AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

			Reference:			CA18/2/3/9926	
Aircraft Registration	ZS-MAD	**Date of Accident**	31 October 2020		**Time of Accident**	0429Z	
Type of Aircraft	Piper Pawnee PA-25-235D		**Type of Operation**		Agriculture (Part 137)		
Pilot-in-command Licence Type	Commercial Pilot Licence (CPL)		**Age**	51	**Licence Valid**	Yes	
Pilot-in-command Flying Experience	**Total Flying Hours**		4128.29		**Hours on Type**	Unknown	
Last Point of Departure	Private airstrip, Kirkwood, Eastern Cape Province						
Next Point of Intended Landing	Jacaranda farm, Kirkwood, Eastern Cape Province						
Damage to Aircraft (Substantial/Destroyed)	Destroyed						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Jacaranda farm at Global Positioning System (GPS) co-ordinates determined to be 33°25'09.4" South 025°27'58.7" East and at an elevation of 330 feet (ft)							
Meteorological Information	Wind direction: 230°, Wind speed: 5kt, Temperature: 14°C, Dew Point: 11°C, Cloud Cover: CAVOK, Cloud Base: 4800ft, Visibility: 9999m, QNH: 1028hPa						
Number of People On-board	1	**Number of People Injured**	0	**Number of People Killed**	1	**Other (On Ground)**	0
Synopsis							

On Saturday morning, 31 October 2020, a pilot on-board a Piper Pawnee PA-25-235D aircraft with registration ZS-MAD took off from a private airstrip in Kirkwood in the Eastern Cape province to perform an insecticide crop-spraying operation on Jacaranda farm. The farm is located approximately 12.2 kilometres (km) from the airstrip where the aircraft took off. The flight was conducted in visual flight rules (VFR) by day under the provisions of Part 137 of the Civil Aviation Regulations (CAR) 2011 as amended.

According to the owner of the Jacaranda farm, the pilot was crop-spraying lemon trees at a height of about 50 feet (ft) above ground level (AGL). Approximately 30 minutes into the flight and after the second application run, the aircraft turned right to reposition for the third application run. A witness who is a resident at the farm and was, at the time, inside her house, stated that the aircraft flew over her house twice and, during the third turn, the aircraft sounded like it was flying at a low height. A few seconds later, she heard a loud bang. A second witness stated that she saw the aircraft making a right turn at a low height. Moments later, the aircraft's right-side wing collided with a tall tree. Following impact with the tree, the aircraft was seen flying in a nose-down attitude. Later, a trail of smoke was seen coming from the direction of the aircraft accident site.

The two witnesses rushed to the accident site but could not help the pilot out of the burning wreckage due to the intensity of the fire. The aircraft was destroyed by impact forces and post-impact fire. The Aircraft Rescue and Fire-fighting (ARFF) team were called to the accident site and attended to the pilot, however, the pilot had sustained fatal injuries during the accident sequence.

Probable Cause/s and/or Contributory Factors

The pilot misjudged his proximity to the trees during a turn for a third spray run; he collided with one of the trees, resulting in loss of control and the fatal crash.

SRP Date	13 July 2021	Publication Date	15 July 2021

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ABBREVIATION	DEFINITION
A/C	Aircraft
ACCID	Accident
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AMO	Aircraft Maintenance Organisation
AMSL	Above Mean Sea Level
AP	Approved Person
ATF	Authority to Fly
°C	Degree Celsius
CAA	Civil Aviation Authority
CAR	Civil Aviation Regulations
CAVOK	Ceiling and Visibility OK
C of R	Certificate of Release
CPL	Commercial Pilot Licence
CVR	Cockpit Voice Recorder
E	East
ELEV	Elevator
FAPE	Port Elizabeth Aerodrome
FDR	Flight Data Recorder
ft	Feet
GPS	Global Positioning System
hpa	Hectopascal
IIC	Investigator In charge
INCID	Incident
IOC	Investigator on Call
KM	Kilometre(s)
kts	Knot(s)
m	Metre(s)
METAR	Meteorological Aeronautical Report
MPI	Mandatory Periodic Inspection
N/A	Not Applicable
NM	Nautical Mile
Q	Quart(s)
QNH	Query: Nautical Height
RWY	Runway
S	South
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
UTC	Co-ordinated Universal Time
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
Z	Zulu (Zero Hours Greenwich)

INTRODUCTION

Reference Number	**:** CA18/2/3/9926
Name of Owner/Operator	**:** SHEASBY AVIATION
Manufacturer	**:** Piper Aircraft Corporation
Model	**:** Piper Pawnee PA-25-235D
Nationality	**:** South African
Registration Marks	**:** ZS-MAD
Place	**:**Jacaranda farm in Kirkwood, GPS co-ordinates: S33˚29'13", E025˚34'07" Eastern Cape Province
Date	**:** 31 October 2020
Time	**:** 0429Z

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to apportion blame or liability****.*

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Investigation Process:

The accident was notified to the Accident and Incident Investigations Division (AIID) on 31 October 2020 at about 0530Z. The investigator/s travelled to Kirkwood on 1 November 2020 to conduct an on-site (full scope) investigation. The investigator/s co-ordinated with all authorities on site by initiating the accident investigation process according to CAR Part 12 and investigation procedures. The AIID is leading the investigation as the Republic of South Africa is the State of Occurrence.

Notes:
1. Whenever the following words are mentioned in this report, they shall mean the following:

- *Accident — this investigated accident*
- *Aircraft — the PA-25-235D involved in this accident*
- *Investigation — the investigation into the circumstances of this accident*
- *Pilot — the pilot involved in this accident*
- *Report — this accident report*

2. Photos and figures used in this report were taken from different sources and may have been adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows or lines.

Disclaimer:
This report is produced without prejudice to the rights of the AIID, which are reserved.

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1 On Saturday morning, 31 October 2020, a pilot on-board a Piper Pawnee PA-25-235D aircraft with registration mark ZS-MAD took off from a private airstrip in Kirkwood in the Eastern Cape province to conduct a crop-spraying operation on the Jacaranda farm. The farm is approximately 12.2 kilometres (km) from the private airstrip on which the aircraft had loaded the insecticide before take-off. The flight was conducted under visual flight rules (VFR) by day under the provisions of Part 137 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2 According to the owner of the Jacaranda farm, the pilot was crop-spraying lemon trees at a height of approximately 50 feet (ft) above ground level (AGL).

1.1.3 Approximately 30 minutes into the operation and after the second spray application run, the aircraft turned right to reposition for the third application run. A witness who is a resident at the farm and was, at the time, inside her house, stated that the aircraft flew over her house twice and, during the third turn, the aircraft sounded like it was flying at a low height. A few seconds later, she heard a loud bang. She quickly went outside to investigate. This was when she saw a cloud of black smoke coming from the east side of her house (the accident site). A second witness who was working on the farm stated that she saw the aircraft making a right turn at a low height of approximately 50ft. Thereafter, the aircraft's right-side wing suddenly collided with a tall tree, which was approximately 50ft. She then saw debris from the aircraft falling as the aircraft went down in a nose-down attitude. Moments later, she saw a cloud of smoke coming from the direction of the accident site. Following impact with the tree, the aircraft impacted terrain (this was out of sight of witnesses). Both witnesses stated that they had rushed to the site of the accident and, on arrival, found the aircraft engulfed in flames. They could not rescue the pilot due to the intensity of the flames. They then called the owner of the farm who contacted the Aircraft Rescue and Fire-fighting (ARFF) team. Witnesses described the local weather conditions at the time of accident as fine with no wind at ground level.

Figure 1: The accident site and the sprayed crop section. (Source: Google Earth)

1.1.4 The pilot was fatally injured and the aircraft was destroyed by post-impact fire.

1.1.5 The accident occurred during daylight at Jacaranda farm at Global Positioning System (GPS) co-ordinates determined to be 33°25'09.4" South 025°27'58.7" East, at an elevation of 330 feet (ft).

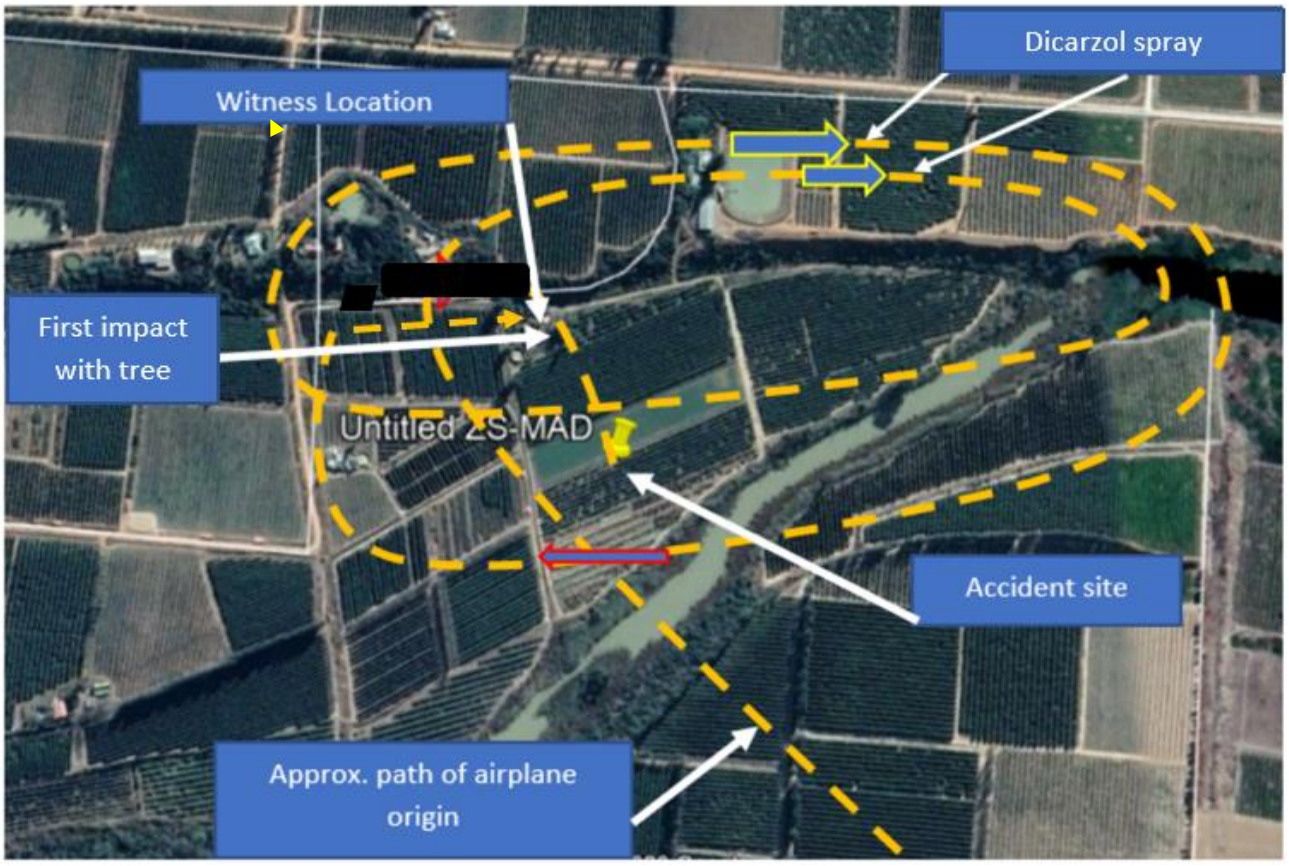


Figure 2: Flight path and accident/witness location. (Source: Google Earth)

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	1	-	-	1	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	-	-	-	-	-
Total	1	-	-	1	-

Note: Other means people on ground.

1.3. Damage to Aircraft

1.3.1 The aircraft was destroyed by impact and a post-impact fire that ensued.

Figure 3: The burnt wreckage post-accident.

1.4. Other Damage

1.4.1. Some lemon trees were uprooted after the aircraft impacted the ground and were also torched by post-impact fire.

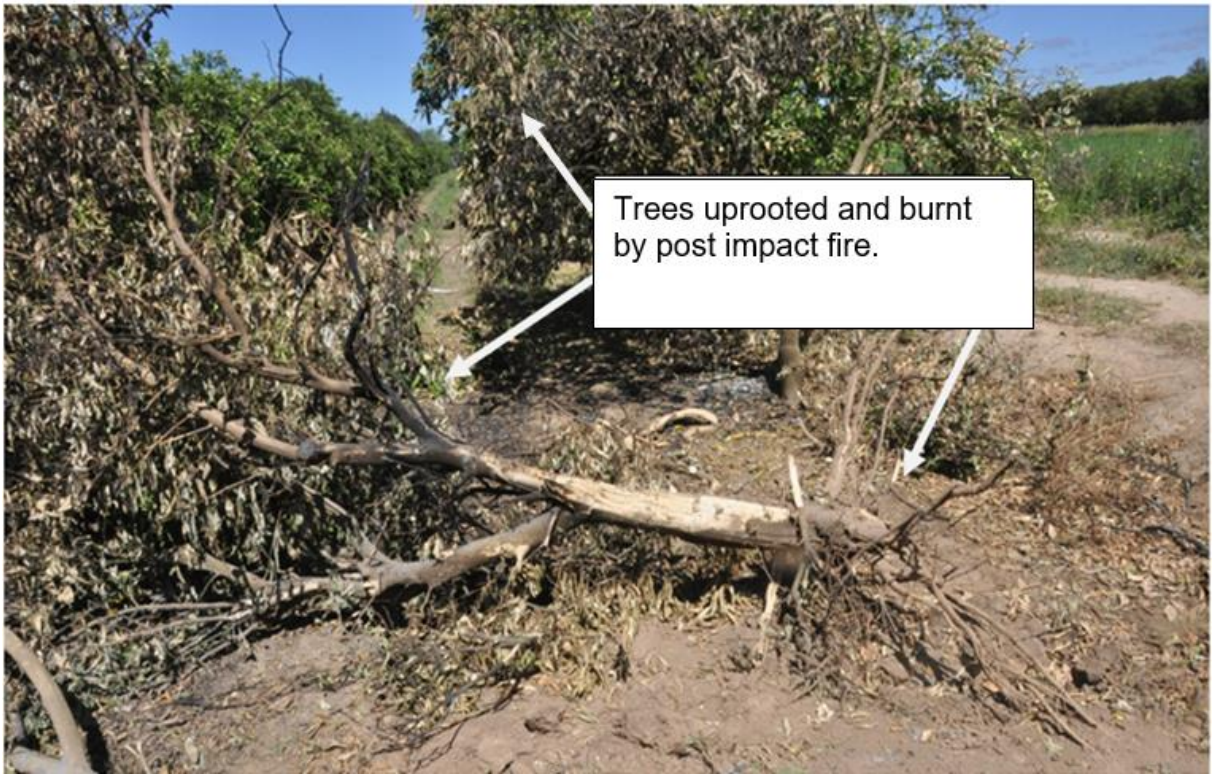


Figure 4: Uprooted and burnt trees.

1.5. Personnel Information

Nationality	South African	Gender	Male	Age	51
Licence Number	**********	Licence Type	Commercial Pilot Licence (CPL)		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument rating				
Medical Expiry Date	(Class 1) 31 October 2023				
Restrictions	Corrective Lenses				
Previous Accidents	None				

Note: Previous accidents refer to past accidents the pilot was involved in, when relevant to this accident.

Flying Experience:

Total Hours	4128.29
Total Past 24 Hours	Unknown
Total Past 7 Days	Unknown
Total Past 90 Days	19.01
Total on Type Past 90 Days	19.01
Total on Type	Unknown

1.5.1 According to the pilot's file and the last two copies of his logbook, the pilot had flown approximately 4128.29 hours until 31 October 2020, of which 19.01 hours were on type in the past 90 days prior to the accident.

1.5.2 The pilot was issued a Commercial Pilot Licence on 23 October 2019 with an expiry date of 31 October 2020. The pilot was granted an extension of 30 (thirty) days on his licence and

rating in terms of CA 61.01.01.05 (6) (h) issued on 1 November 2020 with an expiry date of 30 November 2020.

1.5.3 The pilot was in possession of a Class 1 aviation medical certificate issued on 16 October 2020.

1.6. Aircraft Information

1.6.1 The aircraft was a Piper Pawnee-25-235D, manufactured in the United State of America in 1979 by Piper Aircraft Corporation. It was fitted with a Textron Lycoming engine providing 235 horsepower, driving a McCauley propeller and with fuel tanks of a capacity of 145 litres (l). The aircraft was fitted with additional equipment (G5-agricultural spraying, seeding and dusting, G8-fire spotting, control and fighting) on the wings.

Airframe:

Manufacturer/Model	Piper Aircraft Corporation	
Serial Number	25-7956032	
Year of Manufacture	1979	
Total Airframe Hours (At Time of Accident)	2473.40	
Last MPI (Date & Hours)	16 September 2020	2463.17
Hours Since Last MPI	10.23	
C of A (Issue Date)	4 December 2018	
C of A (Expiry Date)	31 December 2020	
C of R (Issue Date) (Present Owner)	11 March 2016	
Operating Categories	Part 137 (Agriculture)	
Type of Fuel Used in the Aircraft	Avgas 100LL	
Previous Accidents	On 4 April 2017 the aircraft executed an unsuccessful forced landing following an engine failure as a result of damaged magnetos caused by a damaged exhaust muffler.	

Note: Previous accidents refer to past accidents the aircraft was involved in, when relevant to this accident.

1.6.2 The aircraft was issued a Certificate of Release to Service on 18 September 2020 with an expiry date of 18 September 2021 or at 2 563 airframe hours, whichever occurs first.

Engine:

Manufacturer/Model	AVCO Lycoming
Serial Number	L-21683-40A
Part Number	0-540-B2C5
Hours Since New	2463.17
Hours Since Overhaul	184.76

1.6.3 The aircraft was powered by a Lycoming 0-540-B2C5 engine, driving a McCauley 1A200/FA8452, two-bladed, fixed-pitch metal propeller. The engine was installed in 1979. During the last Mandatory Periodic Inspection (MPI) 100-hourly inspection, the aircraft had

accumulated 2 463.17 hours since new and had been flown a further 184.76 hours since its last overhaul (of a 2000-hour overhaul life). There were no significant engine maintenance items recorded in the engine logbook. Under the Supplemental Type Certificate (STC) provisions, only the Lycoming O-540-A1D5 or O-540-H2A5 engines were approved for fitment to the PA 25-235D/A9 aircraft.

Propeller:

Manufacturer/Model	McCauley
Serial Number	AL146001
Part Number	1A200-FA
Hours Since New	184.76
Hours Since Overhaul	Not yet reached

1.6.4 According to available information, the accident aircraft was modified and converted to an agricultural aircraft (A9).

1.6.5 The aircraft's single 145-litre polymer fuel tank was located immediately behind the engine firewall and in front of the payload hopper. According to Load and Fuel Tracking records, the aircraft was refuelled to capacity from a local bowser on 31 October 2020 prior to the accident flight.

1.6.6 The Mass and Balance Report (CA43-17) was issued to the aircraft by the Regulator (SACAA) on 16 November 2018, with an expiry date of 16 November 2023. The calculated take-off weight of the aircraft on the day of the accident was approximately 2808 pounds (lb), which is below the maximum certificated take-off weight of 2900lb.

Empty Weight	1523lb
Pilot	176lb
Cargo(pesticides)	880lb
Fuel	229lb
Total	2808lb
PA25-235D/A9 MTOW	2 900lb

1.7. Meteorological Information

1.7.1 A weather report was obtained from the South African Weather Service (SAWS) for the day and time of the accident. The information provided by SAWS in the table below was obtained from the Meteorological Aeronautical Report (METAR) recorded at Port Elizabeth Aerodrome (FAPE) on 31 October 2020 at 0430Z, which is located 53 nautical miles (nm) north-east (NE) of Kirkwood.

Wind Direction	230°	Wind Speed	5kts	Visibility	9999m
Temperature	14°C	Cloud Cover	Broken	Cloud Base	4800ft
Dew Point	11°C	QNH	1028hpa		

1.7.2 Between 5 and 7 octas of cloud were reported in the general vicinity between 0400Z and 0430Z bases, ranging from 4200ft to 4800ft above ground level (AGL).

1.8. Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as required by the Regulator (SACAA). There were no recorded defects with the navigation equipment prior to the accident flight.

1.8.2 A burnt GPS Tracker Recording system was recovered from the accident site for further analysis. But due to its state of damage, analysis could not be performed.

1.9. Communication

1.9.1 The aircraft was equipped with standard communication equipment as required by the Regulator (SACAA). There were no recorded defects with the communication equipment prior to the accident flight.

1.10. Aerodrome Information

1.10.1 The accident did not occur at or near an aerodrome. The accident site is approximately 12.2 kilometres (km) from the take-off private airstrip at GPS co-ordinates 033°29'13"S 025°34'07"E, at an elevation of 330ft.

1.11. Flight Recorders

1.11.1 The aircraft was not fitted with a cockpit voice recorder (CVR) or a flight data recorder (FDR), and neither was required by regulation to be fitted to this type of aircraft.

1.12 Wreckage and Impact Information

1.12.1 On the third spray pattern, the pilot misjudged the tree height and impacted a tree that was approximately 50ft high which caused the right-side wing to bend downward. The aircraft continued in a nose-dive attitude and collided with the lemon trees of an approximate height of 7ft.

Figure 6: The engine under the front part of the wreckage.

1.12.2 The instruments panel was destroyed by post-impact fire.

Figures 7 & 8: Damaged instruments.

1.12.3 The aircraft was made of fibre cloth, which was destroyed by post-impact fire.

Figure 9: Wreckage at the scene of the accident.

1.12.4 The on-site investigation found the following: the right rudder cable had broken strands approximately four inches adjacent to the pilot seat. The same rudder cable was wrapped around the pilot's control stick and end points attached normally. Pulleys could not be checked for serviceability due to fire damage. The left-side rudder cable was still connected, and continuity was confirmed to the front connection.

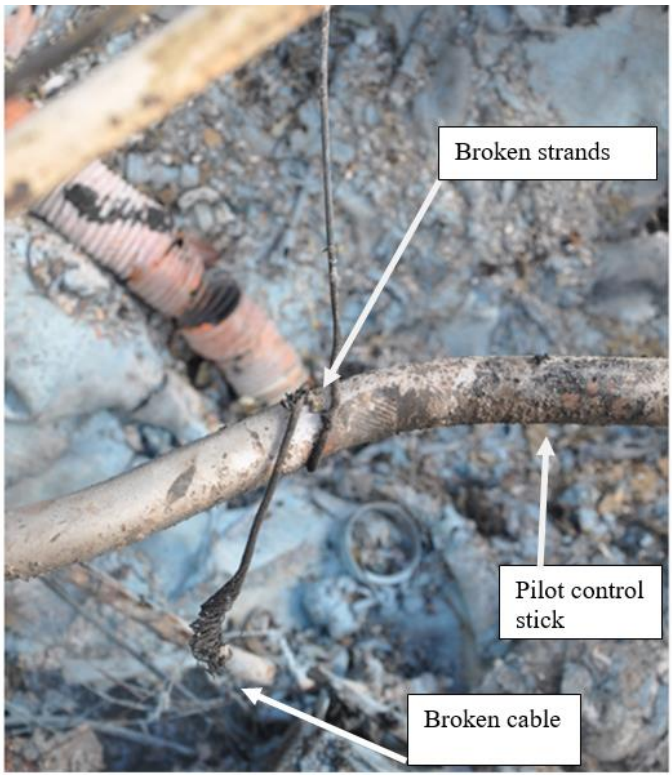


Figure 10: Damaged rudder cable.

1.12.5 The bottom elevator bungee spring that assists the elevator to stay at the desired angle was elongated; the top one had no anomalies. Continuity on both springs was confirmed to the front connection with no broken strands on the cables, and the elevator frame could be moved up and down.

Figure 11: Elevator bungee spring cables.

1.12.6 The engine was still intact except for wires that were burnt. The engine could only be turned 90° by hand due to propeller hub damage. One of the propeller blades had a small “S” bent; no other anomalies were detected. The engine fire-extinguisher lever was found in the “OFF” position.

Figure 12: Engine and propeller post-accident indicate that the engine was producing power at time of impact.

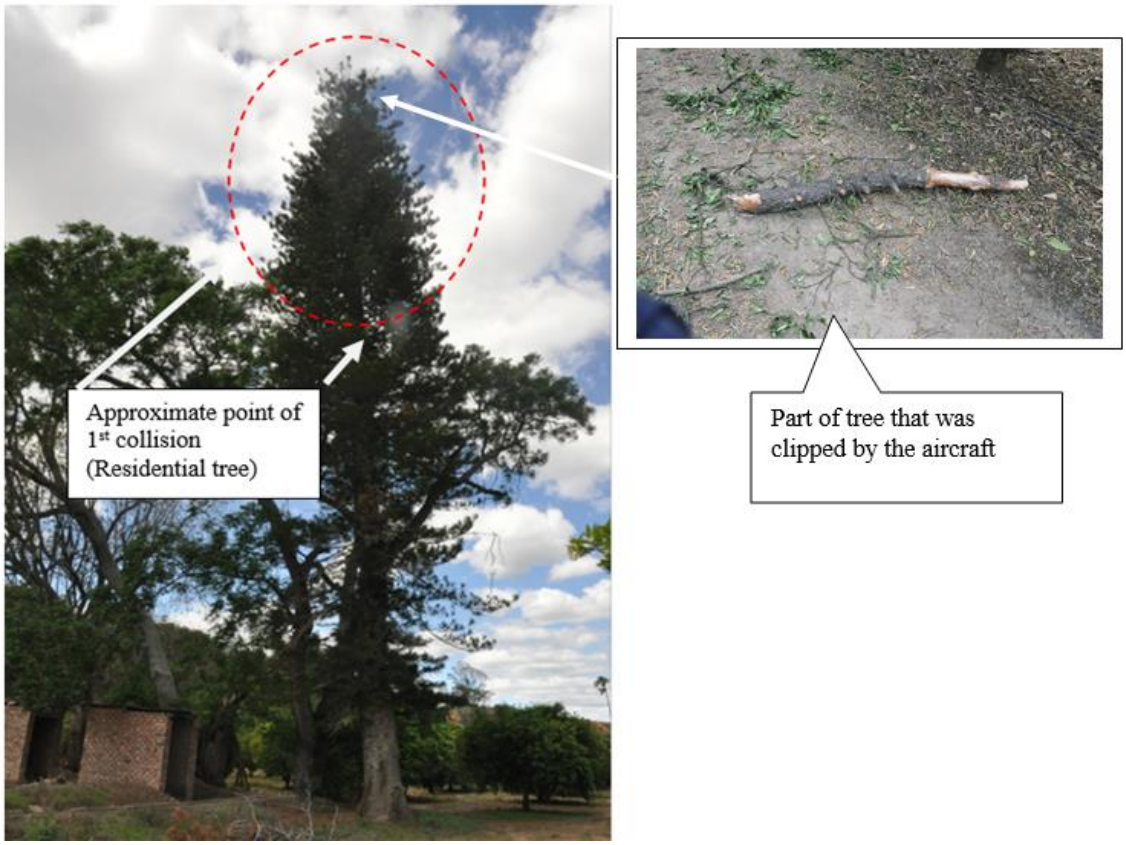


Figure 13: The first tree that the aircraft impacted.

1.13 Medical and Pathological Information

1.13.1 The medico-legal post-mortem report indicated that the pilot's fatal injuries were due to multiple blunt force injuries sustained during impact.

1.14 Fire

1.14.1 A post-impact fire ensued and destroyed the aircraft.

1.15 Survival Aspects

1.15.1 The accident was considered not survivable due to the extensive damage sustained in the cockpit area as a result of impact forces, as well as the post-impact fire that ensued.

1.15.2 The pilot seemed to have been restrained by a four-point harness. The airframe harness attachment points were intact; however, the post-impact fire had consumed the harness webbing and inertia reel, precluding any further assessment of the restraint system integrity.

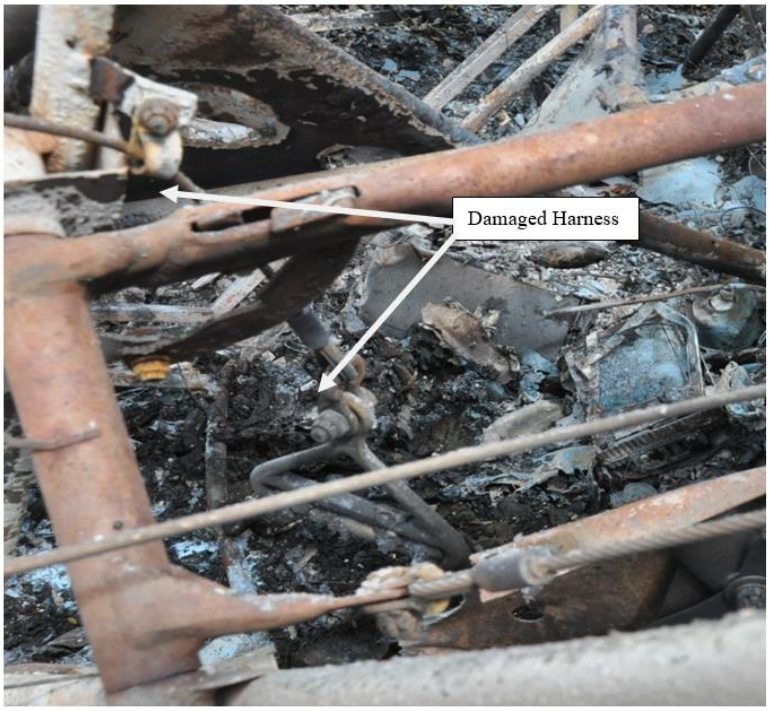


Figure 14: The damaged harness in the wreckage.

1.16 Tests and Research

1.16.1 Tests

1.16.1.1 The aircraft flight control cables were sent to a laboratory for further analysis. Below is the report from the laboratory.

Elevator Stabiliser Cable:
No clear evidence of pre-existing fracture initiation. All damages are impact-related with some temperature induced indications. (photos 1 and 2)

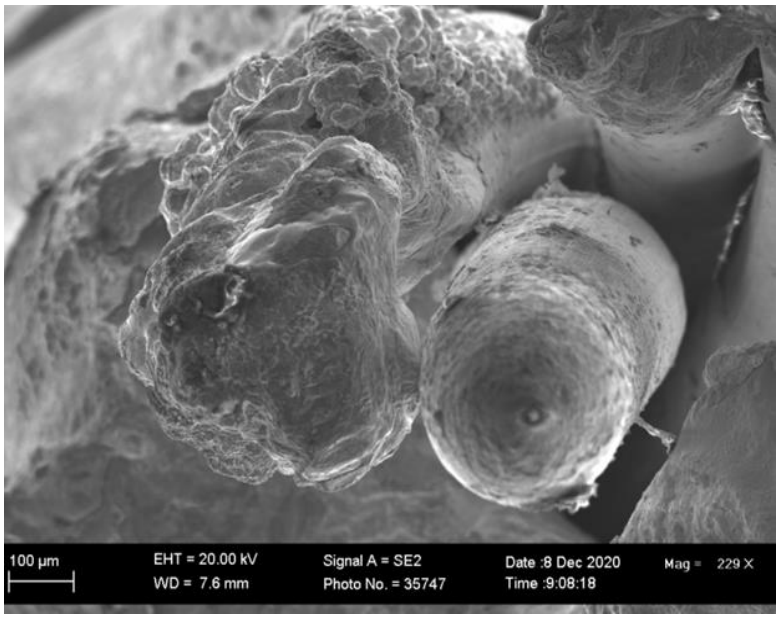


Photo 1

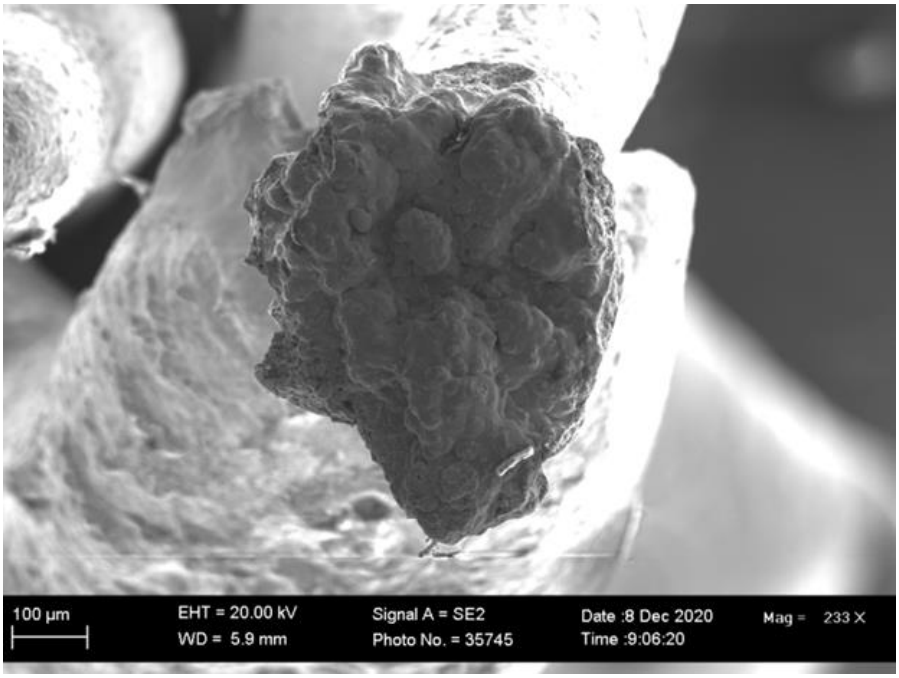


Photo 2

Right-hand Rudder Control Cable:
No clear evidence of pre-existing fracture initiation. All damages are impact-related with some temperature-induced indications. (Photo 3).

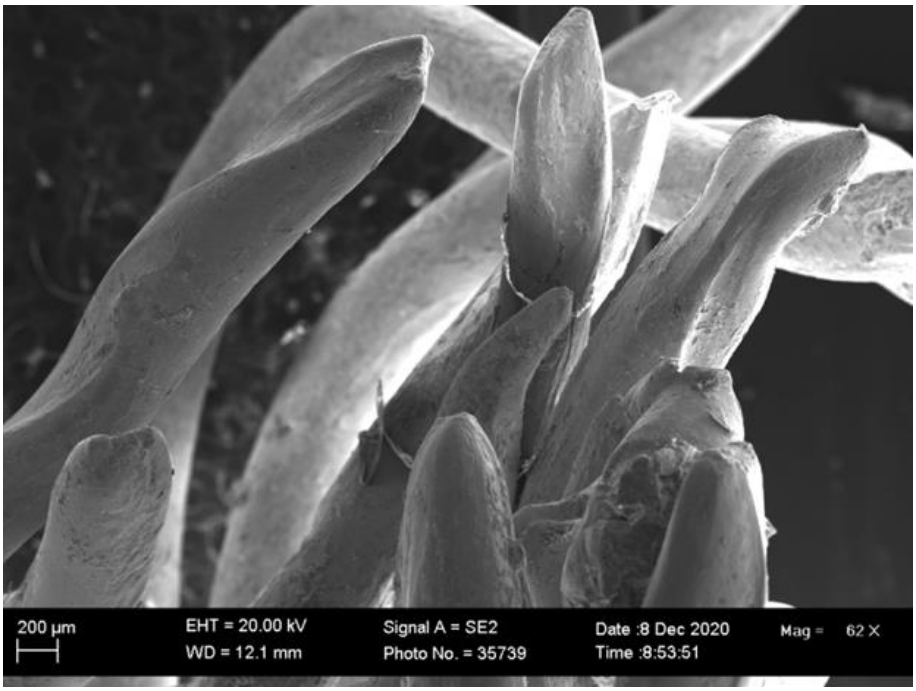


Photo 3

The lack of clear necking at the fracture positions suggest that the cable was severed and not exposed to a tensile overload. The localised inter-cable strand indentations confirm a side load (during impact) to be the primary cause of cable failure (photos 4, 5 and 6).

