SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Accident and Incident Investigations Division** Form Number: CA 12-57

LIMITED SERIOUS INCIDENT INVESTIGATION REPORT

Reference Number	CA18/3/2/1359						
Classification	Serious Incident	**Date**	3 August 2021	**Time**	1400Z		
Type of Operation	Private (Part 91)						
Location							
Place of Departure	Wonderboom Airport (FAWB)	Place of Intended Landing	Wonderboom Airport (FAWB)				
Place of Accident	Morningside private farm in Rustenburg, North West province						
GPS Co-ordinates	Latitude	S 25° 38' 08"	Longitude	E 26° 55' 03"	Elevation	4200 ft	
Aircraft Information							
Registration	ZS-FWK						
Model/Make	Piper PA-28-140						
Damage to Aircraft	Minor	Total Aircraft Hours	12120.65				
Pilot-in-command							
Licence Valid	Yes	Gender	Female	Age	29		
Licence Type	Private Pilot Licence (Aeroplane)						
Total Hours on Type	134.0	Total Flying Hours	144.0				
People On-board	1 + 1	Injuries	0	Fatalities	0	Other (On Ground)	0

What Happened

On 3 August 2021, a pilot and a passenger on-board a Piper Cherokee aircraft with registration ZS-FWK took off on a cross-country flight from Wonderboom Airport (FAWB) routing via waypoint UTRUK, Rustenburg Airfield (FARG) and Zeerust Airfield (FAZR) with the intention to return to FAWB. A flight plan was filed, and the flight was conducted in visual flight rules (VFR) by day under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot stated that whilst flying over FARG, she initiated a climb from 6500 feet (ft) to 8500ft to be able to fly over the mountain range located west of FARG. However, whilst initiating the climb, she noted that the aircraft's altimeter was showing a slow rise. Eventually, the aircraft reached 7500ft overhead the mountain range, however, the pilot encountered a tailwind; thereafter, the aircraft started to descend with the airspeed indicator showing an increase from 100 knots (kts) to 180kts. The pilot tried to reduce speed by reducing power slightly to stop the descent but was unsuccessful. She tried again to reduce power but still the airspeed remained at 180kts. The pilot then searched and found a suitable area to conduct a precautionary landing. Whilst on finals for landing, the airspeed indicator

was still showing an airspeed of 180kts. She then applied power to initiate a go-around and, as the aircraft began to climb, the airspeed indicator decreased to 60kts. She then committed for a full landing ahead of her flight path. The aircraft touched down successfully but towards the end of the landing roll, it struck a wire fence and the aircraft's wings got entangled with the wire fence. The aircraft came to rest in that position.

The aircraft sustained scratches on both wings and the windscreen. The pilot and the passenger were not injured during the serious incident.

Figure 1: The aircraft at the accident site. (Source: Approved Training Organisation)

Post-incident inspection revealed that the pitot tube (installed on the underside of the left wing) had been severed by the wire fence during the landing roll. The aircraft maintenance engineer (AME) conducted an on-site test on the pitot tube by blowing into both the pitot and static port. The pitot port was clear, but the static port was blocked with no air coming out on the other end.

