SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10270						
Classification	Accident	**Date**	18 February 2023		**Time**	0755Z	
Type of Operation	Private (Part 141)						
Location							
Place of Departure	New Tempe Aerodrome (FATP), Free State Province	Place of Intended Landing	New Tempe Aerodrome (FATP), Free State Province				
Place of Occurrence	On Runway 10 at New Tempe Aerodrome (FATP), Free State Province						
GPS Co-ordinates	Latitude	29° 01'50.69"S	Longitude	026° 09'36.87"E	Elevation	5 432 ft	
Aircraft Information							
Registration	ZS-EMH						
Make; Model; S/N	Mooney M-20F (Serial Number: 670077)						
Damage to Aircraft	Substantial	Total Aircraft Hours	4364.9				
Pilot-in-command							
Licence Type	Commercial Pilot Licence (CPL)	Gender	Male	Age	31		
Licence Valid	Yes	Total Hours	1143.8	Total Hours on Type	4.6		
Total Hours 30 Days	3.6	Total Flying on Type Past 90 Days	3.6				
People On-board	2+0	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0

What Happened

On Saturday, 11 February 2023, an instructor and a student pilot on-board a Mooney M-20F aircraft with registration ZS-EMH took off on a training flight from New Tempe Aerodrome (FATP) in the Free State province to the general flying area (GFA), with the intention to land back at FATP. The flight was conducted under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

The instructor stated that prior to departure, the student pilot conducted a pre-flight inspection, and nothing abnormal was found. The aircraft had about 227 litres (l) of Avgas 100LL in the tanks. The aircraft took off and climbed to an altitude of 5500 feet (ft), cruising at a speed of 125 knots. According to the instructor, the flight from FATP to GFA proceeded as expected, as well as the flight back to FATP for a full stop landing. The instructor stated that upon arrival at FATP, they joined downwind and the student pilot carried out the downwind checks. The instructor assumed that the gear was selected down and locked after the downwind checks; he did not verify. As the student pilot flew over the threshold of Runway 10 (RWY 10) for touchdown, the aircraft skidded on its belly for a few metres before it came to a halt on the right side of the runway. After the aircraft had stopped, the instructor noticed that the landing gear control lever was selected to the ‘up’ position (retracted).

The aircraft sustained substantial damage to the underbelly skin and the landing gear doors, as well as the propeller blade tips. The occupants were not injured during the accident sequence.

What was found:

- Post-accident, the landing gear was cycled, and it was found to be serviceable. The unsafe landing gear warning horn was tested and found to be serviceable.

Figure 1: The instrument panel showing the landing gear control lever in the UP position. (Source: Operator)

Figure 2: The aircraft at the accident site. (Source: Operator)

- The description and operation of the landing gear system (Source: Mooney M20F Operators Manual)

Landing Gear System

The electrical landing gear retraction system is operated by the wheel-shaped switch on the upper portion of the flight panel. To raise the gear, the knob is pulled out and the switch moves up to its upper detent. An "airspeed switch" is incorporated in the electrical circuit which prevents landing gear retraction until a safe speed is attained.

CAUTION

Never rely on the airspeed safety switch to keep the gear extended while taxiing, taking off or landing. Always check the gear switch for the down position.

A limit switch will stop the gear in its retracted position, the gear-up light will come on and the gear switch will require no further attention until landing. To lower the landing gear. The knob is pulled out, moved down and placed in the lower detent. A limit switch will stop the landing gear system when the proper locking force has been exerted to hold the gear down, and the green gear-down-light will come on.

WARNING

A discharged storage battery may prevent the landing gear from fully extending.
There are three ways to check that the gear is completely down and locked.

1. The green "safe-to land" indicator light (on the left panel) will come on.

2. The black indicator marks, as seen through the glass in the floor boards, will be aligned.

3. Retard throttle fully, and if no warning horn is heard the gear should be down and locked. The gear warning horn emits an interrupted sound of a different pitch than the stall warning horn.

When these conditions are fulfilled, the aircraft may be landed with no further attention to the gear system.

- Section 4 – Normal Procedures from the Mooney M20F Operators Manual:

<u>Landing Procedures</u>

<u>Use the following checklist before landing:</u>

1. Fuel selector ON fuller tank.

2. Boost pump on

3. Mixture full rich (control forward)

4. Power boost OFF (control full forward)

Note: Warning light adjacent to Power Boost control will be on if gear is down and Power Boost is not OFF

5. Landing gear down (lower at 120 mph or less)

Note: The low frequency Warning horn will sound intermittently (beep) if gear is not down and locked and throttle is retarded. Check for green "down and locked" light. If green light is not working, it can be screwed out and replaced in flight with red "Gear Up" light to verify the locked position.

6. Propeller high rpm (control forward).

7. Seat belts fastened

It is recommended that the base leg be flown at 90 mph. Upon turning final or sooner if necessary, extend the desired number of flaps. Flaps speed is 105 mph. As the flaps are extended, the aircraft's nose will become heavy. Roll the trim back so that the aircraft will glide hands off at approximately 80 mph.

Retarding the throttle below 12 inches of manifold pressure causes the gear warning horn to emit a regular, intermittent tone, unless the gear is down and locked.

The official weather report from the South African Weather Service (SAWS) on the day of the accident was as follows:

METAR: FATP 180800Z 01003KT CAVOK 20/18 Q1021.
Wind 010° at 03 knots; Temperature 20°C; Dew Point 18°C; Ceiling and visibility OK.

Findings

The instructor

(i) The instructor was initially issued a Commercial Pilot Licence (CPL) on 15 November 2019. His last validation was conducted on 25 November 2022 with an expiry date of 30 November 2023. The Mooney M-20F aircraft was endorsed on the instructor's licence. A Class 1 medical certificate was issued to the instructor on 17 February 2022 with an expiry date of 28 February 2023 with no restrictions. At the time of the accident, the instructor had flown a total of 1143.8 hours, of which 4.6 hours were on the aircraft type. The instructor was licensed and qualified for the flight in accordance with the SACAA regulations.

Student pilot

(ii) The student pilot was initially issued a Private Pilot Licence (PPL) on 16 May 2022. His last validation was on 31 March 2023 with an expiry date of 31 March 2025.

The aircraft

(iii) The aircraft's Certificate of Registration (C of R) was issued to the current owner on 16 August 2021. The Certificate of Airworthiness (C of A) was issued initially on 16 May 1995. The latest reissued C of A had an expiry date of 31 May 2023. The aircraft was considered airworthy at the time of the flight.

(iv) According to the aircraft's latest Certificate of Release to Service (CRS) and logbooks, the last 50-hour annual inspection was certified on 26 October 2022 at 4357.87 total airframe hours with an expiry date of 25 October 2023 or at 4457.87 airframe hours, whichever occurs first. At the time of the accident, the aircraft had accumulated 4364.9 airframe hours. The aircraft was flown a further 7.03 hours since the last annual inspection.

(v) The last 50-hour inspection was carried out by the aircraft maintenance organisation (AMO). The AMO had a valid AMO-approval certificate that was issued on 1 September 2022 with an expiry date of 30 September 2023. The aircraft maintenance engineer (AME) who certified the last inspection was appropriately licensed to carry out maintenance on the aircraft type. The maintenance records indicated that the aircraft was maintained in accordance with the existing regulations and approved procedures.

(vi) The landing gear selector lever was found in the 'up' position (retracted position) post-accident.

(vii) The instructor stated that they joined downwind, thereafter, the student pilot completed the downwind checks. The instructor made an assumption that the gear was down and locked, however, this was not the case. The aircraft landed wheels up.

(viii) According to the Pilot's Operating Handbook (POH), the aircraft was equipped with a landing gear warning horn.

(ix) The student pilot reported that there were no mechanical malfunctions with the landing gear system that would have precluded normal operation. According to the investigation, it is likely that the aircraft landed in a high-power setting; therefore, it is possible that the manifold pressure was above 12 inches when the aircraft landed, which would have resulted in the landing gear warning horn not activating.

(x) Post-accident, the aircraft was placed on jacks and the landing gear warning system was tested; it was found to be serviceable. The landing gear was lowered and locked into place without any anomalies.

(xii) Fine weather conditions prevailed at the time of the flight; the weather had no bearing to this accident.

Probable Cause

The landing gear lever was not extended during landing, which led to a belly landing.

Contributing Factors

The student pilot did not complete the downwind checks as per the POH.

Lack of supervision by the instructor.

Safety Action(s)

None.

Safety Message

Pilots are advised to always be vigilant during the critical phases of flight such as take-offs and landings.

About this Report

The decision to conduct a limited investigation is based on factors including whether the cause is known and the evidence supporting the cause is clear, the level of safety benefit likely to be obtained from an investigation and that will determine the scope of an investigation. For this occurrence, a limited 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 limited report. The report has been compiled using information supplied in the initial notification, as well as from follow-up desktop inquiries 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 occurrence.

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
In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011 and ICAO Annex 13, 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 apportion blame or liability.
Disclaimer
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This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa