

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

					Reference:	CA18/2/3/9844	
Aircraft Registration	ZS-KAJ	Date of Accident	27 December 2019		Time of Accident	1400Z	
Type of Aircraft	Beechcraft Bonanza A36		Type of Operation	Private (Part 91)			
Pilot-in-command Licence Type	Commercial Pilot Licence		Age	47		Licence Valid	Yes
Pilot-in-command Flying Experience	Total Flying Hours		3890.40		Hours on Type	50.60	
Last Point of Departure	Grand Central Aerodrome (FAGC): Gauteng Province						
Next Point of Intended Landing	Louis Trichardt Aerodrome (FALO): Limpopo Province						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Short of Runway 10 FALO GPS S 23°03'47.17" E 029° 51'21.72" at an elevation of 2989 feet (ft).							
Meteorological Information	Wind direction: 110° wind speed: 10-15kts CAVOK temperature:30°C						
Number of People On-board	1+5	No. of People Injured	0		No. of People Killed	0	
Synopsis	<p>The pilot and five passengers on-board a Beechcraft Bonanza A36 aircraft with registration ZS-KAJ departed Grand Central Aerodrome (FAGC) on a private flight to Louis Trichardt Aerodrome (FALO). The take-off and cruise phases were uneventful. The pilot reported that upon turning final approach to FALO and after being cleared for landing by the air traffic control (ATC), the aircraft engine lost power and went into idle. The pilot tried to troubleshoot the problem, but the throttle was stuck on full power, and there was no power in the engine. The pilot glided the aircraft as he was flying above the trees. The main gears made contact with the treetops as the aircraft glided above them. The pilot kept the aircraft just above the stall speed, however, as the aircraft glided above the last tall tree, the right wing hit the treetop and the aircraft turned 45° to the right (of its path). It impacted the ground with the left side of the main wheel which caused it to collapse. The aircraft spun around a few times before coming to a stop facing the direction from which it had approached. The pilot ensured that all passengers disembarked safely.</p> <p>The pilot and the passengers did not sustain any injuries. The aircraft was substantially damaged during the accident sequence.</p> <p>The investigation revealed that the engine lost power and went into idle because of the separation of the throttle control cable and the fuel control arm. This was a result of the bolt connecting the fuel throttle rod end to the fuel control unit arm separating from the nut. The nut, bolt and pin were never located.</p>						
SRP Date	8 September 2020		Publication Date	9 September 2020			

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ABBREVIATION	DESCRIPTION
AGL	Above Ground Level
AME	Aircraft Maintenance Engineer
AMO	Aircraft Maintenance Organisation
AMSL	Above Mean Sea Level
CPL	Commercial Pilot Licence
FAGC	Grand Central Aerodrome
FALO	Louis Trichardt Aerodrome
Ft	Feet
Kt	Knots
RSA	Republic of South Africa

Reference Number : CA18/2/3/9844
Name of Owner/Operator : Walter Gilfillen
Manufacturer : Beech Aircraft Corporation
Model : Beechcraft Bonanza A36
Nationality : South African
Registration Marks : ZS-KAJ
Place : Louis Trichardt Aerodrome
Date : 27 December 2019
Time : 1400Z

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 (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**.*

Investigations process:

The accident was notified to the Accident and Incident Investigations Division (AIID) on 27 December 2019 at about 1430Z. The investigators co-ordinated with all authorities by initiating the accident investigation process according to CAR Part 12 and investigation procedures. The AIID of the South African Civil Aviation Authority (SACAA) is leading the investigation as the Republic of South Africa (RSA) is the State of Occurrence.

Notes:

1. Whenever the following words are mentioned in this report, they shall mean the following:

- Accident— this investigated accident*
- Aircraft — the Beechcraft 36 ZS-KAJ involved in this accident*
- Investigation — the investigation into the circumstances of this accident*
- Pilot — the pilot involved in this accident*
- Report — this accident report*

2. Photos and figures used in this report were taken from different sources and may be adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows or lines.

Disclaimer:

This report is produced without prejudice to the rights of the SACAA, which are reserved.

1. FACTUAL INFORMATION

1.1. History of Flight

- 1.1.1 On 27 December 2019 at approximately 1245Z, the pilot and five passengers on-board a Beechcraft Bonanza A36 aircraft with registration ZS-KAJ departed Grand Central Aerodrome (FAGC) to Louis Trichardt Aerodrome (FALO) on a private flight. The take-off and cruise phases were uneventful, and the flight was carried out under visual flight rules (VFR). The pilot reported that upon turning final approach at FALO and after being cleared for landing by the air traffic control (ATC), the aircraft lost power and went into idle. The pilot tried to troubleshoot the problem, but the throttle was stuck on full power, and with no power in the engine. The pilot glided the aircraft over the trees, however, the main gears made contact with the treetops as the aircraft glided above them. The pilot kept the aircraft just above the stall, however, while gliding over the last tall tree, the right wing hit the treetop and the aircraft turned 45° to the right (of its path). The aircraft impacted the ground with the left side of the left main wheel, which caused it to collapse. The aircraft spun around a few times before coming to a stop facing the direction from which it had approached. The pilot then ensured that all passengers disembarked safely.
- 1.1.2 After disembarking the aircraft, the pilot opened the cowling and found that the bolt, nut and pin connecting the fuel throttle rod end to the fuel control unit arm were missing, which caused the engine to lose power and idle.
- 1.1.3 The pilot and the passengers did not sustain any injuries during the accident sequence; however, the aircraft was substantially damaged.
- 1.1.4 The accident occurred during daylight on an open field short of Runway 10 at FALO at Geographical Position System (GPS) determined to be S 23°03'47.17" E 029° 51'21.72" at an elevation of 2989 feet (ft).

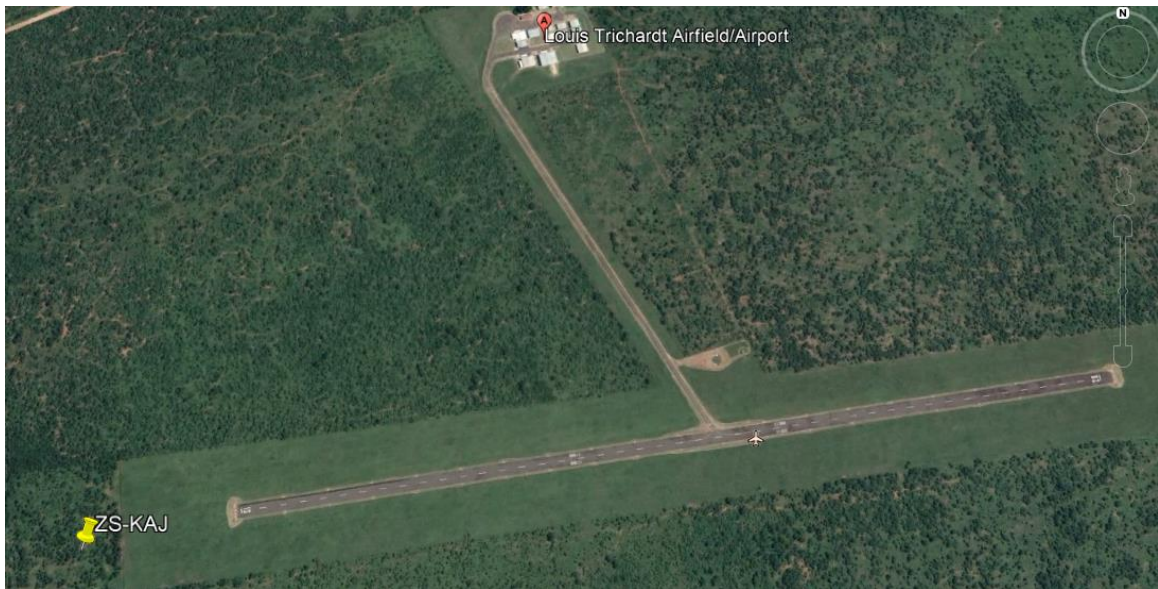


Figure 1: The accident site in relation to the runway.

