

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

Editorial revision of Report: 22 September 2010.

| | | | | | | |
|--|--|------------------------------|--------------------------|-----------------------------|-------------------------|-------|
| | | | | Reference: | CA18/2/3/8713 | |
| Aircraft Registration | ZS-JXD | Date of Accident | 28 November 2009 | | Time of Accident | 0955Z |
| Type of Aircraft | Cessna 177 | | Type of Operation | Private | | |
| Pilot-in-command Licence Type | Private pilot | | Age | 43 | Licence Valid | Yes |
| Pilot-in-command Flying Experience | Total Flying Hours | | 136.0 | | Hours on Type | 35.0 |
| Last point of departure | Stellenbosch Aerodrome FASH (Western Cape) | | | | | |
| Next point of intended landing | Stellenbosch Aerodrome FASH (Western Cape) | | | | | |
| Location of the accident site with reference to easily defined geographical points (GPS readings if possible) | | | | | | |
| 3.12Nm NNE of Runway 23 in Fisantekraal GPS: S33°43.59' E018°45.65' | | | | | | |
| Meteorological Information | Temperature 20°; CAVOK; Wind: Calm | | | | | |
| Number of people on board | 1 + 3 | No. of people injured | 0 | No. of people killed | 0 | |
| Synopsis | | | | | | |
| <p>The pilot took off with three passengers from Stellenbosch Aerodrome on a private flight to the general flying area. The pilot stated that he refuelled the aircraft before the flight and that the dipstick indicated that the right-hand tank was $\frac{3}{4}$ full and the left-hand tank $\frac{1}{2}$ full, with an estimated endurance of 3h30min. The flight was planned to be 2h15 minutes. The pilot stated that while en route back to Stellenbosch, the engine started to "stutter" (run rough) and that he then decided to land at Fisantekraal. The pilot experienced a complete loss of power and executed a forced landing on an open field. The aircraft landed hard, causing the nose wheel to break off and the right-hand wing tip to impact the ground.</p> <p>The pilot and 2 passengers were not injured during the incident. The Air Mercy Services (AMS) helicopter arrived on site and one of the passengers was treated for a bruised arm.</p> | | | | | | |
| Probable Cause | | | | | | |
| <p>The accident was attributed to an unsuccessful forced landing after fuel exhaustion.</p> <p>Contributory factor: 1. Poor pre-flight planning and not ensuring that the aircraft had sufficient fuel on board. 2. The pilot used an incorrectly calibrated dipstick to measure the fuel for the flight. The aircraft had 2 dipsticks with the same aircraft registration on them.</p> | | | | | | |
| IARC Date | | | | Release Date | | |



AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Stellenbosch Flying Club
Manufacturer : Cessna Aircraft Company
Model : C177B
Nationality : South Africa
Registration Marks : ZS-JXD
Place : Stellenbosch Aerodrome (FASH)
Date : 28 November 2009
Time : 0955Z

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.

Purpose of the Investigation:

*In terms of Regulation 12.03.1 of the Civil Aviation Regulations (1997) 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 establish legal liability.***

Disclaimer:

This report is given without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On Saturday, 28 November 2009 at 0715Z the pilot took off from Stellenbosch Aerodrome (FASH) for a private flight with 3 passengers on board. The pilot stated that prior to the flight he refuelled the aircraft with 6,5 US gallons on the right-hand tank. After refuelling the fuel attendant used the dipstick which was in the aircraft, which read $\frac{3}{4}$ on the right-hand tank. The pilot stated that before refuelling he had used the dipstick that was in the aircraft, and the reading was $\frac{1}{2}$ on both tanks. During the start the pilot noted that the fuel gauges were reading less than $\frac{1}{2}$ on the right-hand tank and $\frac{1}{2}$ on the left-hand tank and relied on the information from the dipstick.

1.1.2 The pilot performed a low-level scenic flight around the Cape Peninsula to Langebaan. While returning to Stellenbosch the aircraft engine started to "stutter" (run rough) and the fuel gauges were indicating empty. According to the pilot's knowledge, the fuel gauge was inaccurate.

1.1.3 The pilot then decided to divert to Fisantekraal Aerodrome (FAFK) and squawked 7700 (the emergency squawk) on the transponder mode. The pilot then experienced a complete loss of power and performed a forced landing on an open field. The aircraft landed hard and the nose wheel broke, and the right wing impacted the ground and was damaged.

1.1.4 The Air Mercy Service (AMS) helicopter arrived at the scene and one passenger

was treated for bruised hand.

1.2 Injuries to Persons

| Injuries | Pilot | Crew | Pass. | Other |
|----------|-------|------|-------|-------|
| Fatal | - | - | - | - |
| Serious | - | - | - | - |
| Minor | - | - | 1 | - |
| None | 1 | - | 2 | - |

1.3 Damage to Aircraft

1.3.1 The aircraft was substantially damaged.

1.4 Other Damage

1.4.1 None

1.5 Personnel Information

| | | | | | |
|---------------------|---------------|---------------|---------------|-----|----|
| Nationality | South African | Gender | Male | Age | 43 |
| Licence number | ***** | Licence type | Private Pilot | | |
| Licence valid | Yes | Type endorsed | Yes | | |
| Ratings | Night rating | | | | |
| Medical expiry date | 31/08/2010 | | | | |
| Restrictions | None | | | | |
| Previous accidents | None | | | | |

Flying Experience:

| | |
|----------------------------|-------|
| Total hours | 136.0 |
| Total past 90 days | 5.0 |
| Total on type past 90 days | 4.0 |
| Total on type | 35.0 |

1.6 Aircraft Information

Airframe:

| | | |
|--|-------------------------|------|
| Type | Cessna C177B | |
| Serial number | 177-02585 | |
| Manufacturer | Cessna Aircraft Company | |
| Date of manufacture | 1976 | |
| Total airframe hours (at time of accident) | 4649.3 | |
| Last MPI (date & hours) | 22/10/2009 | 4635 |
| Hours since last MPI | 14.3 | |
| C of A (expiry date) | 15/08/2010 | |
| C of R (issue date) (present owner) | 23/11/2007 | |
| Operating categories | Standard | |

Engine:

| | |
|----------------------|---------------------|
| Type | Lycoming 0-360AIF6D |
| Serial number | L22512-36A |
| Hours since new | 4649.3 |
| Hours since overhaul | 604.0 |

Propeller:

| | |
|----------------------|---------------------|
| Type | McCauley B2D34C-211 |
| Serial number | 765628 |
| Hours since new | 4635.0 |
| Hours since overhaul | 1604.0 |

1.7 Meteorological Information

1.7.1 According to the pilot's questionnaire the weather conditions were as follows:

| | | | | | |
|----------------|-------|-------------|-----------|------------|-----------|
| Wind direction | - | Wind speed | Calm | Visibility | CAVOK |
| Temperature | 20° C | Cloud cover | Sky clear | Cloud base | Sky clear |
| Dew point | - | | | | |

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as per the equipment list approved by the Regulator. There were no recorded defects in navigational equipment prior to the flight.

1.9 Communications

1.9.1 The aircraft was equipped with VHF communication equipment as per the equipment list approved by the Regulator. There were recorded defects in communication equipment prior to the flight.

1.9.2 The pilot was transmitting his intentions on frequency 124,8 MHz before diverting to Fisantekraal and changed to frequency 131,1 MHz.

1.9.3 The pilot squawked 7700 (emergency squawk) after he experienced loss of power.

1.10 Aerodrome Information

1.10.1 The pilot performed a forced landing on an open field at the GPS coordinates of S33°43.59' E 018° 45.65'.

1.11 Flight Recorders

1.11.1 The aircraft was not fitted with a flight data recorder (FDR) or cockpit voice recorder (CVR), nor was this required by the Regulator.

1.12 Wreckage and Impact Information

1.12.1 The pilot performed a forced landing on an open field. During the precautionary landing the aircraft ran on an uneven surface, causing the nose-wheel to collapse, break and separate from the aircraft.



Figure1: Showing the broken nose wheel

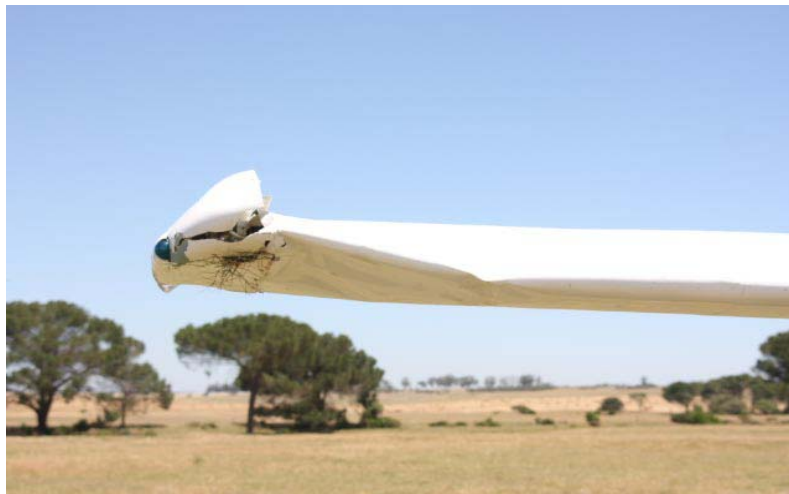


Figure 2: Showing damage to the right wing

1.13 Medical and Pathological Information

1.13.1 The Air Mercy Services (AMS) helicopter arrived at the scene and the personnel gave medical treatment to one passenger, who had a bruised arm.

1.14 Fire

1.14.1 There was no pre- or post-impact fire.

1.15 Survival Aspects

1.15.1 The accident was considered to be survivable because there was no major damage to the cabin area which could have led to a fatal injury.

1.15.2 The pilot activated the emergency squawk 7700 after loss of engine power. The emergency personnel were dispatched by the Air Traffic Navigations Services (ATNS) after observing a 7700 squawk which disappeared from the radar screen.

1.16 Tests and Research

1.16.1 The Stellenbosch Airport safety officer was at the scene after the accident and made the following observations:

- i. Mags and master switched off by the pilot.
- ii. No flaps used for landing.
- iii. Oil quantity on 5 and found satisfactory.
- iv. Transponder code set to 7700.
- v. Fuel selector set to both tanks.
- vi. No evidence of fuel in either tank.

1.16.2 The pilot stated that he had used the dipstick marked ZS-JXD with a black marking pen. The information that the dipstick was incorrectly calibrated was brought to the pilot's attention after the accident. The pilot was notified that the correct dipstick (marked ZS-JXD) was stored behind the pilot's seat inside the aircraft with the registration ZS-NNR. The pilot used the second dipstick which was marked ZS-JXD and not calibrated correctly.

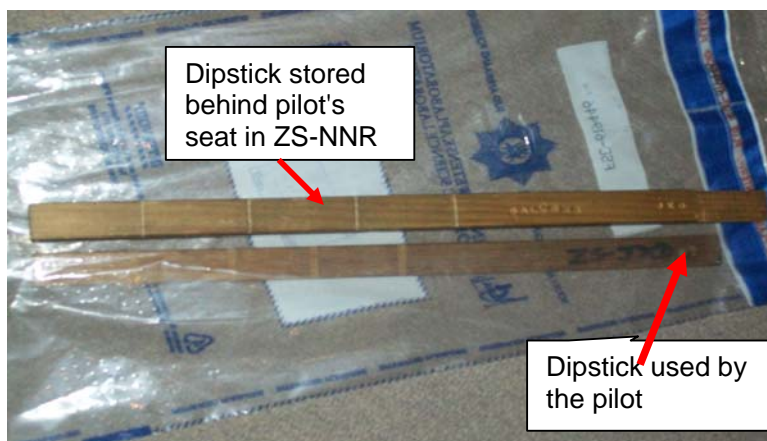


Figure3: The picture above shows the two dipsticks
Having the same aircraft registration: ZS-JXD

1.16.3 The aircraft was equipped with two integral 30,5 US gallons fuel tanks, providing a total of 60 US gallons of usable fuel. The aircraft was refuelled with 6,5 US gallons of 100 LL avgas at Stellenbosch Aerodrome before the flight. This should have the right-hand tank indicating $\frac{3}{4}$ (22,5 US gallons) and the left-hand tank $\frac{1}{2}$ (15 US gallons), with the total fuel on board of 37,5 US gallons. With a fuel consumption of 10,5 US gallons/ hour at 75% power the endurance should have been 3h30 min. According to the pilot the flight time involved was only 2h30min.

Using the other dipstick, the 7,5 US gallons mark will indicate 6,25 US gallons, which is 1,25 gallons less. Therefore the right hand-tank will indicate less than $\frac{3}{4}$ (18,75 US gallons) and the left hand tank will indicate less than $\frac{1}{2}$ (12,5 US gallons) and the total fuel on board will be 31,25 US gallons, which will give an endurance of 2h54min.

It is evident that the two dipsticks indicated a 6,25 US gallons difference.

1.17 Organisational and Management Information

1.17.1 The aircraft belongs to the Stellenbosch Flying Club.

1.17.2 According to available records, the aircraft maintenance organisation (AMO) that certified the last MPI on the aircraft prior to the accident was in possession of a valid AMO approval.

