



# AIRCRAFT ACCIDENT REPORT

SEA/2018/10/04/F

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**Accident Investigation Bureau**

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**Final Report on the Accident involving Air Tractor AT-401B aircraft with nationality and registration marks 5N-BTV, operated by Skypower Express Airways Nigeria Limited, which occurred at Rukubi village 90 NM South-East of Abuja; Nigeria on 4th October, 2018.**



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This report was produced by the Accident Investigation Bureau, Nigeria (AIB-N), Nnamdi Azikiwe International Airport, Abuja.

The report was based upon the investigation carried out by AIB-N, in accordance with Annex 13 to the Convention on International Civil Aviation, Civil Aviation Act 2006 and Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2019. In accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of aircraft accident/serious incident investigations to apportion blame or liability.

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Safety Recommendations in this report are addressed to the Regulatory Authority of the State, as well as other stakeholders, as appropriate. The Regulatory Authority is the authority that ensures implementation and enforcement.

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## **GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT**

AD	Airworthiness Directive
AFQRJOS	Aviation Fuel Quality Requirements for Jointly Operated Systems
AGL	Above Ground Level
AG-NAV	A precision navigation system used to give flight guidance for pilots in the cockpit, during aerial sprays and surveys using GPS receivers, light bars and laser altimeters.
AMO	Approved Maintenance Organisation
AOC	Air Operator Certificate
CPL	Commercial Pilot Licence
CVR	Cockpit Voice Recorder
FAA	Federal Aviation Administration
FDR	Flight Data Recorder
GPS	Global Positioning System
MSL	Mean Sea Level
NCAA	Nigerian Civil Aviation Authority
Nig. CARs	Nigeria Civil Aviation Regulations
NM	Nautical Mile
PMS	Premium Motor Spirit
SB	Service Bulletin



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UTC                      Coordinated Universal Time

VMC                     Visual Meteorological Condition

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<b>Aircraft accident report number:</b>	SEA/2018/10/04/F
<b>Registered Owner:</b>	Olam Nigeria Limited
<b>Operator:</b>	Skypower Express Airways Nigeria Limited
<b>Manufacturer:</b>	Air Tractor Inc. Olney, Texas; USA
<b>Aircraft type and model:</b>	Air Tractor, AT-401B
<b>Year of Manufacture:</b>	2000
<b>Nationality and registration marks:</b>	5N-BTV
<b>Serial number:</b>	401-1120
<b>Location:</b>	Olam Rice Farm Rukubi, 90 NM South-East of Abuja; Nigeria, Coordinates 7°54'06"N, 8°19'36"E, elevation of 218 ft
<b>Date and Time:</b>	4th October, 2018 at 09:15 h  (All times are local, equivalent to UTC+1 unless otherwise stated)

## SYNOPSIS

Accident Investigation Bureau (AIB) was notified of the occurrence by Olam Nigeria Limited on 4th October, 2018. Investigators arrived the site the following day and commenced post accident assessments. All relevant stakeholders were notified.



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On 4th October, 2018 an Air Tractor AT401B aircraft with nationality and registration marks 5N-BTV, operated by Skypower Express Airways Nigeria Limited was on agricultural aerial spray (operation) on a Visual Flight Rules (VFR). The operation was scheduled for three sorties at Olam rice farm, located at Rukubi, about 90 NM South-East of Abuja, Nigeria. On board was one occupant (pilot) and fuel endurance of two hours ten minutes.

At about 09:04 h, the aircraft tookoff from Rukubi airstrip to NE05 field, with 600 litres of liquid chemical for the third and last sortie of 22 runs for the day. According to the Pilot, after six runs, he climbed to about 150 ft and turned left to line up for the next run; heading west. Halfway into the run, the pilot heard the engine sputter, backfired and stopped. He also stated that the oil pressure, oil temperature and the fuel pressure indications were all within the green arc. Then, he primed the engine and tried to re-start it, the engine cranked but did not start.

At this point, the pilot decided to dump the liquid chemical and force-land the aircraft on a field referred as N803 which is 1.5 km from where the engine failed.

The aircraft impacted ground with the right main landing gear first, followed by the left main landing gear at about three meters from the point of first impact. The right main wheel sheared and the aircraft then skidded for about 38 m and flipped over.

### **Causal factor**

An undetermined engine failure at low altitude that necessitated the execution of emergency forced-landing on a farmland.

### **No safety recommendation was made**



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## 1.0 FACTUAL INFORMATION

### 1.1 History of the flight

On 4th October, 2018 an Air Tractor AT401B aircraft with nationality and registration marks 5N-BTV, operated by Skypower Express Airways Nigeria Limited was on agricultural aerial spray operation on a Visual Flight Rules (VFR) flight. The operation was scheduled for three sorties<sup>1</sup> at Olam rice farm, located at Rukubi, about 90 NM South-East of Abuja; Nigeria. On board was one occupant (Pilot). Endurance was two hours ten minutes.

According to the Pilot, he reported for duty at about 07:45 h, carried out pre-flight inspection, inputted the map information of the AG-NAV on the Global Positioning System (GPS) in the aircraft. The aircraft hopper was loaded with 1,040 litres of liquid chemicals for the first two sorties. The two sorties commenced at about 08:05 h and were completed at about 09:00 h.

At about 09:04 h, the aircraft tookoff from Rukubi airstrip to NE05 field, with 600 litres of liquid chemical for the third and last sortie of 22 runs for the day. According to the Pilot, after six runs, he climbed to about 150 ft and turned left to line up for the next run; heading west. Halfway into the run, the pilot heard the engine sputter<sup>2</sup>, backfired and stopped. He also stated that the oil pressure, oil temperature and the fuel pressure indications were all within the green arc. Then, he primed the engine and tried to re-start it, the engine cranked but did not start.

At this point, the pilot decided to dump the liquid chemical and force-land the aircraft on a field referred as N803 which is 1.5 km from where the engine failed. The pilot

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<sup>1</sup> Sorties: The number of operationally low flying movements dispatching a loaded chemical for spraying targeted areas in batches.

<sup>2</sup> Sputter: To make a series of soft explosive or spitting sound

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continued turning left to avoid the residential area, telecommunication mast, rice mill and a school. The pilot further stated that there was a road between N9 and N10 that could be used as alternate landing area but was occupied by people, herds, bikes and a parked pick-up vehicle.

The aircraft impacted ground with the right main landing gear first, followed by the left main landing gear at about three meters from the point of first impact. The right main wheel sheared off about seven meters from the point of first impact. The aircraft then skidded for about 38 m and flipped over.

The Pilot exited the aircraft unassisted without injury.

The accident occurred in daylight, Visual Meteorological Conditions (VMC).

## 1.2 Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft
<b>Fatal</b>	Nil	Nil	Nil
<b>Serious</b>	Nil	Nil	Nil
<b>Minor</b>	Nil	Nil	Nil
<b>None</b>	1	Nil	1
<b>TOTAL</b>	1	Nil	1

## 1.3 Damage to aircraft

The aircraft was substantially damaged.



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## 1.4 Other damage

Some rice crops on the farm were destroyed.

## 1.5 Personnel information

### 1.5.1 Pilot

Nationality:	Indian
Age:	48 years
Licence type:	Commercial Pilot Licence (Aeroplane)
Licence validity:	Valid till 23rd March, 2019
Medical:	Valid till 4th September, 2019
Aircraft ratings:	Air Tractor 401, Cessna-152/172, Beech Baron (BE-55), Citabria/Super Cub, Pawnee, Ag CAT
Proficiency validity:	15th September, 2019
Total flying experience:	1,024 h
On type:	850 h
Last 90 days:	184 h
Last 28 days:	54.2 h
Last 7 days:	4.50 h
Last 24 hours:	3.2 h

The Pilot reported to have conducted 14 sorties of urea application on the 3rd of October, 2018.

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### 1.5.2 Engineer A

Nationality:	Nigerian
Age:	61 years
Licence type:	Aircraft Maintenance Engineer's Licence
Licence validity:	29 July, 2021
Ratings:	Air Tractor AT 400/500/600/800, Cessna 172, Embraer-110 PI, Piper PA-23 250 and Pratt & Whitney PT6A series

### 1.5.3 Engineer B

Nationality:	Nigerian
Age:	42 years
Licence type:	Aircraft Maintenance Engineer's Licence
Licence validity:	23rd March, 2022
Ratings:	Air Tractor AT 400/401/500/600/800, Cessna 172, Embraer-110 P2 and Pratt & Whitney PT6A-34 engine.

In 2016, two aircraft maintenance engineers were assigned by Skypower Express Airways Limited to the farm on monthly routine. Neither of the engineers was on the farm at the time of the occurrence.

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## **1.6 Aircraft information**

### **1.6.1 General information**

Manufacturer:	Air Tractor Inc.; United States of America
Model:	AT 401B
Serial number:	401-1120
Year of manufacture:	2000
Certificate of Airworthiness:	4th October, 2018
Certificate of Insurance:	Valid until 1st September, 2018
Airframe time:	2,947 h
Total landings:	2,986
Hours since last inspection:	27:12 h

The Air Tractor 401B is a family of agricultural aircraft, certified for single pilot operation. It is a low-wing monoplane, conventional landing gear with taildragger configuration. A three bladed propeller radial engine is mounted on the nose of the aircraft. A chemical hopper is provided between the firewall and the cockpit.

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**Figure 1:** AT-401 aircraft (5N-BTV)

### 1.6.2 Power plant

Engine Type:	R-1340-AN1
Manufacturer:	Pratt & Whitney; USA
Serial Number:	24510
Total Time since New:	10,877:55 h
Total cycles:	3005
Fuel used during the operation:	Premium Motor Spirit (PMS)

The R-1340-AN-1 engine is a nine-cylinder, single row, radial engine. It is divided into five sections; front section, main crankcase, cylinders, blower section, and rear section. The main crankcase, cylinders, and front section are generally referred as the power section while the blower and rear sections are called the accessory section. The engine





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may be separated between the blower section and the main crankcase; thus permitting work to be done on either part of the engine. The ignition system is furnished by two scintilla magnetos located at the rear of the engine.

### 1.6.3 Propeller

Manufacturer:	Hamilton Standard, USA
Model/type:	23D40/6533A-18
Serial number:	A356
Number of blades:	Three
Year of manufacture:	2000
Time since overhaul:	1000 h

The operator adopts manufacturer's maintenance manual as its maintenance program for AT-401B aircraft. Maintenance program/inspection procedure manual was duly approved by the Nigerian Civil Aviation Authority.

### 1.6.4 Fuel System

*The AT 401 has two fuel tanks with a capacity of 63 gallons each. Both tanks gravity feed into a small header tank which is located behind the chemical hopper and below the rear spar attached to. The fuel valves handle is located within hand easy reach of the pilot and is marked "main" and "off". There can be no tank selection since both tanks are interconnected. The fuel valve placard is marked "120 gallons usable". This is due to the fact that the left hand fuel tank sender has a shorter float arm than the right hand tank and does not allow the last three to four gallons to be gauged. Also a climb with no rudder selection for torque will result in approximately three gallons being moved to the outboard wall of the right hand tank which becomes unusable. For those reasons only 120 gallons is counted usable although in straight and level coordinated*



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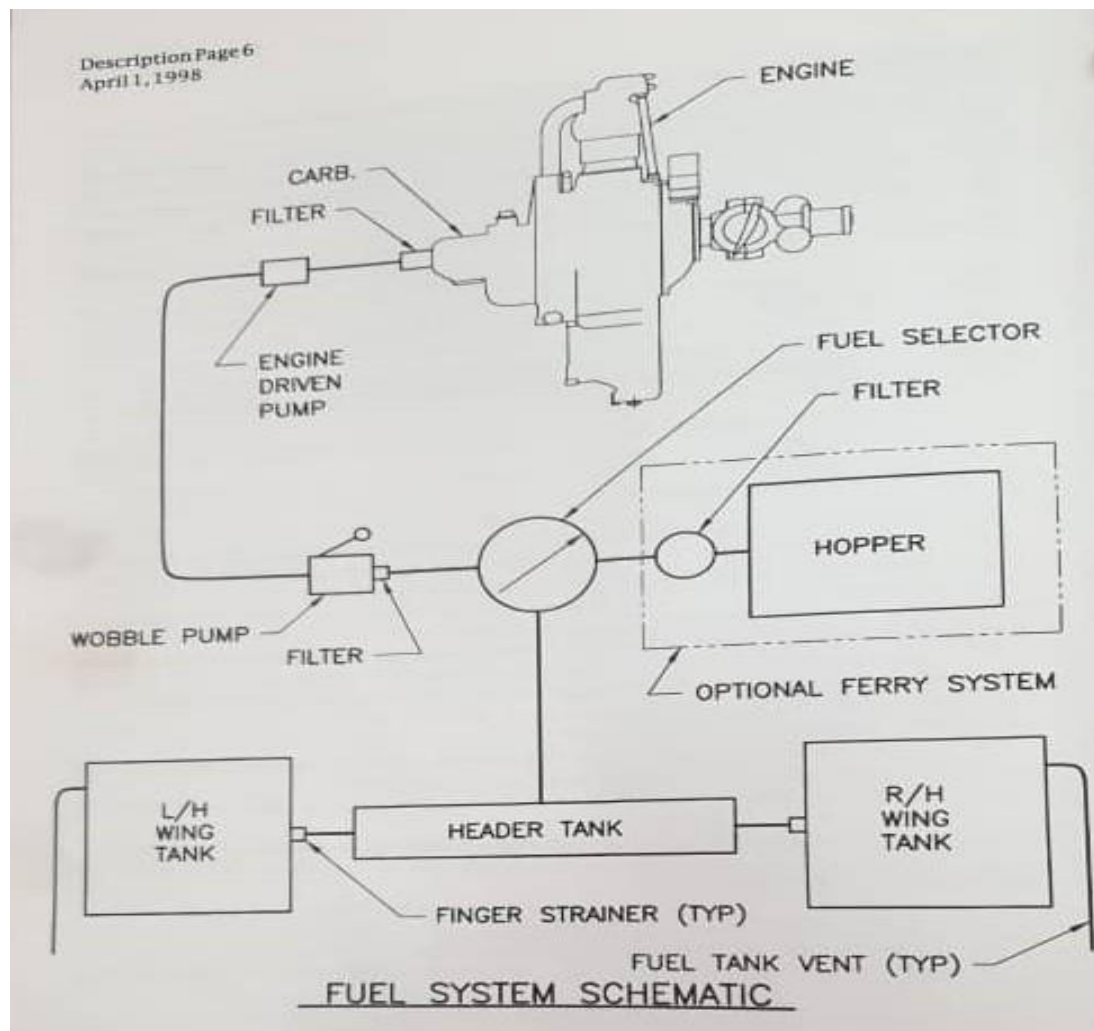
*flight, all the fuel may be used. The fuel gauge receiver, which is located on the instrument panel, is marked in fractions of 120 gallons.*