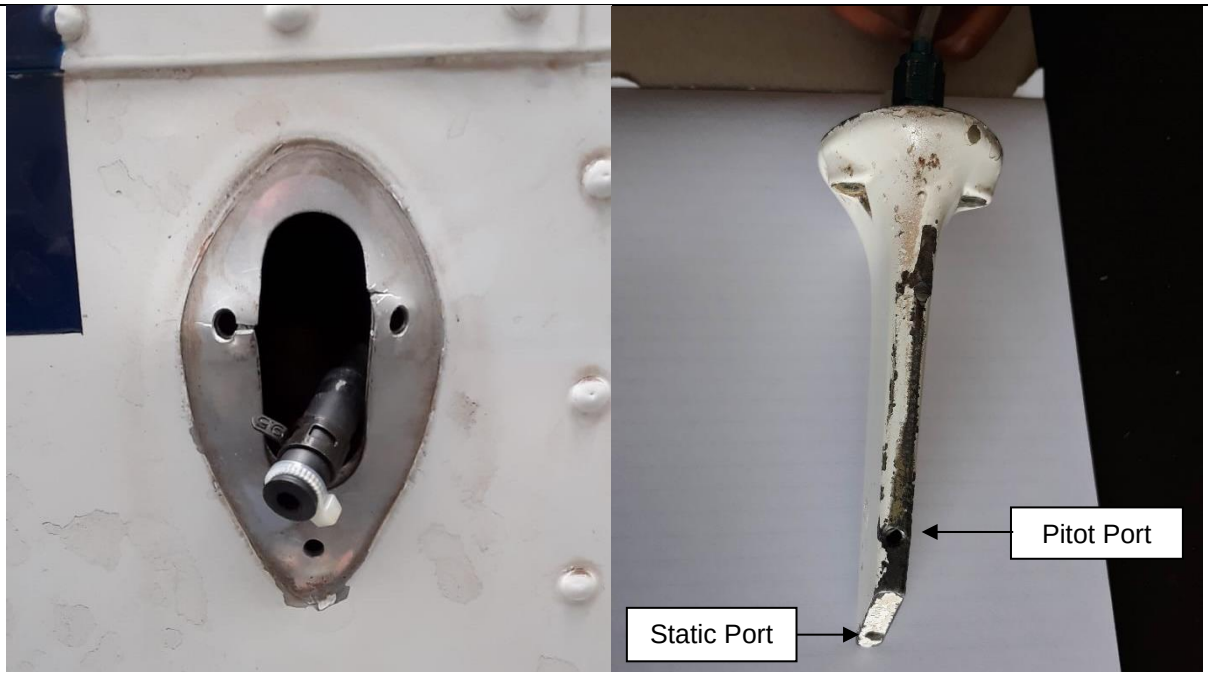


Figure 2: The pitot tube severed from the aircraft. (Source: aircraft maintenance engineer)

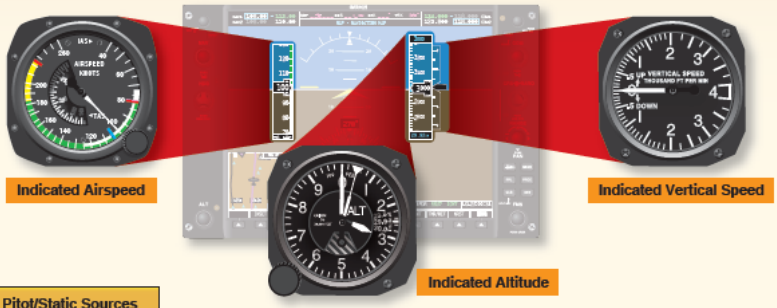
Pitot-Static System (Source: FAA Airplane Flying Handbook)

The source of the pressure for operating the airspeed indicator, the vertical speed indicator (VSI), and the altimeter is the pitot-static system. The major components of the pitot-static system are the impact pressure chamber and lines and the static pressure chamber and lines, each of which are subject to total or partial blockage by ice, dirt, and/or other foreign matter. Blockage of the pitot-static system adversely affects instrument operation.

Partial static system blockage is insidious in that it may go unrecognized until a critical phase of flight. During take-off, climb, and level-off at cruise altitude the altimeter, airspeed indicator, and VSI may operate normally. No indication of malfunction may be present until the airplane begins a descent.

If the static reference system is severely restricted, but not entirely blocked, as the airplane descends, the static reference pressure at the instruments begins to lag behind the actual outside air pressure. While descending, the altimeter may indicate that the airplane is higher than actual because the obstruction slows the airflow from the static port to the altimeter. The VSI confirms the altimeter's information regarding rate of change because the reference pressure is not changing at the same rate as the outside air pressure. The airspeed indicator, unable to tell whether it is experiencing more airspeed pitot pressure or less static reference pressure, indicates a higher airspeed than actual. To the pilot, the instruments indicate that the airplane is too high, too fast, and descending at a rate much less than desired.

If the pilot levels off and then begins a climb, the altitude indication may still lag. The VSI indicates that the airplane is not climbing as fast as actual. The indicated airspeed, however, may begin to decrease at an alarming rate. The least amount of pitch-up attitude may cause the airspeed needle to indicate dangerously near stall speed.