1.18 Additional Information

1.18.1 There is no regulation on the use of dipsticks. It is the pilot in command's responsibility to ensure that the aircraft has sufficient fuel on board. The pilot in command must do a physical check on the fuel tanks during pre-flight inspection and to do fuel trip calculations.

1.18.2 The person responsible for the aircraft is the person responsible for calibrating the dipsticks. The incorrect dipstick was in the aircraft at the time the pilot was performing a pre-flight inspection. It came to the pilot's attention that the dipstick used was not for the aircraft ZS-JXD only after the accident.

1.18.3 The pilot did not complete the Stellenbosch Flying Club's W and B sheet before the flight as required by the club.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

History

2.1 The pilot took off from Stellenbosch Aerodrome for a scenic flight with three passengers on board. While en route back to Stellenbosch the engine started to run rough. The fuel gauges were indicating empty at that time. The pilot decided to land at Fisantekraal. The pilot then experienced a complete loss of power and executed a forced landing in an open field.

- 2.2 The pilot uplifted 6,5 US gallons of fuel before the flight. He used a dipstick to measure the fuel remaining in the tanks before refuelling and both tanks indicated $\frac{1}{2}$ on the dipstick. After refuelling the right tank, it indicated $\frac{3}{4}$ on the right tank and $\frac{1}{2}$ on the left. The pilot ignored the fuel gauges, as he knew that they were unreliable. The pilot did not do a proper flight planning as he ignored the discrepancies between the dipstick and the gauges; a physical inspection of the tanks was not done by the pilot.

Machine

- 2.3 The aircraft lost power due to fuel exhaustion. Both tanks were found to be empty after the accident. The fuel gauges indicated empty while the pilot was returning to Stellenbosch Aerodrome.

Organisation

- 2.4 The aircraft had two differently calibrated dipsticks, both with the same registration marks on the dipsticks. The two dipsticks were stored in two aircrafts, one in ZS-JXD (accident aircraft) and the other in ZS-NNR. The organisation did not inform the pilot of the situation regarding the incorrectly calibrated dipstick prior to the flight. The person responsible for aircraft was supposed to make sure that the incorrectly calibrated dipstick was removed from the aircraft.

3. CONCLUSION

3.1 Findings

- 3.1.1 The pilot had a valid private pilot licence and Class 2 medical certificate with no restrictions. The aircraft type rating was endorsed on the licence.
- 3.1.2 The aircraft had a valid certificate of registration and a valid certificate of airworthiness.
- 3.1.3 The aircraft had two differently calibrated dipsticks with the registration ZS-JXD on both dipsticks.
- 3.1.4 The incorrect dipstick was in the accident aircraft before the flight. The correctly calibrated dipstick was stored behind the pilot seat in aircraft ZS-NNR
- 3.1.5 The aircraft engine lost power due to fuel exhaustion.
- 3.1.6 The aircraft sustained substantial damage in the accident.
- 3.1.7 The incorrectly calibrated dipstick was used to verify the fuel quantity
- 3.1.8 The pilot experienced loss of engine power in flight which resulted in a precautionary landing in an open field.

3.1.9 The aircraft landed on uneven terrain; as a result nose wheel collapsed, broke and got separated from the wreckage.

3.1.10 Pilot failed to ensure that he had adequate fuel supply.

3.2 Probable Cause

3.2.1 The accident was attributed to an unsuccessful forced landing after fuel exhaustion.

3.2.2 Contributory factor:

1. Poor pre-flight planning and not ensuring that the aircraft had sufficient fuel on board.
2. The pilot used an incorrectly calibrated dipstick to measure the fuel for the flight. The aircraft had 2 different dipsticks with the aircraft registration on them.

4. SAFETY RECOMMENDATIONS

4.1 It is recommended that the SACAA training department (part 141) should ensure that flying clubs implement effective control over the use of fuel dipsticks carried on board their aircraft. Flying clubs must develop a policy on the use, calibration and control of dipsticks and incorporate this policy in the club's operations manual. A proper fuel management log should be part of the flight plan.

5. APPENDICES

5.1 None

Report reviewed and amended by the Advisory Safety Panel on 18 May 2010

Editorial Changes made to report to clarify GPS coordinates and paragraphs 1.16.2 and 1.16.3 as to use of dipstick and fuel onboard, by Office of the EM:AIID. 22 September 2010.

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