AIRCRAFT ACCIDENT SHORT REPORT

CA18/3/2/1203 ZU-JEO, Occurrence title	:	During the landing the undercarriage failed to extend
Date and time	:	18 April 2018, 11:09Z
Aircraft registration	:	ZU-JEO
Aircraft manufacturer and model	:	TL Ultralight, TL-2000 STING
Last Point of departure	:	Kuruman Airfield (FAKU), Northern Cape Province
Next point of intended landing	:	ZU-JEO
Location of accident site with reference to easily defined geographical points (GPS readings if possible)	:	Rand Aerodrome (FAGM), Gauteng Province (Elevation: 5200ft) (GPS:26°21'07.2" E027°58'08.4" Gauteng Province)
Meteorological Information	:	Surface wind: Calm. Wind direction: 270° Visibility: CAVOK
Type of operation	:	Private (Part 94)
Persons on board	:	1 + 0
Injuries	:	Nil
Damage to aircraft	:	Substantial

All times given in this report is 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 (2011) this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incident and ***not to apportion blame or liability.***

Disclaimer:

This report is produced without prejudice to the rights of the CAA, which are reserve

1. SYNOPSIS

1.1 The pilot took off from Kuruman Airfield (FAKU) intending to land at Tedderfield Airfield (FATA) on a ferry flight. The pilot stated that when he arrived at FATA he joined the right- hand circuit for runway 09. He further stated that when he selected the gear down he noticed that the front gear did not indicate down and locked and there was a low voltage supply warning light. He stated that he recycled the gear and tried to lower it manually without success. He further stated that another pilot on the ground informed him through the aircraft radio communication that the nose gear was not extended.

1.2 The pilot then elected to divert to Rand Aerodrome (FAGM) where emergency services were available. Upon arrival the pilot stated that he declared an emergency and was given permission to land on runway 29. The pilot further stated that he switched off the engine during the flare to minimise damage. During landing the undercarriage collapsed and the aircraft landed on its belly. The aircraft was substantially damaged and the pilot sustained no injuries.

1.3 The investigation revealed that the undercarriage failed to extend due to a bent landing gear extension and retraction actuator tube of the nose gear. The cause of the bending of the actuator was the fitment of a non-aviation standard part on nose gear actuator extension and retraction tube.

1. FACTUAL INFORMATION

1.1 History of flight

1.1.1 On the 18 April 2018 the pilot took off from Kuruman Airfield (FAKU), intending to land at Tedderfield Airfield (FATA) on a ferry flight. The flight was conducted under the provisions of part 94 of Civil Aviation Regulations 2011 as amended. Good weather conditions prevailed at the time leading to the accident.

1.1.2 The pilot stated that when he arrived at FATA, he joined right- hand circuit for runway 09. He further stated that when he selected landing gear down he noticed that the front wheel did not show down and locked. The pilot stated that after lowering the landing gear the low voltage light illuminated. Another pilot on the ground informed him that the undercarriage appeared to be retracted. The pilot then elected to go to FAGM and performed an emergency landing. During landing the aircraft skidded on its belly before coming to rest in the middle of the runway. The aircraft sustained substantial damage to the underbelly, the nose landing gear actuator and the main landing extension tubes. The pilot sustained no injuries.

1.1.3 According to available records the aircraft was issued with a valid authority to fly certificate which was due to expire on 16 March 2019. According to available documents the last annual inspection was carried out on 17 March 2018 at 538.6 hours by an approved person who issued a certificate of release to service. The aircraft only accrued 11.4hours since the last annual inspection.

1.1.4 Fine weather prevailed at the time leading to the accident.

1.1.5 The accident occurred during daylight at the FAGM with the GPS coordinates determined to be S26°21'07.2'' E027°58'08.4'' and an elevation of 5200 feet.

1.2 Additional Information

1.2.1 The following information was obtained from (AMO) technical report:

- The nose gear was repaired previously by a different Aircraft maintenance organisation (AMO). Change of ownership and the replacement of the flight folio was done on the 19 February 2018. There were no records found of the installation of the nose actuator in the airframe logbook.
- During the investigations by an AMO it was found that a non-standard modification was made to the nose gear actuator which was not recorded in the log books as required by **SACARs 44.01.10** (1) (4) An appropriately rated approved AMO, AME or approved person, rated in accordance with subpart 4 of part 66 shall sign in the appropriate logbook(s) that all procedures, as stated in the application for modification, were adhered to and that he or she is satisfied with the quality of the work which was carried out.
- The manufacturer recommended the use of Part number 120006669.
- The modification was done using non-aviation grade aluminium hollow tube, as well as a bullet cartridge, which housed a clevis bolt end as seen in figure 1.
- The modification made couldn't sustain the force required to move the nose gear, which led to the fabricated tube bending and not extending the nose gear. This failure caused the actuators to draw more current and cause a low voltage in the system.
- According to the approved person who is doing repairs on the aircraft, the nose gear and each main wheel has its own electric actuator. All these actuators are on the same circuit. When the nose gear bent it jammed in place, and prevented the main gear as well as the nose gear from fully extending. The main gear actuator also broke due to the force exerted on it due to landing while only partially extended. He further stated that the low voltage was the result of a faulty nose gear actuator which was affecting the entire system's operation.
- According to the CAR 44.01.10 relating to Modifications of Non-type Certificated Aircraft states that "in the case of a major modification an application for the approval of the modification and authority to fly, as prescribed in Document SA-CATS 44, must be submitted to the Director or the organisation designated for the purpose in terms of part 149, as the case may be, before the modification has been performed". The SA CATS 44.01.10 reference form XYZ, which must be completed when the application for modification is submitted to the Director for Non-Type Certificated Aircraft. The form does not exist yet. The AP claims that he assisted the owner to submit an application for approval of a Modification to SACAA, which included the project status report, but no response was received back from the SACAA. Airworthiness division was consulted regarding this matter and the feedback that was received is that they don't issue modification approvals for non-type certificated aircraft.

- The SACAA technical guidance material for Amateur built aircraft states in par. 14 that “an amateur built aircraft is not a design approved product in terms of the CAA categorisation and as such all subsequent design changes are the responsibility of the amateur aircraft builder. Therefore, the amateur builder must carry out and certify modification and repair on the aircraft and is fully responsible for the modification and repair of such aircraft. This is supported by the feedback received from airworthiness.
- The guidance further give a WARNING: AMATUER - BUILT AIRCRAFT: THIS AIRCRAFT IS NOT REQUIRED TO COMPLY WITH ALL THE REGULATIONS FOR TYPE CERTIFICATED AIRCRAFT TO BE OPERATED FOR SPORT OR RECREATIONAL PURPOSES ONLY YOU FLY IN THIS AIRCRAFT AT YOUR OWN RISK.
- The guidance material further guides that: **NOTE:** In view of the amateur-built aircraft not intended to comply with any prevailing airworthiness design standard, the classification of major or minor modification is not necessarily applicable.

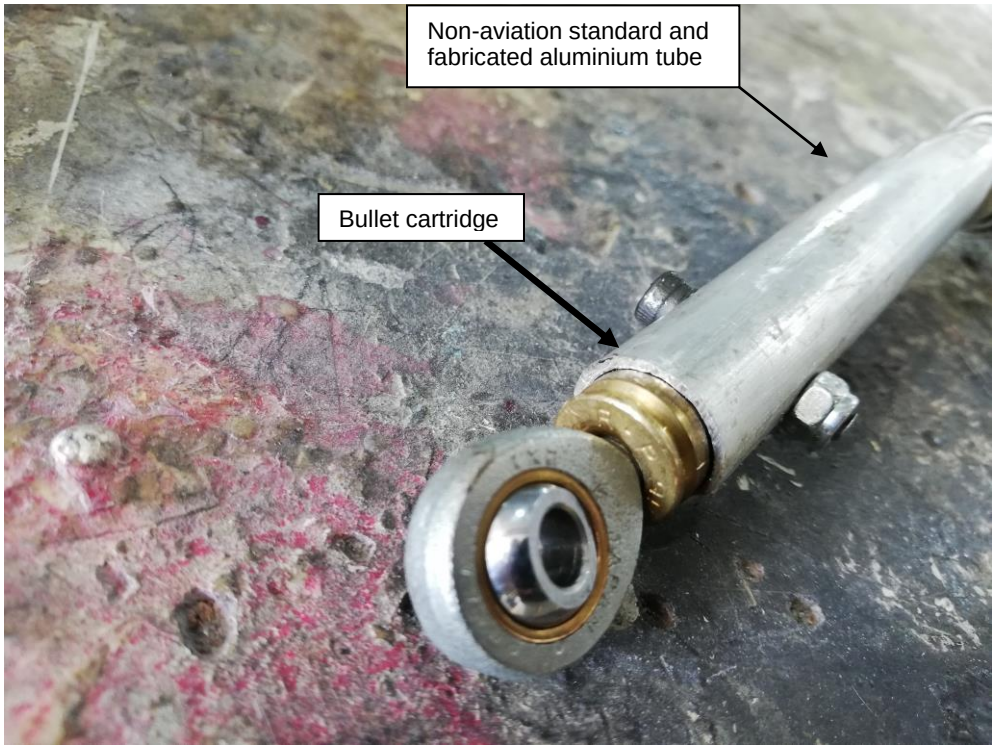

Figure 1: Shows fabricated tube and bullet cartridge.

Figure 2: Shows nose actuator.

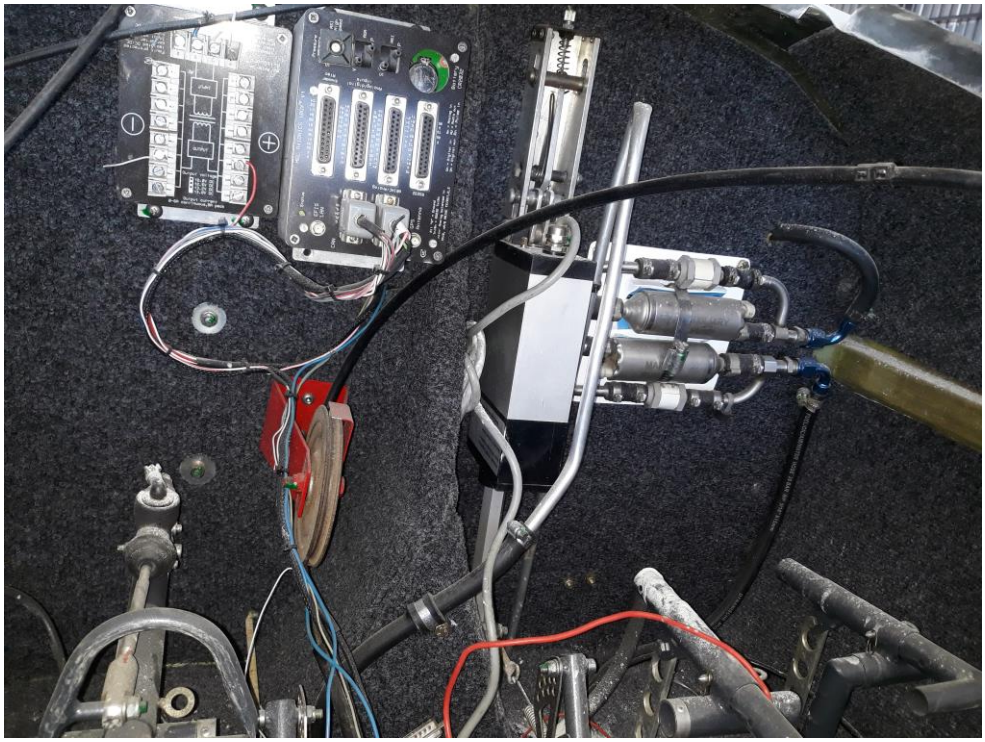

Figure 3: Picture showing original part in a similar aircraft type

2. Findings

2.1 The Pilot had a Commercial Pilot's licence (Aeroplane) which expired on the 31 March 2018 and was properly rated on the aircraft type prior to the incident however; at the time of the accident, the license had expired.

2.2 The pilot's medical certificate expired on the 31 March 2018 and thus not valid.

2.3 The pilot had flown a total of 3237 hours and had a total of 5.1 hours on type.

2.4 The last annual inspection was carried out at 17 March 2018 at 538.6 hours by an approved person who issued a certificate of release to service with expiry of 17 March 2019 or 600 airframe hours.

2.4 The aircraft had a valid Authority to fly which was issued on 27 March 2018 with expiry date of 16 March 2019.

2.5 The aircraft nose gear actuator was fitted with a non-aviation standard aluminium tube and a bullet casing which housed a clevis bolt.

2.5 The aircraft was being operated under Part 94 of Civil Aviation Regulations as amended.

2.6 Weather was not a contributory factor to the accident.

2.7 The SACAA engineering TGM relating to modification of amateur built aircraft is inconsistent with the CAR relating to Non-Type Certificated Aircraft. The TGM place the responsibility of modification solely on the owner. The CAR states that in case of a major modification an application for the approval of the modification and authority to fly, as prescribed in Document SA-CATS 44, must be submitted to the Director or the organisation designated for the purpose in terms of part 149, as the case may be, before the modification has been performed. The SA CATS 44.01.10 reference form XYZ, which must be completed when the application for modification is submitted to the Director for Non-Type Certificated Aircraft. Footnote 1 confirms that this form is yet to be created.

3. REFERENCES USED ON THE REPORT

3.1 Technical report from AMO

Figure 3: Aircraft after being recovered from the accident

3. SAFETY RECOMMENDATION

3.1 None

4. ORGANISATION

4.1 None.

5. TYPE OF SAFETY ACTION

5.1 None

6. SAFETY MESSAGE

6.1 Owners should refrain from using non-standard or un-approved parts as they will lead to failure and injury.

7. PROBABLE CAUSE/CONTRIBUTING FACTOR

7.1 The undercarriage failed to extend due to the bending of the nose gear actuator tube. The bending resulted from a non-aviation standard modification which was fitted to the aircraft.

This report is issued by:
Accident and Incident Investigation Division
South African Civil Aviation Authority
Republic of South Africa

ANNEXURE A

Source: Civil Aviation Regulations of 2011 as amended

Persons to carry out maintenance

44.01.4 (1) No person may carry out maintenance on an amateur built aircraft or a production-built non-type certificated aircraft, or any component thereof, unless such person—

(a) is appropriately rated or approved on type by the Director or the organisation designated for the purpose in terms of part 149, as the case may be, to carry out maintenance; or

(b) carries out the maintenance under the prescribed supervision of a person authorised by the Director or by the organisation referred to in paragraph (*a*). A dual check of the maintenance carried out must be performed by a person referred to in subparagraph (*a*); or

(c) **is the owner of the aircraft provided that an appropriately rated approved AMO, AME or Approved Person, rated in accordance with subpart 4 of part 66, performs a dual check on the maintenance which was carried out**; or

(*d*) is an appropriately rated approved AMO, AME or approved person, rated in accordance with subpart 4 of part 66.

(2) (*a*) Components and parts intended to be used on non-type certificated aircraft may be fabricated by a person or organisation not licensed in terms of part 66 or part 145.

(*b*) **The owner of the aircraft must provide the Director, or the organisation designated for the purpose in terms of part 149, as the case may be, with evidence that the components or parts meet the minimum specification for the component or part as specified by the Original Equipment Manufacturer.**

(*c*) An appropriately rated approved AMO, AME or approved person, rated in accordance with subpart 4 of part 66 shall sign off the component or part in the appropriate logbook.

Modifications

44.01.10 (1) If a person intends to carry out any modifications, including changes to equipment or the installation thereof, which affect, or are likely to affect, the serviceability of the aircraft, or the safety of its occupants or any other persons or property, in relation to an amateur built aircraft or a production built aircraft—

(a) in the case of a minor modification a notification of the modification must be submitted to the Director, or the organisation designated for the purpose in terms of part 149, as the case may be, within 30 days of the modification being performed. All subsequent modifications shall be an amendment to the build standard;

(*b*) **in the case of a major modification an application for the approval of the modification and authority to fly, as prescribed in Document SA-CATS 44, must be submitted to the Director or the organisation designated for the purpose in terms of part 149, as the case may be, before the modification has been performed.**

(2) The application referred to in subregulation (1) must be accompanied by the appropriate fee as described in part 187.

(3) All approved modifications shall be entered into the appropriate logbook(s).

(4) An appropriately rated approved AMO, AME or approved person, rated in accordance with subpart 4 of part 66 shall sign in the appropriate logbook(s) that all procedures, as stated in the application for modification, were adhered to and that he or she is satisfied with the quality of the work which was carried out.

Overhaul, repair and substitution of major components

44.01.16 (1) Overhaul of a Class I or Class II product and repairs to the primary structure of an aircraft, its engine(s) or propeller(s) shall be signed out by an appropriately rated approved AMO, AME or approved person, in terms of subpart 4 of part 66.

(2) **The procedure for the reissuing of a proving flight authority or authority to fly which is deemed to have been suspended when an aircraft is involved in an accident that renders one or more Class I products defective, is prescribed in Document SA-CATS 44.**

(3) Where the manufacturer's instruction or recommendation has not been complied with, such components or equipment must be overhauled as and when their condition shows that it is necessary to keep the aircraft serviceable.

(4) (*a*) In the case of an aircraft operated in terms of part 94, a component or part may be fitted to an aircraft for which traceable records are not available.

(*b*) It shall be the responsibility of the appropriately rated approved AMO, AME or approved person, in terms of subpart 4 of part 66, to ensure that the component or part is acceptable in fit, form and function.

(5) (*a*) Notwithstanding the provisions of subregulation (2), non-type certificated aircraft operated under part 96 or part 141 where the Director or the organisation designated for the purpose in terms of part 149, as the case may be, has approved a time between overhauls that differs from that recommended or specified by the manufacturer, such time between overhauls shall be specified in the aircraft's accepted maintenance schedule, referred to in regulation 44.03.1.

(*b*) Furthermore, where a manufacturer has not recommended or specified the overhaul of an item at certain times but where the Director or the organisation designated for the purpose in terms of part 149, as the case may be, considers its overhaul at certain intervals necessary in the interest of safety, he or she may prescribe a time between overhauls for such item in the aircraft's accepted maintenance schedule.

(*c*) The requirements for the substitution of products, components and parts with new or overhauled items are those prescribed in Document SA-CATS 24.

(*d*) **No part may be fitted to an aircraft for which traceable records are not available. The appropriately rated approved AMO, AME or approved person, in terms of subpart 4 of part 66, is responsible for ensuring that any part received comes from a reliable source and is serviceable, and that the storage limitations have not been exceeded. Substitutions must be certified by the holder of an appropriately rated licence or authorisation.**

Temporary and permanent repairs after accidents

44.01.17 (1) Any repair to an aircraft or aircraft component, which has been damaged after an accident, shall be carried out in accordance with the requirements as prescribed in Document SA-CATS 44.

(2) Following the permanent repair of an aircraft that has been involved in an accident, as defined in paragraph (*b*) of the definition of "accident" in part 1, the aircraft shall meet requirements for the initial authority to fly.

Annexure B

Source: Guidance Material – Amateur built aircraft, Par14.

14. MODIFICATION AND REPAIR REQUIREMENTS

An amateur-built aircraft is not a design approved product or configuration in terms of the CAA categorisation and as such all subsequent design changes are the responsibility of the amateur aircraft builder. However an amateur builder must ensure that those changes are properly recorded in the aircraft logbook. Therefore the amateur builder must to carry out and certify modification and repair on the aircraft and is fully responsible for modification and repair of such an aircraft. Amateur builders performing modification are advised to make themselves fully aware of their legal responsibility under the aviation legislation.

NOTE: In view of the amateur-built aircraft not intended to comply with any prevailing airworthiness design standard, the classification of major or minor modification is not necessarily applicable.