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	-
None	1	-	5	-

1.3. Damage to Aircraft

1.3.1 The aircraft sustained damage to the landing gear, as well as the right and the left wing.

1.4. Other Damage

1.4.1 None.

1.5. Personnel Information

1.5.1 Pilot

Nationality	South African	Gender	Male	Age	47
Licence Number	0270413305	Licence Type	Commercial Pilot Licence		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Night, Instrument and Agriculture				
Medical Expiry Date	31 January 2020				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	3890.40
Total Past 90 Days	20.40
Total on Type Past 90 Days	13.30
Total on Type	50.60

1.5.2 Engineer

Nationality	South African	Gender	Male	Age	56
Licence Number	0272003823	Licence Type	AME Licence		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Cessna, Beechcraft series, Piper series, Robinson R22,44, Bell 206, 407 series, Quest Kodiak, Aerostar 600 series, Aircraft in Group 4, Engines Group 1,2, P&W PT6A series, Garrett Aire TPE331 series, Allison 250 Engines, Compasses direct reading magnetic, Compass remote reading				

1.6. Aircraft Information

Airframe:

1.6.1 The Beechcraft Bonanza is an American general aviation aircraft introduced in 1947 by Beech Aircraft Corporation of Wichita, Kansas. The six-seater, single-engine aircraft is still being produced by Beechcraft.

Type	Beechcraft Bonanza A36	
Serial Number	E-1102	
Manufacturer	Beech Aircraft Corporation	
Date of Manufacture	1977	
Total Airframe Hours (At time of Accident)	5534.68	
Last MPI (Date & Hours)	12 July 2019	5485.14
Hours Since Last MPI	49.54	
C of A (Issue and expiry Date)	18 April 2019 and expires 30 April 2020	
C of R (Issue Date) (Present owner)	30 January 2013	
Operating Categories	Part 91	

Note: The aircraft was last refuelled with 110 gallons of Avgas on 27 December 2019. According to the flight folio, the aircraft flew 2.7 hours on 27 December 2019. According to the pilot questionnaire, there were 19 gallons of fuel remaining in the fuel tank after the accident.

Note: During the last Mandatory Periodic Inspection (MPI), the following was carried out according to the Beechcraft Bonanza Maintenance Manual P/N: 36-590001-3B (revised 1/04/2011)

Airframe:

- Carried out 100 hours MPI
- Carried out pitot static and transponder
- Serviced fire extinguisher
- Carried out five years wing bolt non-destructive testing (NDT) inspection by unit inspection
- Serviced nose wheel shimmy damper
- Serviced nose gear oleo
- Repaired tachometer by Avia instrument CRMA number AI5177
- Fitted new battery P/N: 7035-28 S//N: G 03003680 Teledyne battery release certificate number:32903-0
- Compass swing

Engine:

- Repaired cylinder number 2 done by Aero Engineering and Powerplant (AEP) AMO.
- Replaced cylinder number 2 done by J.P. Instruments Inc. AMO
- Carried out magneto's 500 hours inspection in accordance with four years' time limit-TAM CRMA number: 8774/1 and 8774/2
- Blow-bys recorded: 1)62/80
2)61/80
3)58/80
4)60/80
5)60/80
6)68/80
- Removed the "fuel metering unit inlet screen" (finger filter), cleaned, inspected and re-fitted (as per Teledyne Continental 100 Hr Inspection)

Propeller:

Propeller dressed and painted only.

Engine:

Type	Continental IO-520-BA10B
Serial Number	1004497
Hours Since New	462.88
Hours Since Overhaul	TBO not yet reached

Note: According to the logbooks, the engine was installed on 19 May 2011 and had never been overhauled. The fuel control unit was installed on the same date (19 May 2011) and was never removed.

Propeller:

Type	McCauley 3A32C76
Serial Number	773391
Hours Since New	225.98
Hours Since Overhaul	TBO not yet reached

1.7. Meteorological Information

1.7.1 Weather information was extracted from the pilot questionnaire.

Wind direction	110°	Wind speed	10-15kts	Visibility	10km
Temperature	30°C	Cloud cover	Sky clear	Cloud base	CAVOK
Dew point	Unknown	QNH	Unknown		

1.8. Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment approved by the Regulator (SACAA) for the aircraft type and operation. No defects that could render the navigation system unserviceable were recorded before the flight.

1.9 Communication

1.9.1 The aircraft was equipped with standard communication equipment as per the minimum equipment list (MEL) and approved by the Regulator. There were no recorded defects with the communication equipment prior to the flight.

1.10 Aerodrome Information

Aerodrome Location	Republic of South Africa – Louis Trichardt
Aerodrome Coordinates	GPS S 23°03'47.17" E 029° 51'21.72"
Aerodrome Elevation	3025 ft. (AMSL)
Runway Designations	10/28
Runway Dimensions	1200 x 18m
Runway Used	Runway 10
Runway Surface	Asphalt
Approach Facilities	VOR

Note: The aircraft landed on a field short of Runway 10 at FALO.

1.11 Flight Recorders

1.11.1 The aircraft was not equipped with a flight data recorder (FDR) or cockpit voice recorder (CVR), nor were these required to be fitted by regulation.

1.12 Wreckage and Impact Information

1.12.1 The aircraft took off from FAGC to FALO. During a turn onto final approach, the engine went into idle, glided above trees and landed on a field short of Runway 10. The right wing was damaged due to impact with a tree and the aircraft's main gear collapsed. The aircraft spun around before it finally stopped facing north-west.



Figure 2: The aircraft as it came to rest after the forced landing. (Source: PIC)



Figure 3: Damage sustained to the aircraft's right wing. (Source: PIC)

1.13 Medical and Pathological Information

1.13.1 None.

1.14 Fire

1.14.1 There was no evidence of a pre- or post-impact fire.

1.15 Survival Aspects

1.15.1 The accident was considered survivable as the cabin area remained intact. The pilot and the passengers were restrained by the aircraft's safety harnesses.

1.16 Tests and Research

1.16.1 After landing the aircraft, the pilot opened the cowling and noticed that the bolt connecting the fuel control throttle rod end and control unit arm was missing. The arm was stuck in the 'closed' position, resulting in the engine idling (see Figure 4).

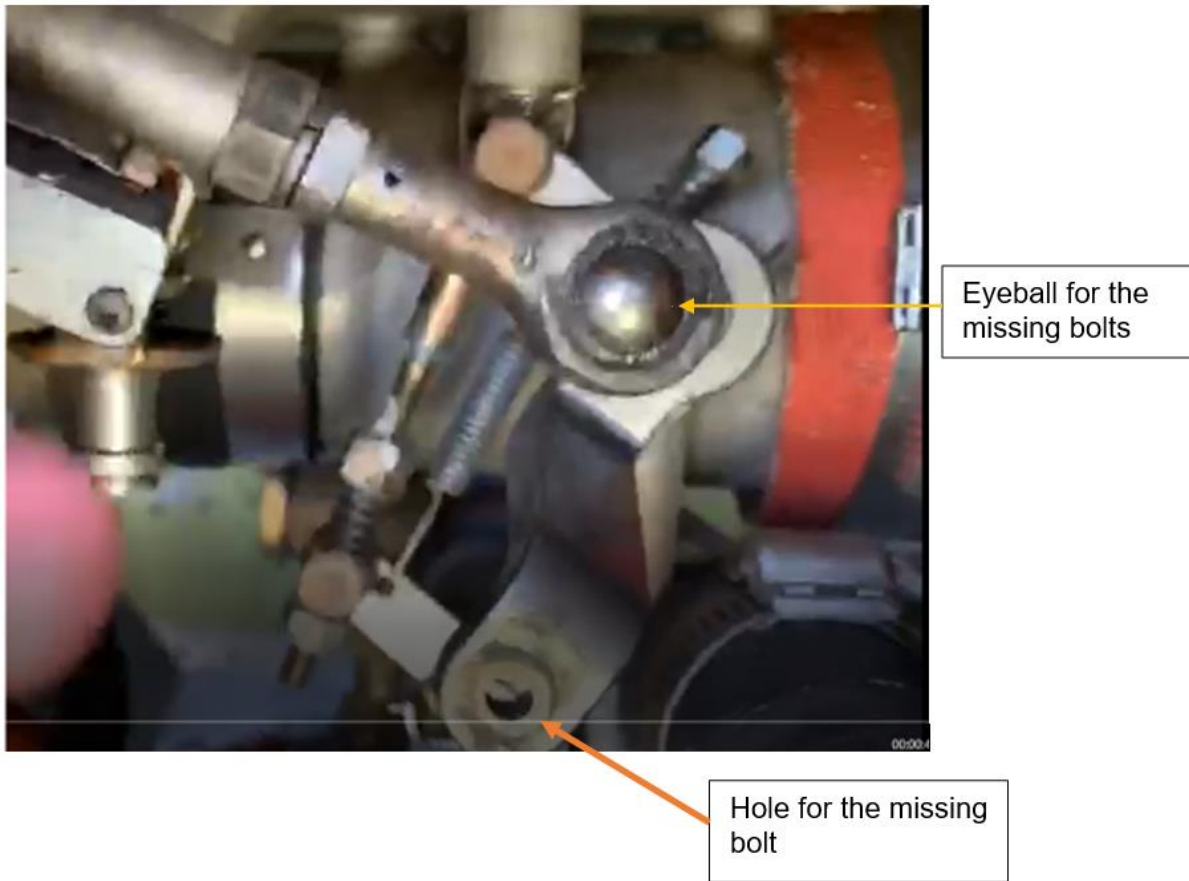
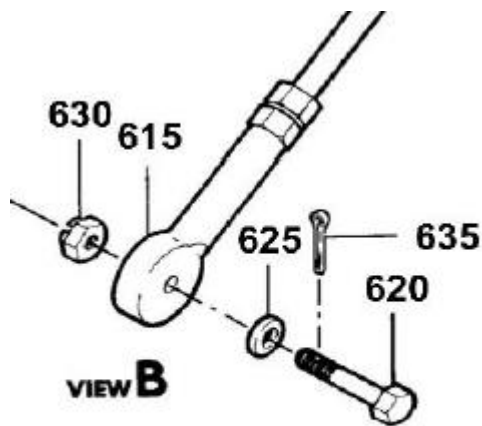


Figure 4: The rod end and the arm with missing hardware. (Source: video from the pilot)

1.16.2 According to the engine logbook, the engine was installed on 19 May 2011 and had never been overhauled. The fuel control unit was also installed on the same date and had never been removed. On 12 July 2019 during the MPI, the “fuel metering unit inlet screen” (finger filter) was removed, cleaned, inspected and re-fitted (as per Teledyne Continental 100 Hour Inspection). The fuel control unit was not removed, only the inlet screen.

1.16.3 According to the illustrated parts catalogue (IPC) in view B (below); the bolt (620), a washer-lock (625), nut (630) and pin (635) connecting the rod end (615) to the fuel control unit arm were missing.



METHODS OF				
615	131765-1F	• ROD END	FE	2
ATTACHING PARTS				
620	130909B18	• BOLT	FE	1
625	AN935-416	• WASHER-LOCK	FE	1
630	AN316-4R	• NUT	FE	1
635	MS24665-132	• PIN	FE	2

Figure 5: IPC view B showing the rod-end and missing items.

1.16.4 When the bolt is not secured with a nut and pin, it will get loose over time. This will cause the bolt to fall off (separate), resulting in loss of fuel control as well as cause the engine to idle. See Figure 6 for a properly secured bolt.



Figure 6: Bolt, nut and pin of a properly secured bolt. (Source : <https://www.prs356.co.uk/porsche-356-parts/steering-damper-hex-head-bolt-with-castle-nut-split-pin-356a-356b-356c/>)

1.17 Organisational and Management Information

1.17.1 This was a private flight from FAGC to FALO, conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.17.2 The last MPI was conducted by an approved aircraft maintenance organisation (AMO). The AMO was last audited by the SACAA in October 2019; and there were no findings. The AMO had a certificate issued by the Regulator on 11 November 2019 with an expiry date of 30 November 2020.

1.18 Additional Information

1.181. None.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1. General

From the available evidence, the following analysis was made with respect to this accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

2.1.1 The pilot was issued a Commercial Pilot Licence (CPL) on 2 February 2005. He was appropriately rated on the aircraft type. His last renewal of the licence was on 15 January 2019, the licence had an expiry date of 29 February 2020. He also had an aviation medical certificate that was issued by a SACAA-accredited medical examiner on 13 January 2019 with an expiry date of 31 January 2020.

2.1.2 The pilot and the passengers took off from FAGC on a private flight to FALO. During final approach, the engine went into idle and the aircraft glided above trees. The right wing impacted a tall tree before the aircraft landed on an open field short of Runway 10.

2.1.3 After landing and disembarking the aircraft, the pilot opened the cowlings and found that the fuel controller rod end and arm were missing a bolt, washer, nut and pin. This indicated that the bolt was not secured with a pin. If the bolt is not secured with a pin, it will get loose over time and eventually separate. This caused the fuel controller to get

stuck on the “off” position, hence, the engine idled. If a bolt is secured with a pin, there is no way of it getting loose because the pin can only be removed using a side cutter.

2.1.4 The engine was installed on 19 May 2011 and had never been overhauled. The fuel control unit was also installed on the same date and had never been removed since its installation. On 12 July 2019 during the MPI, the fuel metering unit inlet screen was removed, cleaned, inspected and re-fitted. The fuel control unit was not removed, only the fuel metering unit inlet screen was removed. During the 100-hour MPI, the fuel control unit is not required to be removed. This indicated that the fuel controller rod end and arm were fitted with a bolt, washer lock and nut, but not with a pin as shown in Figure 6. It is probable that the bolt, washer lock and nut were secured without a pin during installation in 2011. Over time, they got loose because of vibration during flights until they finally separated.

2.1.5 According to the pilot questionnaire, there was 19 US gallons of fuel remaining in the fuel tank after the accident, an indication that there was enough fuel for the flight.

2.1.6 Fine weather conditions prevailed at the time of the accident.

2.1.7 The investigation revealed that the engine lost power and went into idle because of the separation of the throttle control cable and the fuel control arm. This was a result of the bolt connecting the fuel throttle rod end to the fuel control unit arm separating from the nut. The nut, bolt and pin were never located.

3. CONCLUSION

3.1. General

From the available evidence, the following findings, causes and contributing factors were made with respect to this accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusion heading:

- **Findings:** are statements of all significant conditions, events or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.

- **Causes:** are actions, omissions, events, conditions, or a combination thereof, which led to this accident.
- **Contributing factors:** are actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident or incident occurring, or mitigated the severity of the consequences of the accident or incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

3.2. Findings

- 3.2.1 The pilot was issued a Commercial Pilot Licence (CPL) with the aircraft type endorsed on it. The licence was initially issued on 2 February 2005, the last revalidation was issued on 15 January 2019 with an expiry date of 29 February 2020. The pilot was issued a medical certificate on 13 January 2019 with an expiry date of 31 January 2020.
- 3.2.2 This was a private flight conducted under visual flight rules (VFR).
- 3.2.3 The pilot and the passengers were on a private flight from FAGC to FALO.
- 3.2.4 The aircraft idled on final approach, glided and landed on a field short of Runway 10 at FALO.
- 3.2.5 The fuel controller rod end bolt was not properly secured with a pin and eventually got loose over time and, thus, separated. This caused the engine to lose power and idle during final approach at FALO.
- 3.2.6 The aircraft had enough fuel for the flight.
- 3.2.7 The aircraft had a Certificate of Registration (C of R) issued on 30 January 2013.
- 3.2.8 The aircraft had a Certificate of Airworthiness (C of A) issued on 18 April 2019 with an expiry date of 30 April 2020.
- 3.2.9 The aircraft had a certificate of release to service issued on 12 July 2019 at 5485.14 airframe hours with an expiry date of 11 July 2020 or at 5585.14 airframe hours, whichever occurs first. The aircraft had flown a total of 49.54 hours since it was issued the certificate of release to service.
- 3.2.10 The AMO that performed the MPI on the aircraft had a valid AMO certificate.

3.3. Probable Cause/s

3.3.1 The investigation revealed that the engine lost power and went into idle because of the separation of the throttle control cable and the fuel control arm. This was a result of the bolt connecting the fuel throttle rod end to the fuel control unit arm separating from the nut. The bolt, nut and pin were never located.

4. SAFETY RECOMMENDATIONS

4.1. General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report; the AIID expects that all safety issues identified by the investigation are addressed by the receiving States and organisations.

4.2. Safety Recommendation

4.2.1 Safety message: It is recommended that the aircraft maintenance organisations ensure that necessary dual inspections and manufacturers' maintenance instructions are always followed by maintenance personnel.

5. APPENDICES

5.1 None.

This Report is issued by:

Accident and Incident Investigations Division

South African Civil Aviation Authority

Republic of South Africa