AIRCRAFT SERIOUS INCIDENT SHORT REPORT

CA8/3/2/1262: Failure to rotate due to aircraft being operated over its maximum take-off mass, resulting in an aborted take-off.

Date and time	:	4 April 2019, 0730Z
Aircraft registration	:	ZU-FSE
Aircraft manufacturer and model	:	Kitplanes For Africa (Pty) Ltd, Safari LSA
Last Point of departure	:	The Rose Aerodrome, Bronkhorstspruit, Gauteng Province
Next point of intended landing	:	The Rose Aerodrome, Bronkhorstspruit, Gauteng Province
Location of incident site with reference to easily defined geographical points (GPS readings if possible)	:	25°47'46.00" South 028°34'38.9" East, elevation 4950ft
Meteorological Information	:	Surface wind: 050 at 02 kts, temperature: 17°C, dew point 16, visibility: 9999km
Type of operation	:	Part 94 (Operation of Non-type Certificated Aircraft)
Persons on board	:	1+1
Injuries	:	No injuries reported
Damage to aircraft	:	Minor

All times given in this report are Coordinated 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, (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.***

Disclaimer:

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1. SYNOPSIS

1.1. On 4 April 2019 at 0730Z, a pilot and a passenger took off from the Rose Aerodrome in Bronkhorstspruit on a private flight with the intention to land back at the same aerodrome.

1.2 The pilot stated that during the take-off roll, the aircraft failed to reach take-off speed. As the Pilot attempted the abort take-off, the pilot firmly applied brakes and switched off the engine. This caused the nose to tip, resulting in the propeller striking the ground.

1.3 Two of the three blades were damaged by contact with the ground. Both the left- and the right-wing attachment struts were bent while the fuselage structure was still intact. During the incident sequence, the aircraft veered off to the right of the runway, the left wheel assembly separated from the wheel axle, and the aircraft came to a halt 10m from the runway edge. Both occupants of the aircraft did not sustain any injuries.

1.4 The investigation revealed that after reaching the rotation speed (45 knots), the aircraft failed to rotate due to its weight being in excess by 19 kilograms (kg) above the maximum certified take-off mass of 600kg. The take-off was aborted by braking hard, resulting in the nose section tipping forward and the propeller striking the ground. The aircraft veered off the runway to the right, the left wheel and tyre assembly separated from the wheel axle, and the aircraft came to a halt 10m from the edge of the runway.

2. FACTUAL INFORMATION

2.1. History of flight

2.1.1 On 4 April 2019 at approximately 0730Z, a pilot and a passenger took off from the Rose Aerodrome in Bronkhorstspruit area on a private flight with the intention to land back at the same aerodrome. The flight was conducted under the provisions of the Civil Aviation Regulations (CAR) 2011, Part 94 as amended. Fine weather conditions prevailed at the time of this serious incident.

2.1.2 The pilot stated that he had elected to use the full length of Runway 18 for take-off instead of an intersection. The grass runway, which was moist at the time of this serious incident, is 550m in length. This aircraft required a take-off distance of 150m. During the take-off roll on Runway 18 when the pilot was about 3/4 (412 metres) down the runway, he noticed that the speed of the aircraft was 46 miles per hour (mph), which was above the take-off speed of 45mph as stipulated in the pilot operating handbook (POH). The engine output was at 3100 revolutions per minute (rpm). The pilot further stated that after realising that continuing with rotation will lead to a collision with the fence at the end of the runway, he opted to abort take-off by applying the brakes very hard and switching off the engine to bring the aircraft to a stop. This caused the aircraft to yaw to the right before veering off the runway, resulting in the brakes locking and the nose section tipping and causing the propeller and the spinner to strike the ground. Two of the propeller blades broke off. The left wheel tyre assembly also separated from the wheel hub.

2.1.3 The aircraft came to a halt 10m from the edge of the runway. It sustained damages to the propeller blades, spinner, left wheel assembly and wing struts. The pilot and the passenger were not injured during this serious incident.

2.1.4 During the interview, the pilot stated that there was no malfunction with the engine or any system, and that the aircraft was airworthy. He further stated that there were 53 litres (l) of fuel on-board the aircraft. POH states that to clear a 50ft obstacle, the runway distance required is 300m

2.1.5 The aircraft maximum take-off weight (MTOW):

According to the aircraft's documents, the last mass and balance was carried out on 26 January 2016 by an Approved Person (AP). The empty weight of the aircraft was recorded as 386.3kg with the centre of gravity located at 289.09mm from the wing leading edge. According to the information provided by the pilot, the aircraft had a total of 53 litres (38kg) of fuel on-board.

Empty weight	386.3kg
Total fuel on-board	53 litres (38kg)
Pilot	100kg
Passenger	95kg
Baggage	0kg
Total computed weight	619kg
Maximum take-off mass (MTOM)	600kg
Exceeded weight (percentage) 19/600*100	19kg which is 3.2% above the stipulated MTOM

The total mass of the aircraft was in excess by 19kg, which is 3.2% above the prescribed maximum take-off mass as stipulated by the manufacturer.

2.1.5 This serious incident occurred at geographical position determined to be 25°47'46.00" South 028°34'38.9" East, at an elevation of 4 950 feet (ft) above mean sea level (AMSL).

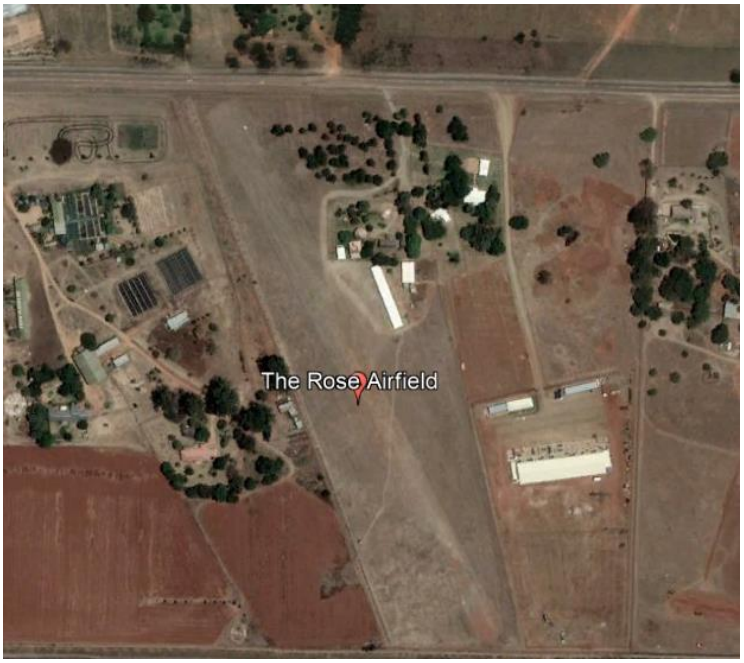

Figure 1: The Rose Airfiled layout. (Google earth overlay)

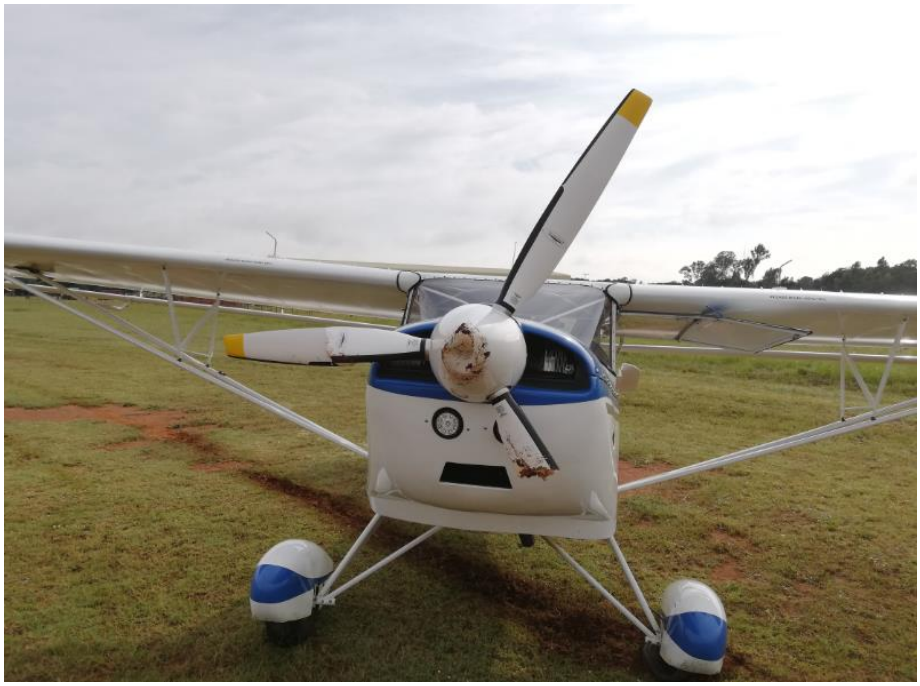

Figure 2: Aircraft as it came to rest. (Photo courtesy: Owner of the aircraft).

2.2.4 **Rejected Take-off/Engine Failure** (Source: Airplane Flying Handbook FAA 8083-3b Chapter 5)

Emergency or abnormal situations can occur during a take-off that require a pilot to reject the take-off while still on the runway. Circumstances such as a malfunctioning powerplant, inadequate acceleration, runway incursion, or air traffic conflict may be reasons for a rejected take-off. Prior to take-off, the pilot should identify a point along the runway at which the airplane should be airborne. If that point is reached and the airplane is not airborne, immediate action should be taken to discontinue the take-off. Properly planned and executed, the airplane can be stopped on the remaining runway without using extraordinary measures, such as excessive braking that may result in loss of directional control, airplane damage, and/or personal injury. In the event a take-off is rejected, the power is reduced to idle and maximum braking applied while maintaining directional control.

2.2.5 **Soft/Rough-Field Take-off and Climb** (Source: Airplane Flying Handbook FAA 8083-3b Chapter 5)

Taking off from a soft surface or through soft surfaces or long, wet grass reduces the airplane's ability to accelerate during the take-off roll and may prevent the airplane from reaching adequate take-off speed if the pilot applies normal take-off techniques. The pilot must be aware that the correct take-off procedure for soft fields is quite different from the take-off procedures used for short fields with firm, smooth surfaces. To minimise the hazards associated with take-offs from soft or rough fields, the pilot should transfer the support of the airplane's weight as rapidly as possible from the wheels to the wings as the take-off roll proceeds by establishing and maintaining a relatively high AOA or nose-high pitch attitude as early as possible.

3. FINDINGS

3.1 The pilot-in-command held a national pilot licence (NPL) which was issued on 13 March 2019 and due to expire on 12 March 2021. His last skills test was conducted on 13 March 2019. The pilot held the required rating to operate the aircraft.

3.2 The pilot's aviation medical certificate was valid at the time of the serious incident. It had been issued on 21 July 2017 and due to expire on 31 July 2021.

3.3 The last annual inspection was carried out on 15 September 2018 at 1813.2 airframe hours or 113 tachometer reading by an approved person (AP) who issued a Certificate of Release to Service on 15 September 2018, with an expiry date of 14 September 2019 or 200 tachometer hours, whichever occurs first.

3.4 The aircraft was issued with an authority to fly on 19 September 2018 and due to expire on 14 September 2019.

3.5 At the time of the serious incident, the airframe hours were 1836.2. The aircraft had operated for 23 hours since its last annual inspection. The engine and propeller hours at the time of the incident were 136 hours and 147.9 hours, respectively.

3.6 The aircraft had 53 litres of fuel before take-off, which rendered the aircraft's total weight to be 619kg. According to the POH, the maximum take-off weight of the aircraft is 600kg. The aircraft exceeded its take-off weight by 19kg (3.2%).

3.7 The take-off speed for the aircraft is 45mph, according to the POH. The pilot aborted the take-off when the airspeed was 46mph and after the aircraft had used 3/4 (412m) of the runway.

3.8 The weather was not a contributing factor in this serious incident, albeit the moist grass runway, which reduced the airplane's ability to accelerate during take-off.

3.9 The aircraft was recovered to an aircraft maintenance organisation (AMO) where an AP inspected the aircraft and issued an inspection report. There were no obvious faults found with the aircraft systems, structure, controls or power train during the inspection. The engine was only inspected for obvious signs of malfunction and none were found. The engine turned through its compression strokes.

3.10 The Rose Aerodrome runway length is 550m. The take-off distance required for this aircraft on grass runway was 150m. The take-off was aborted at 412m.

3.11 The aircraft was 19kg over its maximum take-off weight.

3.12 The pilot did not carry out a proper flight planning as he knew that the take-off distance was 150m and only decided to abort at 412m, which is 264m more than the required take-off length.

3.13 The investigation could not determine why the pilot aborted take-off as there was nothing wrong with the aircraft and its systems.

3.14 The investigation revealed that after reaching the rotation speed (45kts), the aircraft failed to rotate due to its weight being more than 19kg above the maximum certified take-off mass of 600kg. The take-off was aborted by braking hard, resulting in the nose section tipping forward and the propeller striking the ground. The aircraft veered off to the right side of the runway, the left wheel and tyre assembly separated, and the aircraft came to a halt 10m from the edge of the runway.

4. PROBABLE CAUSE

4.1 After reaching the rotation speed (45kts), the aircraft failed to rotate due to its weight being more than 19kg above the maximum certified take-off mass of 600kg. The take-off was aborted by braking hard, resulting in the nose section tipping forward and the propeller striking the ground. The aircraft veered off to the right side of the runway, the left wheel and tyre assembly separated, and the aircraft came to a halt 10m from the edge of the runway.

5. CONTRIBUTING FACTOR

5.1 Improper flight planning.

6. REFERENCES USED ON THE REPORT

6.1 Owner questionnaire.

6.1. Pilot questionnaire.

6.2. Appendix A: Technical report.

7. SAFETY RECOMMENDATION

7.1 Safety message: Pilots to properly plan their flights and ascertain that the aircraft is operated within its limits to avoid injuries and property damage.

8. ORGANISATION

8.1 None.

Appendix A

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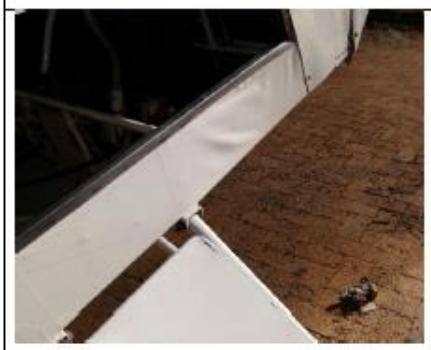
Damage report for the aircraft ZU-FSE 24 April 2019

Report number: KFA 19/FSE/1

The following items were found to be damaged and will either require repair or replacement;

Item	Action
1. Spinner damaged	Replace with new spinner
2. Propeller (Woodcomp) damaged	Replace with new prop
3. Side Bungee truss slightly bent (both sides)	Repair damages
4. Left hand Wingtip damaged	Repair damages
5. Flaperon stall fences (left and right) bent	Replace
6. Bottom cowling and boot cowl, button head screw ripped out from bottom and boot cowl	Repair both bottom and boot cowls
7. Windshield cracked	Replace windshield
8. Windshield brace tube bent	Repair windshield brace tube
9. Left main landing gear bent	Replace left main landing gear
10. Left hand wheel spat damaged	Repair left wheel spat damages
11. Engine	Shock load on engine



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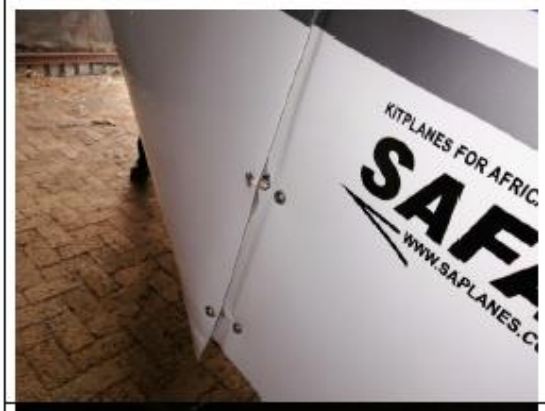

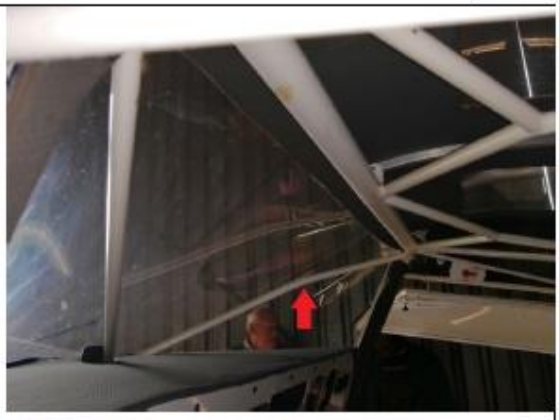

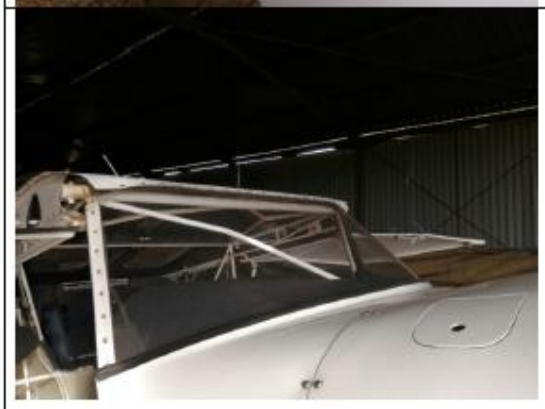

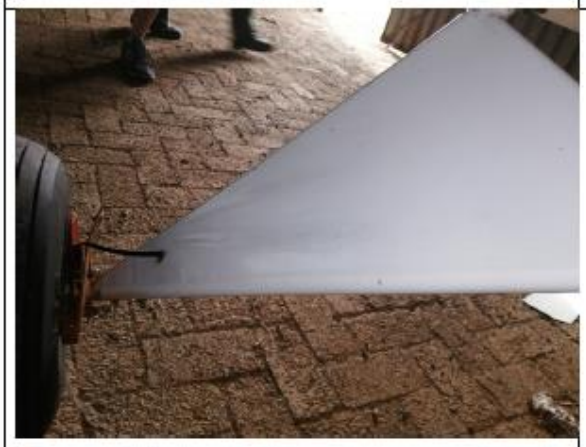

Report on the condition of the engine,

- Was there any defect found with the engine during inspection after the incident?
  - The engine was only visually inspected and no obvious anomalies were found. Fuel flows were normal and filters were clean. The engine turned through its compressions strokes and there were no obvious faults.

- Was there a ground run performed after the incident and what was the result
  - No further action was taken with regards to the engine as the owner decided to upgrade the engine to a Rotax turbo unit which will be more suitable for hot and high conditions.

- Was there any defect with the brakes
  - The brake were inspected and were found to be operating normal, the brake pads had less than 50% wear and were within limits. Brake discs were in good condition.

- Was there any defect found with the steering mechanism of the aircraft
  - All controls on the aircraft were found to be in good order and operating normally and within limits.

- Other
  - No damage to the engine mount or firewall found.
  - The aircraft was generally in a very good condition.
  - The damage that occurred is typical for the type of aircraft when either encountering a severe ground loop or encountering a side load due to centrifugal forces. The damage seem to be consistent with the owners description of events.
  - The previous annual was done at 113.0 engine tach time and 124.9 prop and 1813.2 airframe.
  - The aircraft has flown 23 hours since it's last annual. The annual inspection was done on 15/09/2018. The total time on the engine is thus 136 hours
  - Propeller is 147.9.
  - Airframe total hours are 1836.2.

Summary:
No obvious faults were found with the aircraft systems, structure, controls or power train during the inspection. The engine was only superfluously inspected for obvious signs of malfunction and none were found. The propeller mechanism functioned normal even after sustaining the prop strike. The owner's assessment of the chain of events seen to align with the inspection of the aircraft.