*Finger strainers of coarse wire mesh are located in each fuel tank, through the fuel valves and into the hand wobble pump which is used to fill the line before starting the engine. The hand wobble pump also serves as an emergency fuel pump and has a fine mesh filter screen installed which should be cleaned at various intervals. A fuel drain is located on the wobble pump body.*

*A fuel pressure warning light is installed on the instrument panel and is set to activate when fuel pressure falls below two psi.*

*There are four water traps in the fuel system; one in the each wing tank, one in the header tank, and one in the wobble pump. These drains should be activated daily. Each fuel tank has an overboard venting located near the wing tip. With both tanks completely filled, it is possible during the flight to vent a small amount of fuel overboard by skidding the aircraft or rolling sharply. Fuel type for the AT 401 is the aviation grade 80/87 minimum octane gasoline, if this fuel is not available, use the next highest grade aviation gasoline, up to and including 100 octanes. Under no circumstance should aromatic fuel be used.*

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**Figure 2:** AT 401 fuel system schematic

### 1.6.5 Fuel metering system

*The basic requirement of a fuel metering system is to meter fuel proportionately to air, at a pre-determined ratio to establish the proper fuel/air mixture ratio for the engine at all speeds and altitudes at which the engine may be operated. The fuel metering system must atomize and distribute the fuel from the carburetor into the mass airflow. Each one of the engine's cylinders should receive the same quantity of fuel/air mixture and at the same fuel/air ratio.*



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*If a mixture leaner than that specified for the engine is used, the leanest cylinder of the engine is apt to backfire because the slower burning rate of the lean mixture results in a continued burning in the cylinder when the next intake stroke starts. Excessively rich mixtures result in loss of power and waste of fuel. With the engine operating near its maximum output, very lean mixtures cause a loss of power and, under certain conditions, serious overheating.*

#### **1.6.6 Aircraft maintenance records**

The last major inspection on the aircraft was the 100 h inspection carried out by Skypower Express Airways Nigeria Limited on 8th September, 2018.

From the record of the maintenance, the engine logbook and the aircraft logbook do not indicate any maintenance action being taken on the fuel pump before the occurrence. There was also no information regarding the maintenance action (if any) of the fuel pump before the occurrence.

#### **1.7 Meteorological information**

<b>Time:</b>	<b>0800 h</b>	<b>0900 h</b>	<b>1000 h</b>
<b>Wind</b>	Calm	Calm	Calm
<b>Visibilty</b>	+10 km	+10 km	+10 km
<b>Weather</b>	Nil	Nil	Nil
<b>Cloud</b>	Sky Clear (SKC)	SKC	SKC
<b>Temperature</b>	23°C	23°C	24°C
<b>QNH</b>	Not provided	Not provided	Not provided

## **1.8 Aids to navigation**

The GPS installed on the aircraft was serviceable at the time of the occurrence.

### **1.8.1 AG-NAV**

A precision navigation system used to give flight guidance for pilots in the cockpit, during aerial sprays and surveys using GPS receivers, light bars and laser altimeters.

## **1.9 Communications**

There was effective communication between the aircraft and the ground station on VHF frequency of 123.4 MHz.

### **1.10 Aerodrome information**

The Olam farm airstrip is located within Olam farm factory at coordinates 07°53'41" N, 008°21'10" E and elevation of 259 ft. It is an unpaved airstrip 1200 m long and 20 m wide and the orientation is 05/23 inscribed on paved concrete at both ends. A wind sock is located at each end of the airstrip. It also has a hangar where the aircraft are normally maintained. The airstrip has a wire mesh perimeter fence.

### **1.11 Flight recorders**

The aircraft was not equipped with a Flight Data Recorder (FDR) or Cockpit Voice Recorder (CVR). Neither of these was required by the regulations.

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## 1.12 Wreckage and impact information

The aircraft impacted the ground in a marshy undulating rice farm designated as N803, 3.5 km to the airstrip, with the right main landing gear first, followed by the left main landing gear at about three meters from the point of first impact. The right main landing wheel broke off from its attachment seven meters from the point of impact and was found 24 meters from the first point of impact. A detached section of the spray boom was also located eight meters from the first point of impact. One of the propeller blades remained intact while the remaining two were bent rearwards. The left wing tip leading edge impacted the ground causing substantial damage to the wing. The aircraft flipped over, 38m from the first point of impact and remained generally intact. See Appendix 1: Olam Ondorie Nucleus Rice Farm.



