The SN 7870285 airplane was manufactured by Piper Aircraft in 1978.

The aircraft airworthiness certificate was valid.

The logbooks of the aircraft, airframe, engine, and propeller were lost in the river, after the ditching.

According to the records of the ANAC-homologated workshop that performed the last maintenance interventions in the aircraft, the PT-MMX flew approximately 100 hours since the inspection of "50 hours" made on 20 January 2013.

The last overhaul (type "1,800 hours") was made on 17 June 2011 in the same workshop, and the aircraft flew approximately 700 hours after it.

## **1.7 Meteorological information**

The prevailing weather conditions were VMC.

## **1.8 Navigational aids**

Nil.

## **1.9 Communications**

Nil.

## **1.10 Aerodrome information**

The aerodrome was under management of the Municipal Government. It was neither registered nor homologated. The operational fence did not surround the entire perimeter; there was lack of an Aerodrome Emergency Plan. There were neither firefighters nor firefighting equipment.

The runway was paved with concrete, measuring 1,200m x 23m, with thresholds 14/32 at an elevation of 500ft.

## **1.11 Flight recorders**

Neither required nor installed.

## **1.12 Wreckage and impact information**

The aircraft landed upstream in the waters of the River Tarauacá. At the moment of the ditching, the landing gear was in the extended position, and the flaps were at 40 degrees.

The aircraft was maintaining a nose-up attitude, and the first part to hit the water was the main landing gear.

After touching the water, the aircraft reversed to a nose-down attitude, resulting in a secondary impact of its nose against the water surface.

The strong impact of the front end of the fuselage against the water caused structural damage to the fuselage, and water invaded the aircraft, making it sink quickly.

The most substantial damage to the aircraft occurred, probably, when the aircraft was removed from the bottom of the river.

The flight deck was totally open and destroyed; the wings were severed at the point of attachment to the fuselage.

The propellers showed marks typical of low impact strength, and were not stuck when turned manually. The engines did not have signs of fracture, leaks, or fire.

## **1.13 Medical and pathological information**

### **1.13.1 Medical aspects**

Not investigated.

### **1.13.2 Ergonomic information**

Nil.

### **1.13.3 Psychological aspects**

Not investigated.

#### **1.13.3.1 Individual information**

Nil.

#### **1.13.3.2 Psychosocial information**

Nil.

#### **1.13.3.3 Organizational information**

Nil.

## **1.14 Fire**

There was no fire.

## **1.15 Survival aspects**

After the ditching, two passengers abandoned the aircraft through the aft side door.

When the aircraft was already sinking, the other occupants left it through an impacted-generated opening between the nose and the upper part of the cabin.



The pilot and the person sitting in the right seat passed out after the collision. The pilot was rescued by one of the passengers when he reappeared floating on the surface of the water. The other occupant was considered as missing.

### **1.16 Tests and research**

During the Initial Action, the engines were observed to be in good general state, with free spinning of the propellers and no signs of cracks, leaks or characteristics associated with inflight lock.

The propellers had signs of low power impact.

The teardown of the engines was carried out in a homologated workshop, in the presence of the Investigator in Charge, a Maintenance Accredited person, an Engineer of the Department of Science and Airspace Technology (DCTA), and a representative of the engine manufacturer.

The Technical Report Issued by the DCTA stated that the movable parts of the engine were functioning normally with no signs of leaks and fractures.

It was not possible to analyze the fuel utilized by the accident aircraft, because there was not a sample of the product, but the investigation found out that fuel had come from the city of Rio Branco in the State of Acre, being transported by road and river in metal barrels, before being transferred to plastic containers in the municipality of Envira, State of Amazonas.

The fuel utilized to refuel the aircraft in the morning of the accident had been kept in storage in the residence of the aircraft owner for approximately a month until the date of the occurrence.

### **1.17 Organizational and management information**

Nil.

### **1.18 Operational information**

The aircraft was hired with the purpose of transporting six passengers.

It departed at 10:00 local time, and the forecast duration of the flight leg was 20 minutes.

Although the pilot was experienced in the aircraft and in the type of flight in the region, his ASEL and AMEL ratings had expired.

The pilot informed that he had flown the aircraft on the day before for a total of six hours, and that he had had adequate rest the night before the day of the occurrence.

The landing strip in the municipality of Envira was neither homologated nor registered by the regulating agency. The accident occurred outside of aerodrome area in the Tarauacá River, State of Amazonas.

The aircraft had passed the overnight with approximately 300 liters of fuel in the tanks, and was refueled before the flight with more than 100 liters of aviation gasoline from the barrels stored for about a month in the residence of the aircraft owner.

The drainage of the tanks was done shortly after the refueling. This caused the fuel that had been stored in Envira to mix with the gasoline contained in the aircraft tanks.

The pilot informed that he had done the pre-flight and had not found any abnormalities in the aircraft. He also said that no technical discrepancies had been reported in the aircraft logbook.

After the refueling, the baggage was put in the aircraft, and the six passengers boarded the plane.

The investigation revealed that the takeoff weight was approximately 2,252kg, i.e., an excess of 179kg in relation to the Maximum Takeoff Weight for this model (MTOW: 2,073kg), being, therefore, outside of the limits prescribed by the manufacturer.

The pilot informed that he had checked the engines, the systems of the propeller governor and feathering, as well as the magnets, and everything was within the limits established by the manufacturer.

The takeoff configuration was with flaps at 10°, whereas the aircraft operating manual prescribed flaps at 0° or 25° with short runways and obstacles to be overflown at the departure end of the runway.

During the takeoff run, the aircraft engines operated normally. However, when it passed 600ft altitude AGL at a speed of approximately 90kt (that is, above the VYSE), the pilot noticed loss of power in the left engine.

At this moment, the aircraft was crossing over the Tarauacá River at a distance of 1,100 meters from de runway departure end. Neither the landing gear nor the flaps had been retracted.

The pilot, then, switched both fuel pumps to the HIGH position in the attempt to restore power, lowered the aircraft nose to gain speed, and made a turn to the side of the "good" engine (the right one), trying to return to the Envira landing strip.

According to the Emergency Procedures of the aircraft Operating Manual, if an engine failure occurs after departure at a speed above 85kt, the recommendation is:

*- If the decision is to continue with the takeoff, the pilot has to maintain heading and speed, retract the landing gear when there is positive indication of climb, accelerate to reach 89kt Vi, and then feather the inoperative engine propellers.*

In the sequence, the pilot has to perform the Engine Shutdown Procedure:

- *Identify the inoperative engine;*
- *Mixture Levers: as necessary;*
- *Fuel Select: Cross feed;*
- *Magnets: ON;*
- *Alternative Air Inlet: Open;*
- *Auxiliary Fuel Pump; switch to HIGH. IF THE POWER IS NOT RESTORED RIGHT AWAY, SWITCH IT OFF.*

**WARNING: THE POSITIONING OF THE AUXILIARY FUEL PUMP SWITCH TO HIGH WHEN THE ENGINE IS FUNCTIONING NORMALLY MAY CAUSE UNEVEN OPERATION AND/OR LOSS OF POWER.**

Notwithstanding, still during the turn to the right, the right engine sustained loss of power. At that moment, the aircraft had already lost altitude and was near the top of the trees on the banks of the Tarauacá River.

With the landing gear extended and flaps at 10°, the aircraft got close to the Minimum Control Speed (66kt), with the pilot deciding to make an emergency landing in the river.

Moments before the ditching, the pilot extended the flaps to 40°, and reduced the power levers to the minimum.

The pilot still managed to advise the passengers about his intention to ditch in the river. Some of them took off the shoes, and others unlocked the safety belt before the impact.

A few hours after the ditching, the aircraft was removed from the river bed by third parties, after authorization of the owner.

The removal resulted in substantial damage to the wings, which separated from the fuselage.

### **1.19 Additional information**

a) The aircraft was registered in the Brazilian Aeronautical Register (RAB) in the Private Transport category (TPP), and was operating a charter flight, transporting passengers from Envira to Eirunepé, in the Brazilian State of Amazonas.

b) The aerodrome from which the accident aircraft departed was neither registered nor homologated; and

c) The pilot's AMEL rating had expired more than a year before.

### **1.20 Utilization of other investigation techniques**

Nil.

## **2 ANALYSIS**

It was a passenger transport flight, with duration of approximately 20 minutes.

The aerodrome of origin (Envira) and the destination aerodrome (Eirunepé) are both located in the State of Amazonas. The aircraft departed at 10:00 local time.

In addition to the pilot, there were six passengers on board. Five of them were sitting in seats located in the back of the cabin, and one passenger was sitting beside the pilot, in the front right seat.

