AIRCRAFT ACCIDENT REPORT A 02/18

Air Accident Investigation Bureau

Ministry of Transport, Malaysia

Final Report on the Accident Involving

Fixed Wing Aircraft M-18A Dromader Registration VH-FOS

In Keratong, Pahang, Malaysia

On The 25th February 2018

INTRODUCTION

The Air Accident Investigation Bureau of Malaysia

The Air Accident Investigation Bureau of Malaysia (AAIB) is the air accidents and incidents investigation authority in Malaysia and is responsible to the Ministry of Transport. Its mission is to promote aviation safety through the conduct of independent and objective investigation into air accidents and serious incidents.

The AAIB conducts the investigations in accordance with Annex 13 to the Chicago Convention and Civil Aviation Regulations of Malaysia 2016.

In carrying out the investigations, the AAIB will adhere to ICAO's stated objective, which is as follows:

"The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability."

Accordingly, it is inappropriate that AAIB reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

AIRCRAFT ACCIDENT/SERIOUS INCIDENT REPORT

Aircraft Type	**:**	**M-18A Dromader**
Model	**:**	**PZL ASZ-62IR**
Owner	**:**	**RETSOF PTY LTD**
Nationality	**:**	**Australian**
Year of Manufacture	**:**	**1995**
Aircraft Registration	**:**	**VH-FOS**
Serial Number	**:**	**1Z025-24**
State of Registration	**:**	**Australia**
State of Operator	**:**	**Malaysia**
Place and State of Occurrence	**:**	**Keratong Airstrip, Pahang 02 55.230N 102 52.727E**
Date and Time of Occurrence	**:**	**25th Feb 2018 – 1221LT**

All times in this report are Local Time (LT) (UTC +8 hours)

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SYNOPSIS

VH-FOS departed Keratong Airstrip (02 55.230N 102 52.727E) at approximately 1221LT after two drums of fuels uploaded together with load number 9 of agricultural spraying agent. The aircraft depart with less than the maximum take-off weight allowable for Dromader.

On roll out for the spraying run, pilot notices the power setting of 55% had dropped to 35%. After switching on the fuel pump and applying more power, the power goes up to 40% but then dropped again.

Pilot then decided to land the aircraft at any nearest available place. Only a patch of shrubbery seem to be the best option for the pilot to land. On descending, the engine completely failed. At this instant pilot dumped the spraying agent and flared the aircraft until it settled on the shrub. The aircraft crashed approximately 3Nm to the North East of the airstrips. Pilot evacuated the aircraft safely and the aircraft damaged beyond repair.

1.0 FACTUAL INFORMATION

1.1 History of Flight

On Sunday, 25th February 2018, a fixed wing aircraft Dromader M18 with an Australian registration VH-FOS departed Keratong airstrip (02^0 55' 23"N 102^0 52' 72"E) for crop spraying. The aircraft has been operating at Keratong since 16th February 2018 doing crop spaying from 9.00LT until 18.00LT daily depending on the weather condition of the day.

VH-FOS first departure on 25th February 2018 was at 8.46LT with fuel loaded the day before the flight which has become their routine to refuel aircraft before they end the day.

At 10.17LT aircraft landed at Keratong airstrip for refuelling and uploading of spraying agent and took off again at 10.22LT without any incident. After the eight (8th) run, aircraft landed at 12.00LT for another refuelling and loading of the spraying agent. Aircraft then took off at 12.21LT.

When the aircraft roll out for the spraying run, pilot noticed the power setting of 55% has dropped to 35%. Pilot then checked all gauges and turn on the fuel pump and applied more power. Momentarily the power goes up to 40% before started to drop again.

Pilot decided to make an emergency landing and looking for a suitable place to put the aircraft down. While descending toward a small patch of shrub the engine totally failed. Pilot dumped the spray agent and flare the aircraft over the shrubby area until it ready to stall then allowed the aircraft to settle on the bushes. 6 minutes after departure aircraft crashed at approximately 3nm northeast of the airstrip at $N02^0$ 57' 36" $E102^0$ 50' 42".

1.2 Injuries to person

Injuries	Crew	Passenger	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor	Nil	Nil	Nil
None	01	Nil	Nil

1.3 Damages to aircraft

Aircraft impacted with the ground cushioned by the shrub. However the aircraft considered destroyed with the engine separated from the airframe upon impact. Port wing tip separated from the wing and the right wing badly damaged.