**Figure 3:** Propeller blade after the incident



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**Figure 4:** Propeller Blade Slash Marks



**Figure 5:** Damaged Left Wing Tip Leading Edge



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**Figure 6:** The inverted aircraft at its final position

### **1.13 Medical and pathological information**

Drugs and other substances tests were conducted and the results was negative.

### **1.14 Fire**

There was no pre or post-crash fire.

### **1.15 Survival aspects**

The accident was survivable; the livable volume of the cockpit, the seat and safety harness were intact. The absence of pre- or post-impact fire contributed to the





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survivability of the accident. The pilot broke the right hand side door glass and exited the aircraft without injury.

The rescue and fire fighting team arrived the scene within the recommended period.

### **1.16 Test and research**

Samples of engine oil from the engine sump, fuel from the bowser and the dispensing pump were taken to Kaduna Refinery and Petro-chemical Company Limited, Kaduna for test and analysis. The results of the analysis indicated that the engine oil and the fuel met the Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS). See Appendix 2: Fuel and engine oil analysis result.

Post-crash inspection of the engine was conducted by an authorised engineer in the presence of the investigating team. The accessories, bolts, wirelocks were found in place. The inlet and outlet lines of the fuel system were intact. The carburettor filters were removed, checked and found to be clean and dry. Also, the engine-driven fuel pump was removed and inspected. In an attempt to rotate the fuel pump shaft, it was found to be stiff.

Further examination of the engine and other components was not carried out.

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**Figure 7:** Fuel pump



**Figure 8:** Fuel pump showing the spline and drive shaft

## **1.17 Organizational and management information**

### **1.17.1 Olam Nigeria Limited**

Olam Ondorie Nucleus Rice Farm is one of the subsidiaries of Olam International, established in 2010 operating in Nasarawa State; Nigeria. The rice farm has a total area of 10,920 hectares. The Rice Farm has a fleet of two Air Tractor AT-401B and AT-501 model aircraft for agricultural operations.

An existing management contract enables Skypower Express Airways Nigeria Limited to maintain and operate its aircraft.

### **1.17.2 Skypower Express Airways Limited**

Skypower Express Airways Limited is an approved maintenance organization (AMO), air operator certificate (AOC) and aerial work certificate holder in accordance with the Nigeria Civil Aviation Regulations.

### **1.17.3 Nigerian Civil Aviation Authority (NCAA)**

NCAA is the government agency saddled with the regulation and oversight of aviation activities in Nigeria. The NCAA is set up by the Civil Aviation Act (2006) which empowers the Director General of NCAA to make regulations in aviation. The current regulations are as enshrined in the Nigeria Civil Aviation Regulations (Nig. CARs) 2015. Relevant sections of the Nig. CARs guide activities of personnel and service providers in the aviation industry. Oversight activities are achieved by continuous and periodic audits by inspectors of the NCAA.

## **1.18 Additional information**

### **1.18.1 Carburetor system**

In the operation of the float-type carburetor system, the outside air first flows through an air filter, usually located at an air intake in the front part of the engine cowling. This filtered air flows into the carburetor. When the air flows through the venturi, a low-pressure area is created that forces the fuel to flow through a main jet located at the throat. The fuel then flows into airstream where it is mixed with the flowing air.

The fuel-air mixture is then drawn through the intake manifold and into the combustion chambers where it is ignited. The float-type carburetor acquires its name from a float that rests on the fuel within the float chamber. A needle attached to the float type opens and closes an opening at the bottom of the carburetor bowl. This meters the amount of fuel entering into the carburetor depending upon the position of the float, which is controlled by the level of fuel in the float chamber. When the level of air forces the float to rise, the needle valve closes the fuel opening and shuts off the fuel flow to the carburetor. The needle valve opens again when the engine requires additional fuel, the flow of the fuel-air mixture to the combustion chambers is regulated by the throttle valve, which is controlled by throttle in the flight deck.

The float-type carburetor has several distinct disadvantages. First, they do not function well during abrupt maneuvers. Secondly, the discharge of fuel at low pressure leads to incomplete vaporisation and difficulty in discharging fuel into types of supercharged systems. The chief disadvantage of the float-type carburetor, however, is its icing tendency. Since the float-type carburetor must discharge fuel at a point of low pressure, the discharge nozzle must be located at the venturi throat, and the throttle valve must be on the engine side of the discharge nozzle. This means that the drop in temperature due to fuel vaporization takes place within the venturi. As a result, ice

rapidly forms in the venturi and on the throttle valve. (Source: FAA-H-8083-B PHAK chapter 7 page 7, 8, and 9).

### **1.18.2 Ignition system**

In a spark ignition engine, the ignition system provides a spark that ignites the fuel-air mixture in the cylinders and is made up of magnetos, spark plugs, high tension leads, and an ignition switch.

A magneto use a permanent magnet to generate an electrical current completely independent of the aircraft's electrical system. The magneto generates sufficiently high voltage to jump a spark across the spark plug gap in each cylinder. The system begins to fire when the starter is engaged and the crankshaft begins to turn. It continues to operate whenever the crankshaft is rotating.

Most standard certificated aircraft incorporate a dual ignition system with two individual magnetos, separate sets of wires, and spark plugs to increase reliability of the ignition system. Each magneto operates independently to fire one of the two spark plugs in each cylinder. The firing of two spark plugs improves combustion of the fuel-air mixture and results in a slightly higher output. If one of the magnetos fails, the other is unaffected. The engine continue to operates normally, although a slight decrease in engine power can be expected. The same is true if one of the two spark plugs in a cylinder fails.

A malfunctioning ignition system can be identified during the pretakeoff check by observing the decrease in rpm that occurs when the ignition is first moved from both to right and then from BOTH to LEFT. A small decrease in engine rpm is normal during this check. (Source: FAA-8083-B PHAK chapter 7 page 15)



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### **1.18.3 Fuel Primer**

Both gravity-feed and fuel-pump systems may incorporate a fuel primer into the system. The fuel primer is used to draw fuel from the tanks to vaporise fuel directly into the cylinders prior to starting the engine. During cold weather, when engines are difficult to start, the fuel primer helps because there is not enough heat available to vaporise the fuel in the carburetor. It is important to lock the primer in place when it is not in use. If the knob is free to move, it may vibrate out of position during flight which may cause an excessively rich fuel-air mixture. (Source: FAA-H-8083-B PHAK chapter 7 page 25).

## **2.0 ANALYSIS**

### **2.1 General**

The Pilot was qualified to conduct the flight having met all the requirements stipulated in the relevant sections of the Nigeria Civil Aviation Regulations (Nig. CARs).

The aircraft had a valid certificate of airworthiness and equipped for aerial work/spray operations. The maintenance records showed that the aircraft was maintained in accordance with existing regulations and approved procedures.

### **2.2 Conduct of the flight**

The operation was scheduled for three sorties. After completing two sorties, the aircraft landed and uplifted 600 litres of liquid chemical to complete the third (last) sortie of 22 runs.

On the last sortie, half way into the sixth run the engine failure occurred at about 150 feet above ground level. The pilot primed the engine to re-start but it was not successful. On noticing that, the pilot decided to execute emergency procedure (force-landing) by dumping the liquid chemical. Having been unable to restart the engine and considering that the failure occurred at low altitude, the pilot subsequently force-landed the aircraft on the farm land (N803), which was marshy and undulating resulting in damage to the aircraft.



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### **2.3 Engine failure**

During the post-crash inspection, the engine driven fuel pump was removed and inspected. In an attempt to rotate the fuel pump shaft, it was found to be stiff. This stiffness might have prevented the fuel pump from supplying sufficient fuel into the carburetor, starving the engine of fuel and resulting in loss of power. At the time of this investigation, further engine examination is yet to be conducted to ascertain the actual cause of the engine failure.



## 3.0 CONCLUSIONS

### 3.1 Findings

1. The Pilot was certified to conduct the flight.
2. The certificate of insurance was invalid at the time of the occurrence.
3. The aircraft was on agricultural aerial spray operation.
4. The aircraft took off from Rukubi airstrip with 600 liters of liquid chemical for the last sortie of 22 runs for the day.
5. The engine sputtered; backfired and went dead.
6. The Pilot observed the oil pressure, oil temperature and the fuel pressure indications were all within the green arc.
7. The Pilot primed the engine and tried to re-start but the engine did not start.
8. The Pilot dumped the liquid chemical and force-landed the aircraft.
9. The aircraft force-landed with the right main landing gear first, followed by the left main landing gear at about three meters from the point of first impact.
10. The right main wheel detached from its attachment point and was found about seven meters from the point of first impact, then the aircraft travelled 38 m further and flipped.
11. The Pilot exited the aircraft unassisted without injury.
12. During post-crash inspection, the fuel pump drive shaft was found to be stiff.
13. The results of the analysis showed that the engine oil and the fuel met the Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS)

### 3.2 Causal factor

An undetermined engine failure at low altitude that necessitated the execution of emergency forced-landing on a farmland.

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## 4.0 SAFETY RECOMMENDATIONS

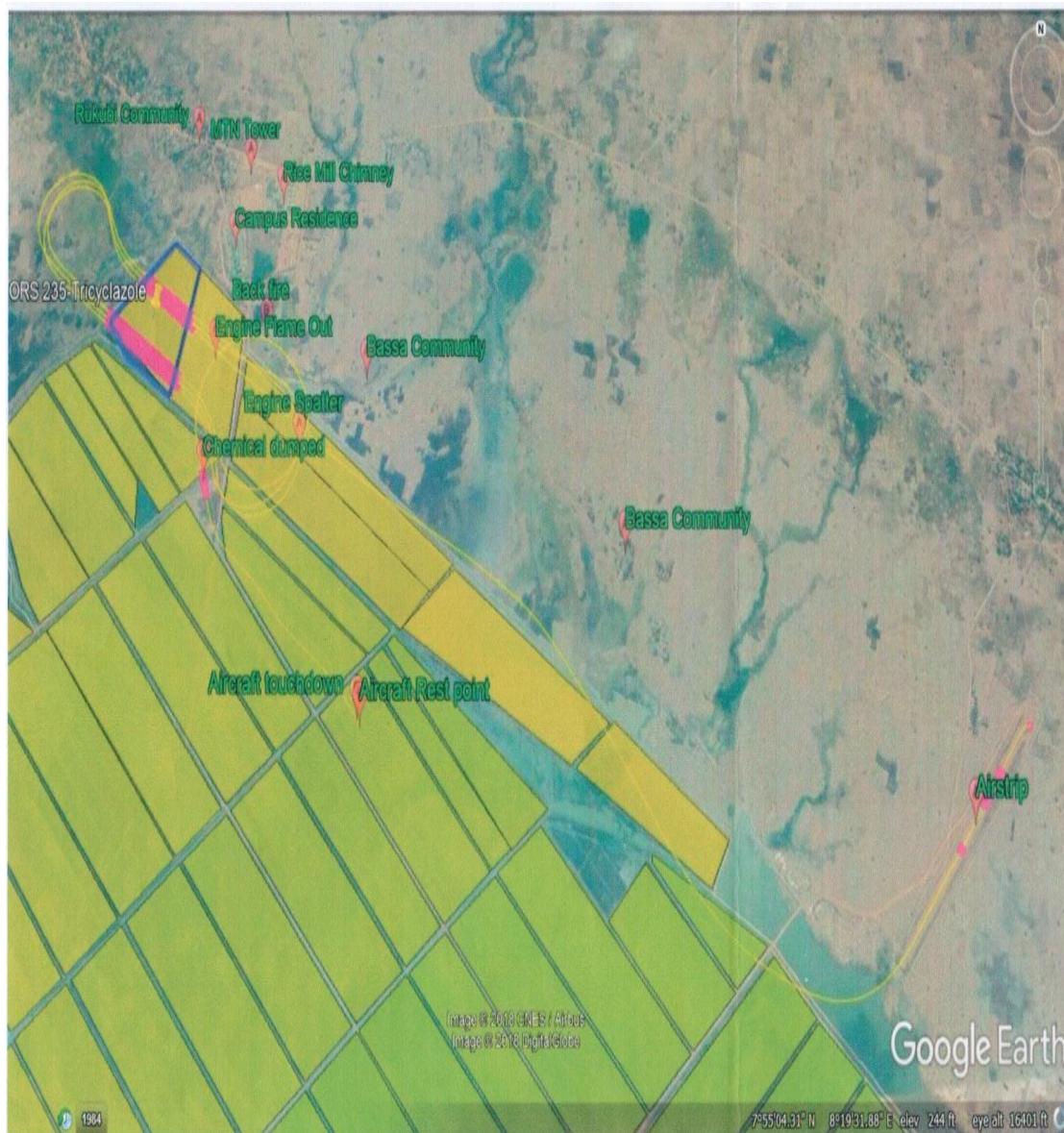
No safety recommendation is issued.

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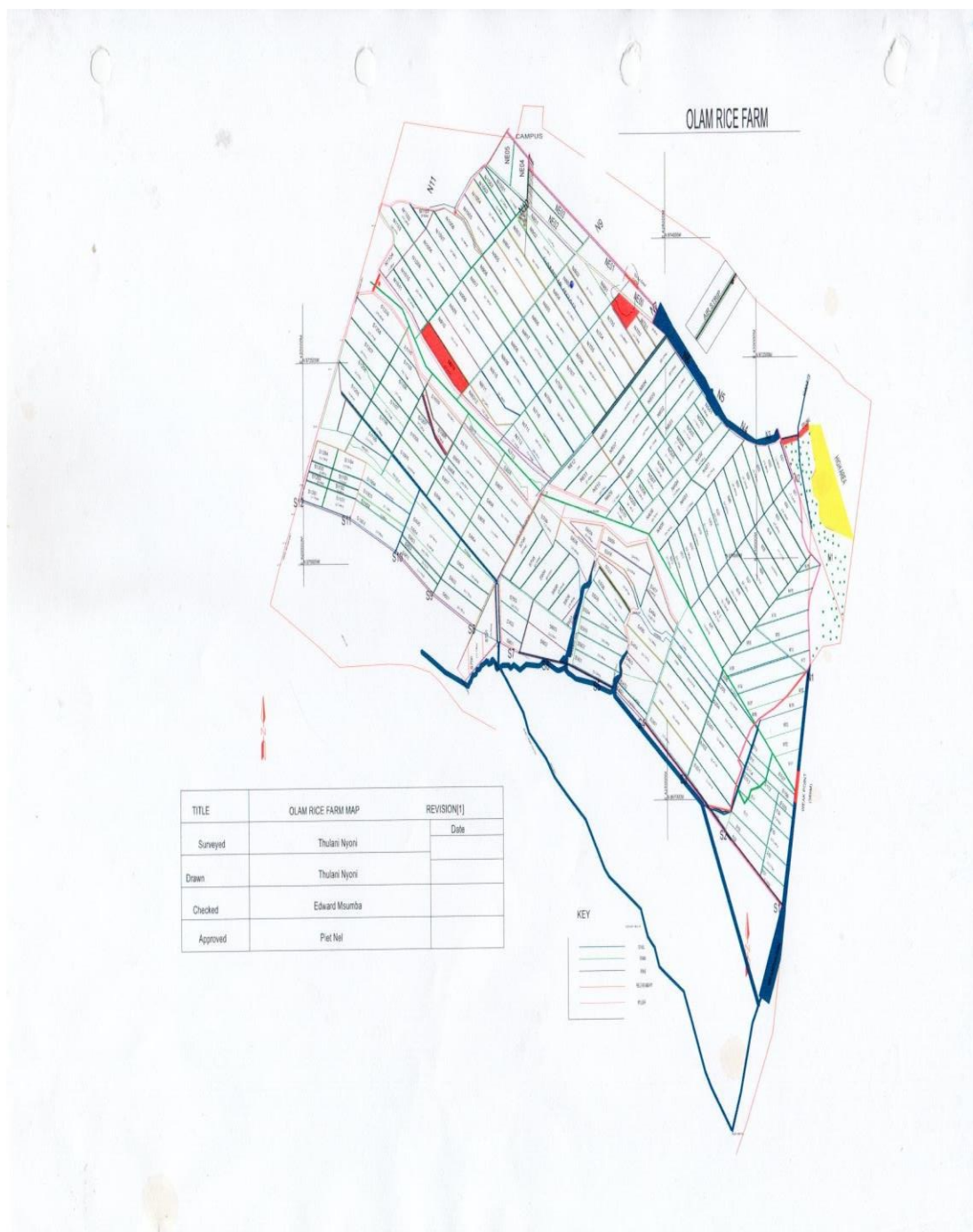
5N-BTV

## APPENDICES

### Appendix 1: Olam Ondorie Nucleus Rice Farm and



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## Appendix 2: Fuel and engine oil analysis result



CLIENT:- ACCIDENT INVESTIGATION BUREAU (AIB)

THRU:- MANAGER PPQC

SAMPLE NAME:- PREMIUM MOTOR SPIRIT (PMS)

SAMPLE TYPE:- LIQUID SAMPLES

DATE RECEIVED:- 8<sup>th</sup> NOVEMBER, 2018.

DATE ANALYSED:- 10<sup>th</sup> NOVEMBER, 2018.

Find below the result of analysis carried out on premium motor spirit samples.

S/ N	TEST/PARAMETER	UNIT OF MEAS.	FUEL DISPENSER	FUEL BOWSER	SPECS.
1.	SPECIFIC GRAVITY	Kg/L	0.7486	0.7543	TO BE REPORTED
2.	KNOCKING RATING (Research Octane Number)		107	99.7	90MIN
3.	REID VAPOUR PRESSURE	PSI	8.53	6.68	9.0MAX
4.	TOTAL SULPHUR	%wt	0.0269	0.1335	0.20MAX
5.	Vapour/Liquid (Ratio T36)		63	66	68MIN.
6.	DISTILLATION:- IBP	°C	41	45	70MAX
	5%		49	51	
	10%		53	54	
	20%		66	62	125MAX
	30%		76	71	
	40%		85	82	
	50%		104	101	180MAX
	60%		119	114	
	70%		142	134	
	80%		153	153	205MAX
	90%		-	-	
	95%		-	-	
	EBP		185	155	
	T/R		85	86	

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# KRPC

## PPQC DEPARTMENT

### ANALYSIS RESULT

CLIENT: ACCIDENT INVESTIGATION BUREAU

THRU: MANAGER PPQC

SAMPLE NAME: ENGINE OIL

SAMPLE TYPE: LIQUID SAMPLES

DATE RECEIVED: 8<sup>th</sup> NOVEMBER, 2018

DATE ANALYSED: 10<sup>th</sup> NOVEMBER, 2018

S/N	ANALYSIS	ASTM	RESULT
1.	SG@ 15/4°C	D1298	0.8893
2.	KV@40°C(Cst)	D445	281.17
3.	KV@100°C(Cst)	D445	25.77
4.	KVI	-	119
5.	FLASH POINT(°C)	93	254