The pilot received his commercial pilot license in 1990, and had accumulated approximately 9,000 flight hours, 1,000 of which in the accident aircraft model.

Despite his experience, the pilot lacked qualification for the flight, since his ASEL and AMEL ratings had expired more than a year before the date of the accident.

The departure aerodrome (Envira) had a concrete paved runway, measuring 1,200m x 23m. The aerodrome was neither registered nor homologated.

Due to the fact that the aerodrome does not have authorization for operation, it is common for the operators to resort to improper storage of fuel, something that can harm the quality of the fuel.

It was observed that some of the fuel utilized by the aircraft had come from plastic containers, which had been stored in the residence of the aircraft owner.

This fuel was kept in storage for a month in Envira (Amazonas). It had been bought in Rio Branco, State of Acre, and then transported in metal barrels by land and river.

Since it was not possible to collect a sample of the aviation gasoline stored in Envira, for purposes of lab exams, a possibility was considered that the fuel had been contaminated by water, which would have caused the engine failure.

Besides, it was also verified that the aircraft stayed overnight with the tanks half-filled and, on account of the humidity of the Amazon region and the drop of the temperature during the night, condensation may have occurred and accumulation of water in the bottom of the aircraft tanks.

Since the drainage of the tanks was done shortly after the refueling in the morning of the accident, particles of water that may have deposited in the bottom of the aircraft tanks could have mixed with the fuel that had been stored in Envira, and ended up harming the operation of the engines a short time after departure.

After the refueling, the pilot did the aircraft pre-flight, without noticing any discrepancies. However, when one considers the preparation for the leg to be flown, it is possible to verify that the Maximum Takeoff Weight was not considered in the planning of the flight.

The sum of the individual weights of the occupants and of the baggage, exceeded the Maximum Takeoff Weight in 179kg, contrary to the aircraft performance limits established by the manufacturer.

Since it was not possible to recover the logbooks containing the aircraft maintenance records, one was not able to conclude on the participation of this aspect in the occurrence.

However, the aircraft had a valid airworthiness certificate, and one estimates that it flew approximately 100 hours after the last inspection (type 50-hours), and 700 hours after the last overhaul (type 1,800-hours).

The result of the Technical Report of the engine teardown and exams conducted by the Department of Science and Airspace Technology showed that the engines were operative, with intact internal components.

As for the procedures carried out by the pilot, it was observed that the utilization of the flaps at 10° for the takeoff was not the configuration prescribed by the manufacturer.

The manual prescribed a normal takeoff (flaps at 0°) or short takeoff for obstacle clearance (flaps at 25°). Therefore, there was deviation from procedures on the part of the pilot.

Other deviations from procedures occurred after takeoff, such as, for example, the pilot failure to retract the aircraft landing gear, with the aircraft climbing (positive climb rate), at a speed of more than 90kt, at an altitude of approximately 600ft (the aircraft had already surpassed the runway limits).

Soon after departure in the initial climb phase when the engine failure occurred, the fact that the landing gear and the flaps were in the extended position contributed to the increase of drag and, consequently, to the loss of speed and altitude.

The pilot's actions during the emergency deviated from the procedures established in the manual of operation issued by the manufacturer.

Initially, only three procedures were adopted: the pilot switched both fuel pumps to HIGH (trying to restore the operation of the engine; lowered the aircraft nose, to prevent loss of speed; and made a turn to the right (side of the "good" engine), in the attempt to return to the runway.

From the analysis of the emergency procedures recommended by the manufacturer and performed by the pilot, it was possible to observe that extremely important items for maintenance of the flight were not complied with by the pilot:

1. Turning to the right, instead of maintaining the heading;
2. Keeping the landing gear extended, increasing drag, and later causing abrupt deceleration when in contact with the river water;
3. Failure to feather the inoperative engine, generating aerodynamic drag, harming the performance of the aircraft with just one engine;
4. Failure to select cross-feed, an item prescribed in the checklist, which would allow feeding from the other tank;
5. Failure to open the alternative air inlet, an item prescribed in the checklists; and
6. Switching both fuel pumps to HIGH, keeping them activated. Such fact may have caused loss of power in the right engine, according to information contained in the manufacturer's manual.

### **3 CONCLUSIONS**

#### **3.1 Facts**

- a) The pilot had a valid Aeronautical Medical Certificate (CMA);
- b) The pilot's ASEL and AMEL ratings had expired more than a year before the day of the accident;
- c) The pilot had enough experience for the type of flight;
- d) The aircraft had a valid airworthiness certificate;
- e) The logbooks of the aircraft, propeller, engine and airframe were lost when the aircraft ditched in the Tarauacá River;
- f) The aircraft had seven persons on board, six of whom were passengers destined to the locality of Eirunepé, State of Amazonas;
- g) The aircraft had an excess weight of 179kg in relation to the Maximum Takeoff Weight;
- h) Before the flight, the aircraft was refueled with 100 liters of aviation gasoline;
- i) The aircraft owner stored fuel in plastic containers for refueling in Envira, State of Amazonas;
- j) The departure aerodrome located in the municipality of Envira was neither homologated nor registered;
- k) After taking off, the aircraft sustained loss of power in the left engine;
- l) The pilot did not perform the complete procedure prescribed for "inflight engine failure";
- m) The pilot made a turn to the right in an attempt to return to the runway;
- n) The right engine also sustained loss of power;
- o) The pilot made an emergency landing in the Tarauacá River, State of Amazonas;
- p) Pilot was seriously injured, five passengers suffered minor injuries, one passenger was reported missing; and

q) The aircraft sustained substantial damage.

## **3.2 Contributing factors**

### **3.2.1 Human Factor**

#### **3.2.1.1 Medical aspect**

Nil.

#### **3.2.1.2 Psychological aspect**

##### **3.2.1.2.1 Individual information**

Nil.

##### **3.2.1.2.2 Psychosocial information**

Nil.

##### **3.2.1.2.3 Organizational information**

Nil.

### **3.2.2 Operational factor**

#### **3.2.2.1 Concerning the operation of the aircraft**

##### **a) Flight indiscipline – a contributor**

Since his AMEL and ASEL ratings had expired more than a year before, the pilot lacked qualification to fly the aircraft.

##### **b) Piloting judgment – a contributor**

During the initial climb phase, upon noticing the loss of power in the left engine, the pilot attempted to return to the runway without retracting the landing gear, although the aircraft had already reached the speed for the best single-engine climb rate. This fact contributed to an increase of drag, loss of altitude, as well as strong impact and deceleration of the aircraft when in contact with the water.

##### **c) Flight planning – a contributor**

The total weight of the occupants, fuel, and baggage exceeded the maximum takeoff weight in 179kg, in discordance with the aircraft performance limits established by the manufacturer.

#### **3.2.2.2 Concerning ATS units**

Nil.

### **3.2.3 Material Factor**

#### **3.2.2.1 Concerning the aircraft**

Not a contributor.

#### **3.2.2.2 Concerning ATS equipment and technology systems**

Not a contributor.

#### 4 SAFETY RECOMMENDATION

*A measure of preventative/corrective nature issued by a SIPAER Investigation Authority or by a SIPAER-Link within respective area of jurisdiction, aimed at eliminating or mitigating the risk brought about by either a latent condition or an active failure. It results from the investigation of an aeronautical occurrence or from a preventative action, and shall never be used for purposes of blame presumption or apportion of civil liability.*

*In accordance with the Law n°12970/2014, recommendations are made solely for the benefit of the air activity operational safety.*

*Compliance with a Safety Recommendation is the responsibility of the holder of the highest executive position in the organization to which the recommendation is being made. An addressee who judges to be unable to comply with a Safety Recommendation must inform the CENIPA on the reason(s) for the non-compliance.*

#### **Safety Recommendations made by the CENIPA:**

##### **To the National Civil Aviation Agency (ANAC):**

**A-109/CENIPA/2013 – 001**

**Issued on 15/06/2015**

Publicize the content of this report at seminars, lectures and similar activities targeted at aircraft owners and operators regulated by the RBHA 91.

**A-109/CENIPA/2013 – 002**

**Issued on 15/06/2015**

Request the Municipal Government of *Envira*, State of Amazonas, to carry out the pertinent procedures for the homologation or, at least, the registration of the runway with the civil aviation authority, or, otherwise, if there is no such interest, determine its definitive interdiction.

#### 5 CORRECTIVE/PREVENTATIVE ACTION ALREADY TAKEN

Nil.

#### 6 DISSEMINATION

- National Civil Aviation Agency (ANAC)
- Brazilian General Aviation Association (ABAG)
- SERIPA VII
- Envira Town Hall, State of Amazonas

#### 7 APPENDICES

Nil.

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On 15/June/2015.