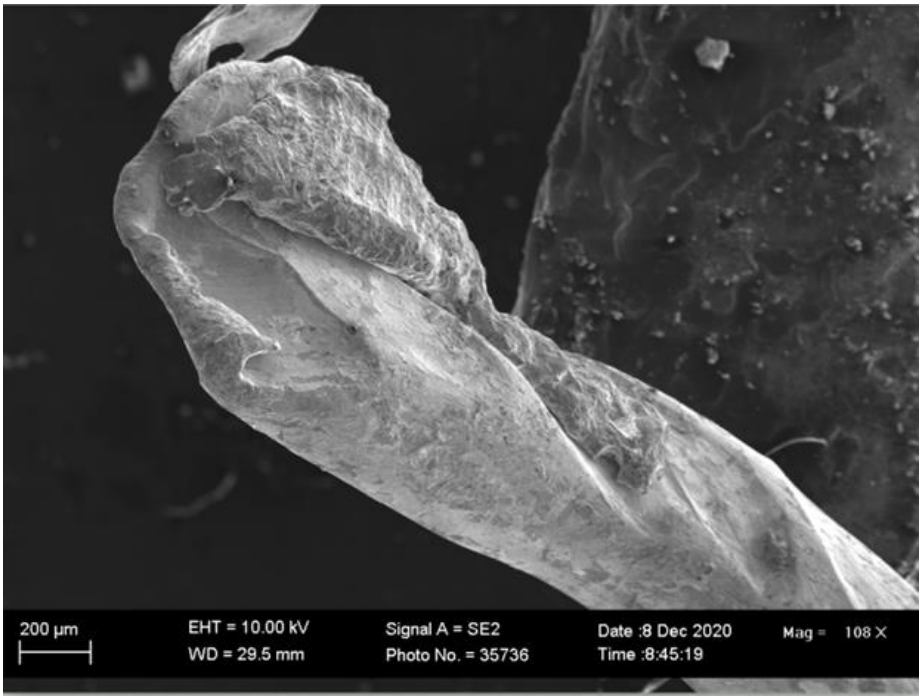


Photo 4

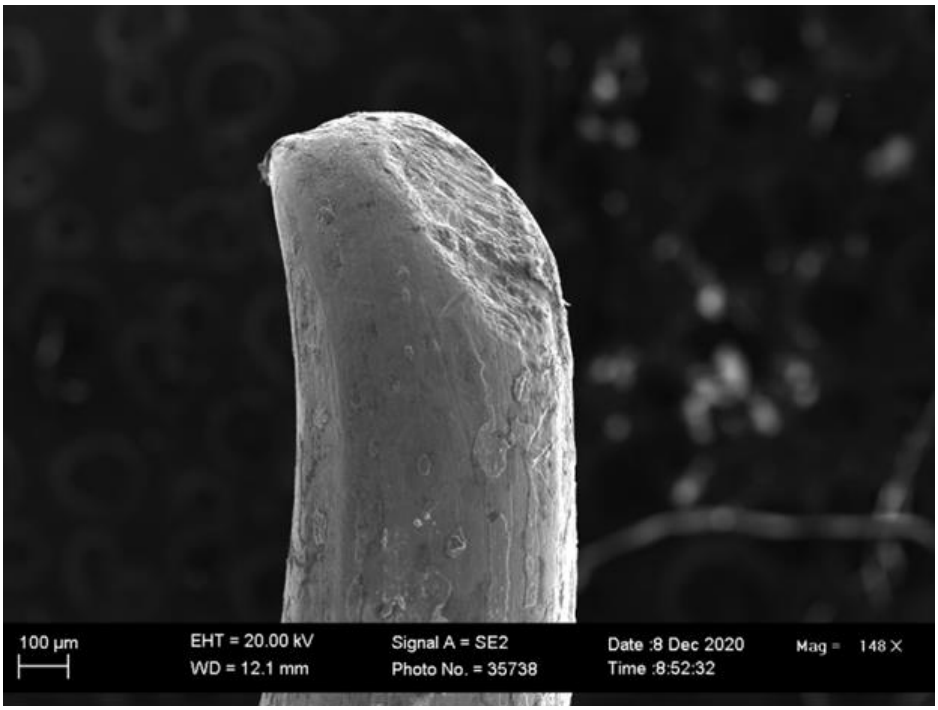


Photo 5

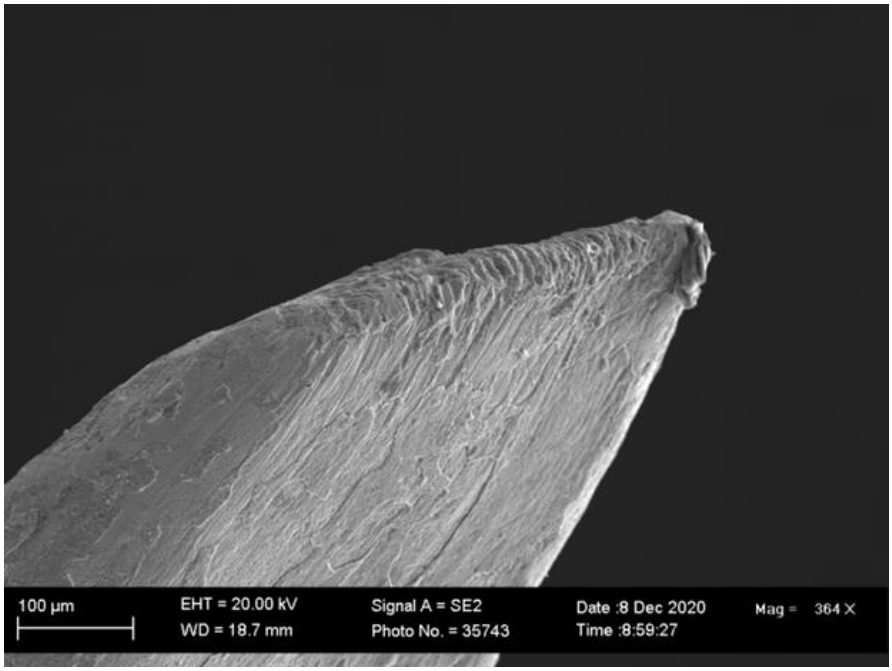


Photo 6

1.16.2 Research

1.16.2.1 Is Crop Dusting Dangerous (Source: aerocorner.com)

Yes. Despite technological advances and the aviation industry becoming highly monitored and safety conscious, crop-dusting remains a 'dangerous line of work' for its pilots. In 2017, there were 67 incidents involving agricultural airplanes, with 7 of these resulting in a fatality.

Some Perspective:

Planes have been used for agricultural purposes for almost 100 years, so it seems strange that this industry is still so risky. In 2017 0.02% of AG pilots had a fatal accident, compared to a fatal accident rate of 0.003% among GA pilots. The same year, there were over 40,000 people killed in car accidents in the US alone, giving it roughly the same fatality risk as crop dusting. Although, it is worth noting that we hop in our cars every day, whereas this is not likely the case for AG pilots. What is perhaps most startling, is that this figure does not appear to be reducing. Whilst commercial aviation has improved its accident rate by 80% in the last decade, this is not the case for agricultural aviation. Today, 'dodging trees, homes, power lines and on-lookers' as an AG pilot causes, on average, 5 accidents a month just in North America.

Why Is Crop Dusting Dangerous?

Power Lines

AG flying is a physically demanding and hazard-rich environment. Collision with objects, namely power lines, is the most common cause for accidents in this type of operation. Obstacles under 200ft are not required to be marked or mapped by the FAA and so power lines are notoriously difficult to spot when flying as low as crop dusters do, even if you know where to look for them. Travelling at speeds up to 200mph, power lines will easily 'slice a plane in half'. Although some AG planes have wire cutters on the landing gear and guides that prevent wires from slicing through the tail, these features do not eradicate this risk.

Stalls

Fatalities in this industry, however, are often the result of stalls. A stall is what happens when the wing loses its ability to generate lift and is dependent on a number of factors including the plane's speed, wing shape and air density. When at altitude, stall recovery is relatively simple, but the pilot must descend in order to do this. But if an AG plane is only 6ft above the ground, there is no room for such a recovery. To avoid this, pilots must make sure to keep their speed up, even in tight turns and evasive maneuvers.

1.17 Organisational and Management Information

1.17.1 The flight was conducted in accordance with the provisions of Part 137 of the CAR 2011 as amended.

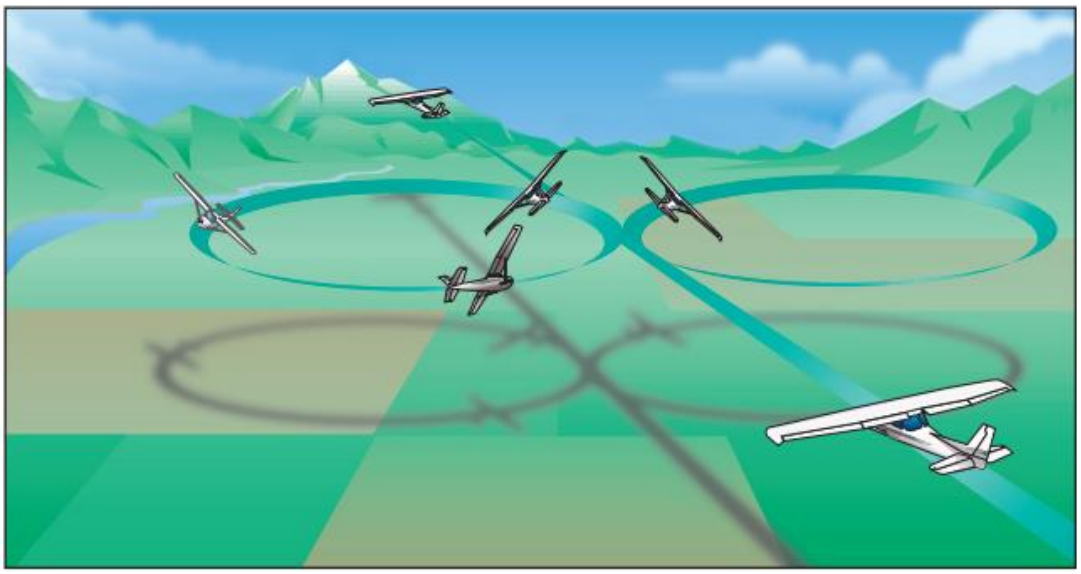
1.17.2 The operator was issued an Air Operating Certificate (AOC) number CAA/G1400D with endorsement of Part 137 by the Regulator (SACAA) on 3 March 2020, with an expiry date of 28 February 2021. The owner of the aircraft had a Class G certificate in accordance with the Civil Aviation Regulations.

1.17.3 The aircraft maintenance organisation (AMO) that carried out the last maintenance inspection on the aircraft was issued an AMO approval certificate on 30 October 2020 with an expiry date of 30 September 2021.