Picture 1

Aircraff final resting place

Picture 2

Impact cushioned by the shrub

Port and starboard wing badly damaged

Picture 3

Starboard wing

Picture 4

Port wing

Engine separated from the airframe, bend and twisted to the left

Picture 5

Engine separated from airframe

Picture 6

Engine bend to the left

Wing Tip and the final path of the aircraft

Picture 7

Port wing tip separated from the wing

Picture 8

Aircraft final path as per the arrow

1.4 Other damages.

Nil.

1.5 Personal Information

1.5.1 Captain

Status	Commander
Nationality	Australian
Age	65 years old
Gender	Male
Licence Type	CPL (50775)
Licence Validity	Valid until 31st August 2018
Total Hours Operating on M18A	> 3000 hours
Total Flying Hours	22,519.7 hours
Rest Period Since Last Flight	> 24 hours
Medical Expiry Date	Class 1 CPL / 30th September 2018

1.6 Aircraft Information

CofA No.	MB/10241
CofR No.	MB/10241/1

Engine Serial Number	1Z025-24 (TPE 331 – 12UHR-702H Model)
Time Since New	19868.8 hrs
Time Since Overhaul (TSO)	3330.1 hrs
Cycle Since Overhaul (CSO)	3985 hrs
Cycle Since Fitted (CSF)	23987 hrs

1.7 Meteorological Information

The weather was CAVOK on 25th of Feb 2018. However, it was heavy rain throughout the day on the 24th of Feb 2018 (One day before the accident)

1.8 Aid to Navigation

Not Applicable.

1.9 Communication

Not Applicable.

1.10 Aerodrome information

Aircraft operating from an unattended grass airstrip belong to and maintained by the oil palm plantation.

1.11 Flight Recorders

Dromader M18-A not fitted with Flight Data Recorder (FDR) neither Cockpit Voice Recorder (CVR).

1.12 Wreckage and impact information

Upon experiencing loss of power pilot has decided to make an emergency landing at the nearest suitable clear area. Having decided to land at the shrubby area, pilot reduced the speed down to stall speed. However shortly later the

engine totally failed. Pilot decision to dump the spray agent and flare the aircraft over the shrubby area until it ready to stall has allowed the aircraft to settle on the bushes.

Even though the impact with ground has been minimised, the aircraft considered **destroyed** with both wings badly damage, and the engine torn off from the airframe and bend sideway.

No other damages on the impact area other than broken trees.

Picture 9

Crash Site – approximately 3 nm to the North West of Keratong Airstrip

1.13 Medical and pathological information

Nil.

1.14 Fire

Nil.

1.15 Survival Aspect

Not applicable.

1.16 Test and research

Fuel test were done to trace if there is water contaminating the fuel. Fuel sample were taken from the Airframe Fuel Filter and FCU Fuel Filter. Both test **CONFIRMED** that there were traces of water in the fuel from both samples. Fuel contamination tests were conducted using the Water Detector Tablet.

However the test on the portable fuel pump's filter shows no trace of water in the fuel.

1.17 Organisational and Management information

Systematic Aviation Services (SAS) wet leased VH-FOS from Dompter Pty Ltd, Australia since 2014 to carry out agricultural spraying and spraying activities in the territory of Malaysia.

1.18 Additional Information

Nil.

1.19 Useful or Effective Investigation Techniques

Nil.

2.0 ANALYSIS

2.1 The day before accident.

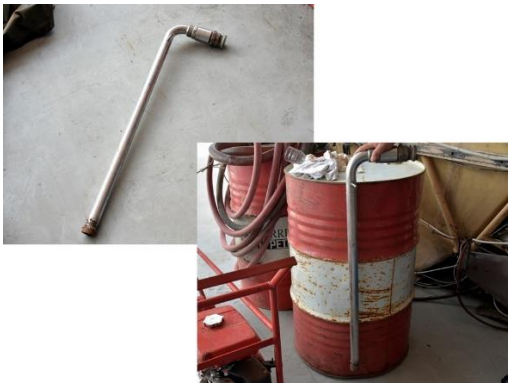
During interview with the pilot and the ground handler, both of them admitted that the day before the accident, 24th Feb 18, Keratong experiencing heavy rain throughout the day. Aircraft was parked under the shade of palm tree with proper cover. So does the avtur fuel drums, motorised fuel pump with the hose were left on the ground throughout that day with a cover.

2.2 Fuel contamination sampling.

Fuel sampling were done by the ground handler before each refuelling as to check if there is any contamination exist in the fuel. The stainless steel pipe used to extract fuels from drums. Checking of fuel contamination **visually** from 4 drains were done after each refuelling. Both pilot and ground handler admitted that there was no trace of water found on each fuel check/drain after the last refuelling before the aircraft experience engine failure.

Picture 10

Fuel Pump



Picture 11

Pipe used connected to the hose

2.3 Refuelling on the day of accident.

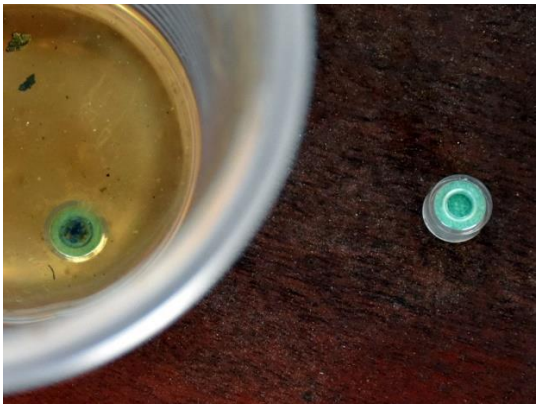
On 25th of Feb 2018 VH-FOS was in an operational status where it has flown for the spraying mission since 08.46LT and continue to fly without any problem encountered. After the third refuelling, aircraft departed at time 12.21LT and after roll out for the spraying aircraft experienced the power lost. 5 minutes later the aircraft crashed at the shrubby area as indicated in **Picture 9**.

2.4 Fuel sampling at crash site.

Fuel (avtur) sample was taken from the **airframe filter** at the crash site and visually a contamination can be seen. When the sample later tested with water detector capsule, it is confirmed that water have been contaminating the fuel.

Picture 12

Visual indication of contamination

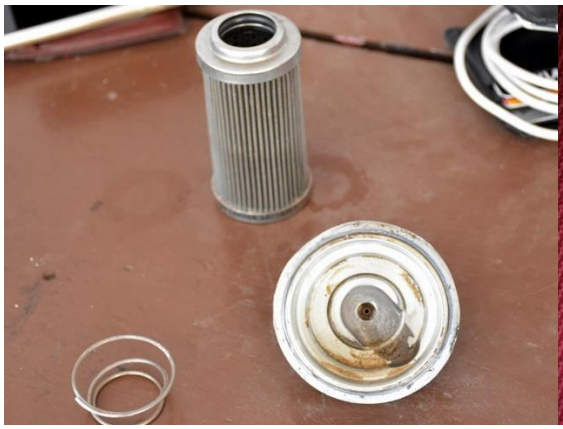


Picture 13

Change of colour of the capsule indicating water exist in the fuel sample

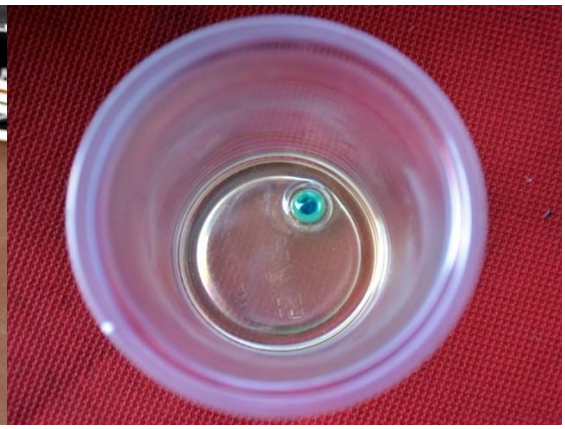
2.5 Fuel sampling on the FCU Filter.

After the wreckage safely secured at the storage hangar in Subang, fuel sample from the **FCU filter** were taken and tested for contamination. The water detector tablet used and the colour of the capsule changed to indicate water exist in the FCU filter.



Picture 14

FCU Fliter



Picture 15

Fuel sample from FCU filter. The colour of the tablet changed

2.6 Fuel sampling from the portable fuel pump's filter.

Same methodology of checking fuel contamination was done on the fuel sample from the portable fuel pump filter. **No trace of water** were found.

2.7 Examining the portable fuel pump and it accessories.

Investigators were only able to inspect the portable fuel pump with accessories approximately 11 days after the accident (8th Apr 18). By that time if there was any trace of water, it have been dried out due to hot weather of Malaysia.

The motorised pump was in a working condition. The filter was checked and no trace of water found.

The stainless pipe used (dipped into the fuel drum) has been modified with a stopper bars on the side as to ensure the pipe did not goes all the way to the bottom of the drum. This is the procedure use by the ground handler as to ensure some of the fuel at the bottom will be left in the drum as a precautionary to ensure if there is a water contamination, it will remain in the drum.

The hose is made up of a few hoses joint together using the hose clamp. This hose found to be dry with no sign of water during the inspection.

Picture 16

Fuel Pump, drums and hose

Picture 17

Pipe used connected to the hose

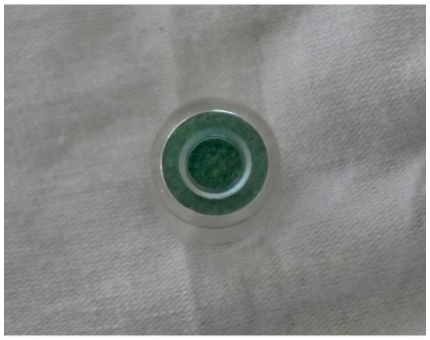
2.8 The Water Detector Capsules.

The standard Water Detector Capsules which is available in the market used by SAS ground handler in detecting water contamination. However as explained by the ground handler, the method employed to check water contamination is not as recommended by the manufacturer of the capsules.

The ground handler will drop the capsule in the fuel sample and stir the sample for a moment. If the colour of the capsule remain the same, no water exist in the fuel.

The actual sampling process require the capsule to be attach to a syringe (without a needle) and then dip in the fuel sample. Using the syringe, fuel will be extracted through the capsule. If there is any water contaminating the fuel, the colour of the table will immediately change.

The storage life for unused Shell Water Detector capsule is nine months from the time of manufacture. Capsules used by the ground handler was manufactured in the year of 2014 (**Picture 20**)



Picture 18

Water Detector capsule

Picture 19

Capsules container

Picture 20

Month and year of manufacture

2.9 Source of contamination

The investigation team was unable to trace the actual source of the water contaminating the fuel. However, it is strongly believed that the heavy rain over Keratong the whole day before the accident contributed to the contamination. The fuel drums, motorised fuel pump and fuel pump's hose were inspected 11 days after the accident. Due to hot weather of Malaysia, no trace of water from those items during inspection which by then would have been dried out. The source of water could be from any of the three items which are the fuel drums, the motorised fuel pump or the fuel pump's hose.

2.10 Fuel management at working site

The ground handler have been with SAS for a long period of time and have been handling multiple type of aircraft. However, the ground handler has never been sent to any courses or refresher course related to fuel management or ground handling management. The knowledge on safety aspect of ground handling is very vital especially when aircraft operating at a remote area without the present of supervisor to oversee ground handling operation.

2.11 Competency check on ground handler

The ground handler have not done any competency check in handling aircraft and fuel management.

2.12 The usage of water detector capsules

Expired water detector capsules and incorrect methodology employ will reduce or perhaps hinder detection of water in fuels

3.0 CONCLUSIONS

3.1 Findings

3.1.1 The pilot was properly licensed and qualified to conduct the flight.

3.1.2 The aircraft was in an airworthy condition and had a valid Certificate of Airworthiness and it has been maintained in accordance with the appropriate Maintenance Schedule.

3.1.3 The aircraft was parked overnight under the shade of palm tree with proper cover.

3.1.4 The avtur fuel drums, motorised fuel pump with the hose were left on the ground throughout the operation with a cover.

3.1.5 Rusted and dented drums (the two avtur 66 gallons drums inspected) used by operator.

3.1.6 Checking of fuel contamination was done visually by both the pilot and ground handler after each refuelling and also by using water detector capsule randomly.

3.1.7 The ground handler did not attend any training or courses on fuel management and fuel-related technical course.

3.2 Cause

The cause of the accident was due to fuel contamination which lead to engine failure during flight.

4.0 Safety Recommendation

It is recommended that:

4.1 Operator to develop Standard Operating Procedure on a proper management of fuel at work side including the proper ways of testing the fuel (not just dipping the capsule), storing of fuel drum after being unloaded and proper storage of fuel hose when not in use.

4.2 Operator is to emphasise on the Quality Assurance in order to ensure the usage of expired water detector capsules will not happen again when checking for fuel contamination.

4.3 Operator is to provide course and/or training including refresher training for ground handler on managing fuel.

4.4 Operator is to conduct a quality control on a fuel management and usage of fuel from drum storage.

5.0 APPENDICES

Nil.