Effect of Blocked Pitot/Static Sources on Airspeed, Altimeter, and Vertical Speed Indications	Indicated Airspeed	Indicated Altitude	Indicated Vertical Speed
Pitot source blocked	Increases with altitude gain, decreases with altitude loss.	Unaffected	Unaffected
One static source blocked	Inaccurate while sideslipping; very sensitive in turbulence.		
Both static sources blocked	Decreases with altitude gain, increases with altitude loss.	Does not change with actual gain or loss of altitude.	Does not change with actual variations in vertical speed.
Both static and pitot sources blocked	All indications remain constant, regardless of actual changes in airspeed, altitude, and vertical speed.		

Figure 3: The effects of a blocked pitot tube. (Source: FAA, Airplane Flying Handbook)

The pitot static and Mode C transponder checks were carried out on 19 April 2021 at a total of 11936.65 airframe hours. All systems were found to be serviceable and were signed off by the Aircraft Maintenance Organisation (AMO). The last inspection on the pitot system was carried out during the Mandatory Periodic Inspection (MPI) on 22 June 2021 at 12036.65 airframe hours. The pitot and static system were tested for freedom from obstruction and leaks using calibrated equipment. The pitot and static system were found to be serviceable and were signed off by the AMO. The aircraft was flown a further 84 hours until the day of the serious incident.

The meteorological aerodrome report (METAR) for 3 August 2021 at 1400Z was obtained for FARG. The weather information was as follows: Wind: 060°/02kt, Temperature: 22°C, Dew point: 3°C, QNH: 1026hPa. The aircraft was being flown in a westerly direction and, therefore, encountered a tailwind whilst overhead the mountain.

Tips on Mountain Flying (Source: FAA)
Plan to be at the altitude at least three miles before reaching the ridge and stay at that altitude until at least three miles past it. This clearance zone will give you a reasonable safety zone to avoid the most severe turbulence and down drafts in windy conditions. When you actually cross a ridge, you should do so at a 45° angle to the ridge. This allows you to turn away from the ridge quicker if you encounter a severe downdraft or turbulence. Once you have crossed the ridge, turn directly away from it at a 90° angle to get away from the most likely area of turbulence quickly. Plan your crossing to give yourself the ability to turn toward lower terrain quickly if necessary.

The Never exceed speed (Vne) of the aircraft type is 155 kts. (Source: Piper Cherokee POH)

Findings:

- The serious incident aircraft started to show signs of static port failure only when the aircraft started to descend as stated in the FAA handbook "*may go unrecognized until a critical phase of flight".*

- When the serious incident aircraft was descending, the airspeed remained high but when it climbed, the airspeed reduced as stated in the FAA handbook "*While descending, the airspeed indicator, unable to tell whether it is experiencing more airspeed pitot pressure or less static reference pressure, indicates a higher airspeed than actual. If the pilot begins a climb, the indicated airspeed, however, may begin to decrease at an alarming rate".*

- The pilot was able to continue operating during the flight and landing phases while the aircraft had reached Never Exceed Speed (Vne). This could have been a successful forced landing if the wire fence was not in the landing roll path.

Probable cause:
It is probable that whilst flying over the mountain range, the aircraft experienced a downdraft which caused the aircraft to start descending. With the static port blocked, the airspeed indicator began to give inaccurate readings which the pilot interpreted as actual.

Contributary factor:

The pilot initiated a precautionary landing and during the landing roll, the aircraft's wings were caught in a wire fence.

Safety Action/s

None.

Safety Message and/or Safety Recommendation/s

Pilots should be made aware, through training, of possible signs in-flight when the aircraft experiences a pitot system failure.

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****.*

About this Report

Decisions regarding whether to investigate, and the scope of an investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, no investigation has been conducted, and the Accident and Incident Investigations Division (AIID) has relied on the information submitted by the affected person/s and organisation/s to compile this brief report. The report has been compiled using information supplied in the initial notification, as well as follow-up information to bring awareness of potential safety issues to the industry in respect of this occurrence, as well as possible safety action/s that the industry might want to consider in preventing a recurrence of a similar accident.

This report provides an opportunity to share safety message/s in the absence of an investigation.

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.

Disclaimer

This report is issued by:

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