1.18 Additional Information

STEEP TURNS (Source: Airplane Flying Handbook, FAA-H-8083-3A pages 9-12)

The objective of the manoeuvre is to develop the smoothness, coordination, orientation, division of attention, and control techniques necessary for the execution of maximum performance turns when the airplane is near its performance limits. Smoothness of control use, coordination, and accuracy of execution are the important features of this manoeuvre. The steep turn manoeuvre consists of a turn in either direction, using a bank angle between 45° to 60°. This will cause an overbanking tendency during which maximum turning performance is attained and relatively high load factors are imposed. Because of the high load factors imposed, these turns should be performed at an airspeed that does not exceed the airplane's design manoeuvring speed (VA). The principles of an ordinary steep turn apply, but as a practice manoeuvre the steep turns should be continued until 360° or 720° of turn have been completed.



The limiting load factor determines the maximum bank, which can be maintained without stalling or exceeding the airplane's structural limitations. In most small planes, the maximum bank has been found to be approximately 50° to 60°. The pilot should realize the tremendous additional load that is imposed on an airplane as the bank is increased beyond 45°. During a coordinated turn with a 70° bank, a load factor of approximately 3 Gs is placed on the airplane's structure. Most general aviation type airplanes are stressed for approximately 3.8 Gs. Regardless of the airspeed or the type of airplanes involved, a given angle of bank in a turn, during which altitude is maintained, will always produce the same load factor. Pilots must be aware that an additional load factor increases the stalling speed at a significant rate—stalling speed increases with the square root of the load factor. For example, a light plane that stalls at 60 knots in level flight will stall at nearly 85 knots in a 60° bank. The pilot's understanding and observance of this fact is an indispensable safety precaution for the performance of all maneuvers requiring turns. Before starting the steep turn, the pilot should ensure that the area is clear of other air traffic since the rate of turn will be quite rapid. After establishing the manufacturer's recommended entry speed or the design maneuvering speed, the airplane should be smoothly rolled into a selected bank angle between 45° to 60°. As the turn is being established, back-elevator pressure should be smoothly increased to increase the angle of attack. This provides the additional wing lift required to compensate for the increasing load factor. After the selected bank angle has been reached, the pilot will find that considerable force is required on the elevator control to hold the airplane in level flight—to maintain altitude. Because of this increase in the force applied to the elevators, the load factor increases rapidly as the bank is increased. Additional back-elevator pressure increases the angle of attack, which results in an increase in drag. Consequently, power must be added to maintain the entry altitude and airspeed.

Common errors in the performance of steep turns are:

- *Failure to adequately clear the area.*
- *Excessive pitch change during entry or recovery.*

- *Attempts to start recovery prematurely.*
- *Failure to stop the turn on a precise heading.*
- *Excessive rudder during recovery, resulting in skidding.*
- *Inadequate power management.*
- *Inadequate airspeed control.*
- *Poor coordination.*
- *Failure to maintain constant bank angle.*
- *Disorientation.*

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1. General

From the available evidence, the following analysis was made with respect to this accident. This shall not be read as apportioning blame or liability to any particular organisation or individual.

2.2. Analysis

2.2.1 There was no evidence of any in-flight failure of the airframe structure or flight control systems. The engine appeared to have been producing significant power at the time of impact.

2.2.2 A probability exists that as the pilot was operating at a height of approximately 50ft and during a right turn to reposition for the third spray run, he misjudged the aircraft's proximity to the trees he was flying over, resulting in a collision with one of the trees and the subsequent loss of control before crashing. The challenges or contributing factors to this accident are that his aircraft was a low-wing, which made it difficult to see objects under the wing (blind spot); and even if he could have seen that there was a tree, it would have been difficult to judge the height of a tree from the sky: *all trees seem to have the same height from the sky*. The other challenge was the fact that as he was making the steep right turn, he was also to make a descent to approximately 50ft to begin spraying. Fifty feet is the approximated height of the tree (that he collided with) and, as the aircraft was travelling at high speed, it was not easy to initiate an evasive manoeuvre (see Figure 2).

2.2.3 The calculated take-off weight of the aircraft on the day of the accident was within limits, therefore, it was considered unlikely that weight and balance issues were a contributing factor in this accident.

3. CONCLUSION

3.1 General

From the available evidence, the following findings, causes and contributing factors were made with respect to this accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusion heading:

- **Findings —** are statements of all significant conditions, events or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.
- **Causes —** are actions, omissions, events, conditions or a combination thereof, which led to this accident.
- **Contributing factors —** are actions, omissions, events, conditions or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident occurring, or would have mitigated the severity of the consequences of the accident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

3.2 Findings

3.2.1 The pilot was initially issued a Commercial Pilot Licence (CPL) on 4 July 2001. His last licence validation was on 23 October 2019 with an expiry date of 31 October 2020. The pilot was granted an extension of 30 (thirty) days on his licence and rating in terms of the CA 61.01.01.05 (6) (h), issued on 1 November 2020 with an expiry date of 30 November 2020.

3.2.2 The pilot was issued a Class 1 aviation medical certificate on 16 October 2020 with an expiry date of 31 October 2023.

3.2.3 The aircraft was issued a Certificate of Airworthiness on 4 December 2018 with an expiry date of 31 December 2020. The aircraft was issued a Certificate of Registration on 11 March 2016.

3.2.4 The aircraft was issued a Certificate of Release to Service on 18 September 2020 with an expiry date of 18 September 2021 or at 2 563 airframe hours, whichever occurs first.

3.2.5 The last MPI (100h/1year) was carried out on 18 September 2020 at 2 463.17 airframe hours. The aircraft had accumulated an additional 0.23 airframe hours since the last inspection check maintenance.

3.2.6 The flight was conducted under the provisions of Part 137 of the Civil Aviation Regulations (CAR) 2011 as amended and was involved in agricultural operations at the time of accident. The flight lasted approximately 30 minutes. Clear weather conditions prevailed at the time of accident.

3.2.7 The operator was issued an Air Operating Certificate (AOC) number CAA/G1400D Part 135 with endorsement of Part 137 by the Regulator (SACAA) on 3 March 2020, with an expiry date of 28 February 2021. The owner of the aircraft had a Class G certificate in accordance with the Civil Aviation Regulations.

3.2.8 The AMO that carried out the last maintenance inspection on the aircraft was issued an AMO approval certificate on 30 October 2020 with an expiry date of 30 September 2021.

3.2.9 The flight was conducted under visual flight rules (VFR) by day. Witnesses described local weather conditions at the time of accident as fine with no wind at ground level.

3.2.10 During the right turn, the pilot misjudged his proximity to the trees during a turn for a third spray run and collided with one of the trees, resulting in loss of control and the fatal crash.

3.3 Probable Cause/s

3.3.1 The pilot misjudged his proximity to the trees during a turn for a third spray run and collided with one of the trees, resulting in loss of control and the fatal crash.

4. SAFETY RECOMMENDATIONS

4.1. General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report. The AIID expects that all safety issues identified by the investigation are addressed by the receiving States and organisations.

4.2. Safety message

4.2.1 Operators and pilots are reminded of the dangers of aerial application near rising terrain and the importance of pre-flight planning of application runs to account for nearby terrain.

5. APPENDICES

5.1 None.

This report is issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa