

AIRCRAFT INCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/3/2/0876	
Aircraft Registration	ZS-ACS	Date of Incident	16 November 2011		Time of Incident	1717Z
Type of Aircraft	King Air 200		Type of Operation	Training		
Pilot-in-command Licence Type	Air Transport		Age	52	Licence Valid	Yes
Pilot-in-command Flying Experience	Total Flying Hours		10723		Hours on Type	862.30
Last point of departure	Wonderboom Aerodrome (FAWB) in Gauteng					
Next point of intended landing	Wonderboom Aerodrome (FAWB) in Gauteng					
Location of the incident site with reference to easily defined geographical points (GPS readings if possible)						
Runway 11 at Wonderboom Aerodrome						
Meteorological Information	Surface Wind: 320/05 Visibility: 10km Temperature: 27°C					
Number of people on board	2+1	No. of people injured	0	No. of people killed	0	
Synopsis	<p>The aircraft took-off uneventfully from Wonderboom Aerodrome on a local training flight in the General Flying Area with the intention to land back at Wonderboom Aerodrome. During the training exercises, the right hand main landing gear failed to extend. After unsuccessful attempts to extend the landing gear, the aircraft landed on Runway 11 with the right hand main landing gear retracted.</p> <p>It was established that that the right hand main landing gear actuator was defective.</p> <p>The aircraft sustained substantial damage.</p> <p>The occupants on-board were not injured.</p>					
Probable Cause						
<p>The aircraft landed with the right main landing gear retracted.</p> <p>Contributory Factor: mechanical failure</p>						
IARC Date		Release Date				



AIRCRAFT INCIDENT REPORT

Name of Owner/Operator : Harvinox (Pty) Ltd
Manufacturer : Beech Aircraft Corporation
Model : B200
Nationality : South African
Registration Marks : ZS-ACS
Place : Wonderboom Aerodrome
Date : 16 November 2011
Time : 1717Z

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 The aircraft took-off from Runway 29 at Wonderboom Aerodrome for a training flight in the General Flying Area.
- 1.2 While doing exercises in the flying area, the right main landing gear failed to extend. The flight crew completed the emergency checklist actions contained in the Aircraft Flight Manual, but the right hand main landing gear failed to extend with the normal electrical system and with the manual system.
- 1.3 The flight crew decided to return to Wonderboom Aerodrome and notified ATC of the right main landing gear emergency situation. The ATC allowed the aircraft to orbit at 5500 ft AGL and burn off fuel while at the same time continuing with the emergency procedure to extend the undercarriage manually.
- 1.4 The pilot then executed an emergency landing with the right hand landing gear retracted. On touchdown with the left hand main landing gear and nose landing gear extended, the aircraft departed the runway to the left.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

1.3.1 The aircraft sustained substantial damage in the accident.

1.4 Other Damage

1.4.1 Limited to skid markings on the runway surface.

1.5 Personnel Information

1.5.1 Instructor information:

Nationality	South African	Gender	Male	Age	52
Licence Number	0270212491	Licence Type	Airline Transport		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Instructor, Instrument, Night and Test pilot				
Medical Expiry Date	03 June 2019				
Restrictions	Corrective lenses				
Previous Accidents	None				

Flying Experience:

Total Hours	10723
Total Past 90 Days	93.15
Total on Type Past 90 Days	3.00
Total on Type	862.30

1.5.2 Student pilot information:

Nationality	South African	Gender	Male	Age	26
Licence Number	0271064610	Licence Type	Commercial		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Instrument and Night rating				
Medical Expiry Date	31/12/2011				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	540.0
Total Past 90 Days	50.0
Total on Type Past 90 Days	2.00
Total on Type	2.00

1.6 Aircraft Information

Airframe :

Type	B200	
Serial No.	BB-961	
Manufacturer	Beech Aircraft Corporation	
Date of Manufacture	1982	
Total Airframe Hours (At time of Incident)	11788.7	
Last MPI (Date & Hours)	06 October 2011	11778.0
Hours since Last MPI	10.7	
C of A (Expiry Date)	27 October 2012	
C of R (Issue Date) (Present owner)	30 August 2011	
Operating Categories	Standard Part 135	

Engine 1:

Type	Pratt and Whitney PT6A-42
Serial No.	PCE-93072
Hours since New	7771.6
Hours since Overhaul	2702.6

Engine 2:

Type	Pratt and Whitney PT6A-42
Serial No.	PCE-93962
Hours since New	11095.4
Hours since Overhaul	733.1

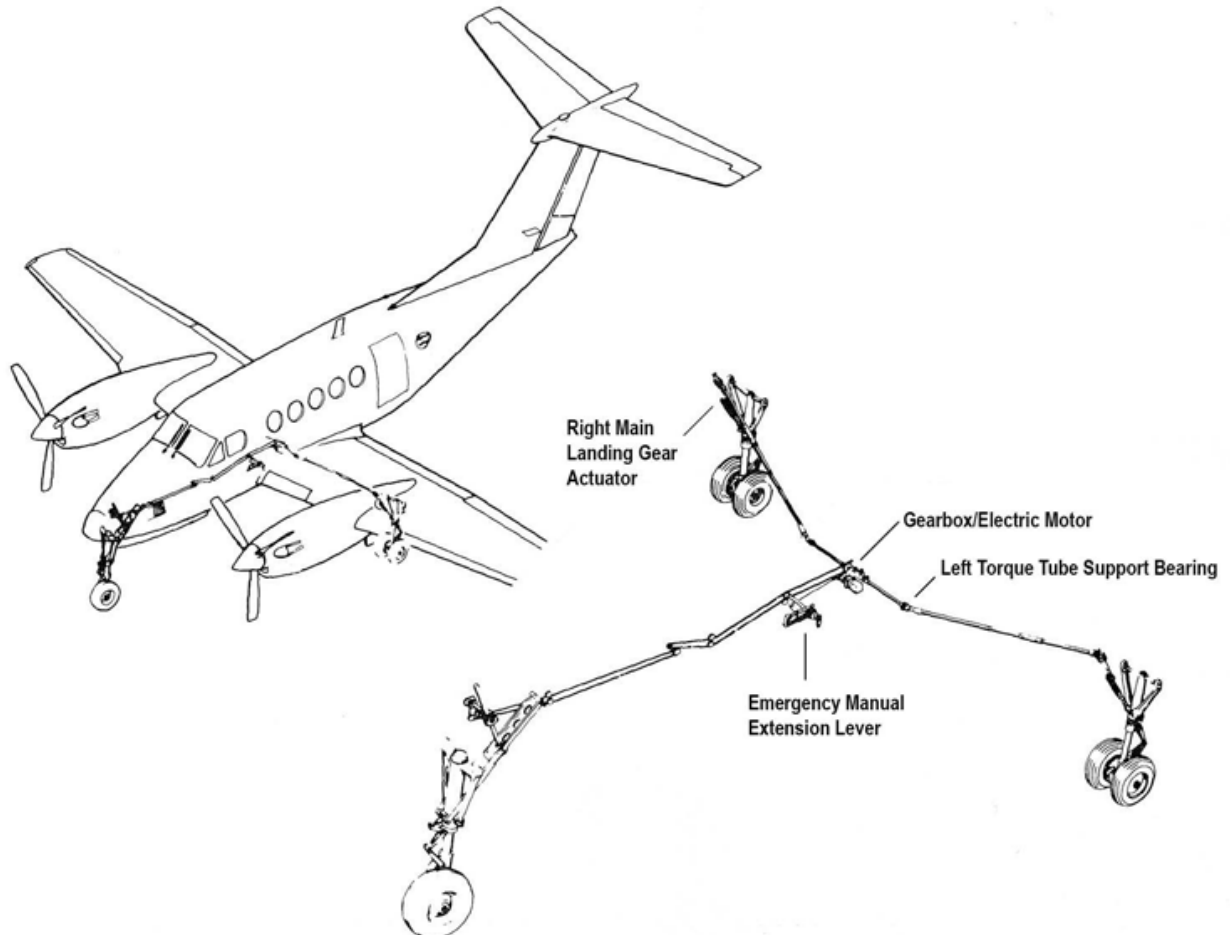
Propeller 1:

Type	Hartzell HCB3TN-36G
Serial No.	BUA27064
Hours since New	9715.8
Hours since Overhaul	10.7

Propeller 2:

Type	Hartzell HCB3TN-36
Serial No.	BUA27064
Hours since New	9715.8
Hours since Overhaul	10.7

1.6.1 Illustration of the mechanical landing gear system from the Super King Air 200³



1.6..2 Landing Gear- Description and Operation (Mechanical Landing Gear)

The tricycle type landing gear is operated by a split-field series-wound motor located on the forward side of the main centre section spar. One field is used to drive the motor in one direction and the other drives the motor in the opposite direction. To prevent overtravel of the gear, a dynamic brake relay simultaneously breaks the power circuit to the motor and makes a complete circuit through the armature and the unused field winding. The motor then acts as a generator and the resulting electrical load on the armature stops the gear almost instantly. The landing gear motor is controlled by the landing gear extension switch located on the right hand side of the pilot's subpanel.

The main gear actuator is driven by the torque shafts from the motor gearbox and the nose gear actuator is driven by a Duplex chain from a sprocket on the gearbox torque shaft. A spring-loaded friction clutch between the gearbox and the torque shaft protects the system in event of a mechanical malfunction. A 200-ampere, remote circuit breaker (located under the centre floorboard on the landing gear electrical panel, forward of the front spar) protects the system on airplanes serials BB-2 thru BB-185 from an electrical overload. A 150-ampere current limiter replaces the remote circuit breaker on BB-186 and subsequent model 200 series airplanes that utilise the mechanical landing gear. If Kit No. 101-3069-1 has been incorporated on these airplanes, a 60-ampere circuit breaker will be installed in place of the 150-ampere current limiter. Notched hook and plate attachments fitted to each main drag brace and the over-centre action of the nose gear drag brace provide positive mechanical down-locks. A jackscrew in each actuator holds the gear in the retracted position.

To confirm gear retraction when the airplane is on the ground, a safety switch on the right main strut breaks the control circuit whenever the strut is compressed.

Caution: Never rely on the safety switch to keep the gear down while taxiing or on landing or take-off roll. Always check the position of the landing gear switch.

The landing gear incorporates air-oil type shock struts that are filled with both compressed air and hydraulic fluid. Their correct inflation should be assured before each flight.

Caution: Never tow or taxi the airplane with a flat strut. Even brief towing or taxiing with a deflated strut can cause severe damage.

Adopted from the Super King Air 200 Series Maintenance Manual.

1.7 Meteorological Information

Wind direction	320°C	Wind speed	5 kts	Visibility	10 km
Temperature	27°C	Cloud cover	CAVOK	Cloud base	n/a
Dew point	5°C				

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as approved by the regulator for the aircraft type and there were no recorded defects prior to the flight.

1.9 Communications.

1.9.1 Wonderboom Airport (FAWB): The communication facilities provided by Air Traffic Services (ATS) at FAWB are Tower/Approach (118.35 MHz)). The communication facilities are available 24 hours a day. There was no proof of any anomaly experienced with the communication facilities at the airport.

1.9.2 Aerodrome Rescue Fire-fighters (ARFF): The emergency rescue services (fire-fighters) at FAWB were notified by ATC of the emergency situation of the aircraft and dispatched to standby on Runway 29-11. All communications with the emergency rescue services were co-ordinated by ATC. There was no anomaly identified with communication between ATC and emergency rescue services.

1.10 Aerodrome Information

Aerodrome Location	Wonderboom (FAWB)	
Aerodrome Co-ordinates	S25 39 19.10 E028 13 16.83	
Aerodrome Elevation	4095ft	
Runway Designations	11/29	06/24
Runway Dimensions	1828 x 30	1280 x 22
Runway Used	11	
Runway Surface	Asphalt	
Approach Facilities	PAPIs	

1.11 Flight Recorders

1.11.1 This aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), nor were they required by regulation to be fitted to this type of aircraft.

1.12 Wreckage and Impact Information

1.12.1 On touchdown Runway 11, the aircraft rolled for 1200m, veered-off to the left onto the grass area, came to a halt approximately 17m from the edge of the runway.

1.12.2 The aircraft sustained substantial damage to the right hand inboard flap, right hand outboard flap during the ground impact sequence.

1.13 Medical and Pathological Information

1.13.1 None

1.14 Fire

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

1.15 Survival Aspects

1.15.1 The incident was considered to be survivable. The aircraft was intact but sustained substantial damage to the belly bottom side of the airframe. The flight crew and passenger were properly restrained by the aircraft safety belts. All the occupants survived the incident without sustaining any injuries.

1.15.2 The ARFF personnel at FAWB had their response vehicles on standby at Runway 29-11 waiting for the aircraft to execute an emergency landing. After the aircraft had landed and came to a stop on the grass, the fire-fighters started spraying foam agent. The crew and passenger evacuated safely from the aircraft.

1.16 Tests and Research.

1.16.1 The aircraft was recovered to an AMO (Aircraft Maintenance Organisation) where the aircraft was put on jacks and retraction tests were done in order to check the operation of the landing gear system. It was discovered that the right hand main landing gear actuator had failed internally (see picture below).



Figure 2 showing the right hand main landing gear actuator before disassembly

1.16.2 The right hand main landing gear actuator was submitted for metallurgical examination and it was found that the two bevel gears in the actuator showed extensive wear on the teeth and some of the teeth were missing as shown below:



Figure 2 showing the extensive wear of teeth and missing tooth on the small drive gear.

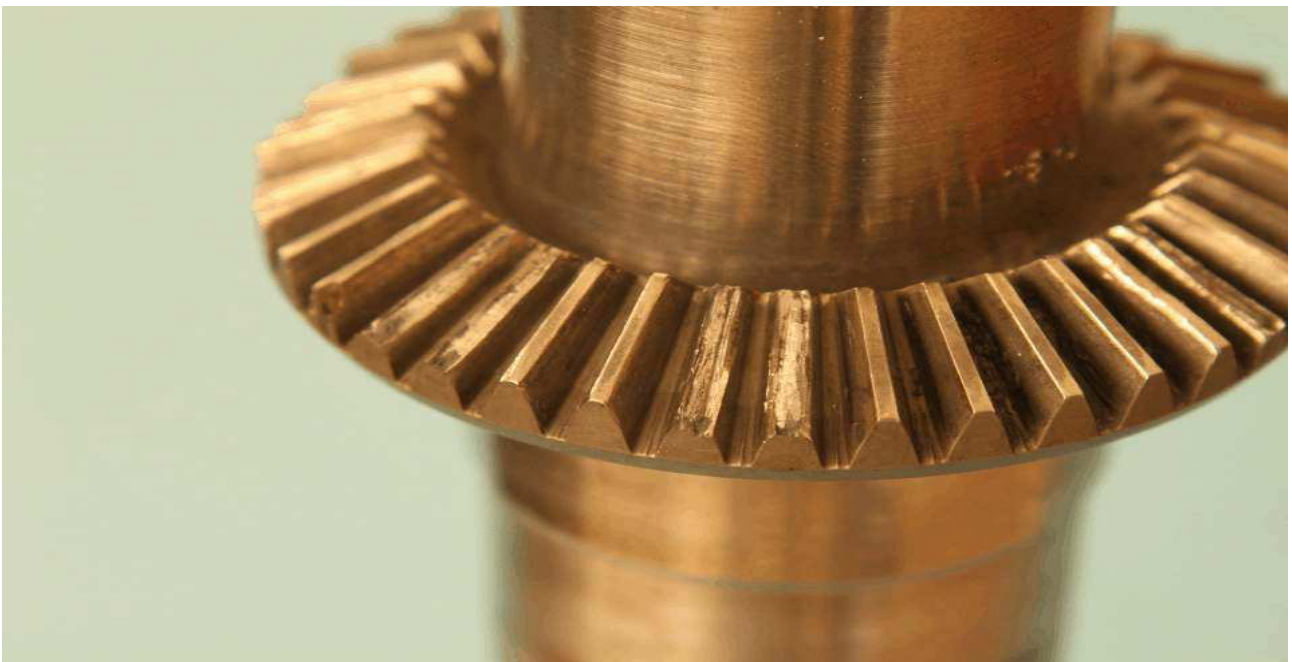


Figure 3 showing wear of teeth and missing teeth on large drive gear

1.16.3 It was also discovered that of the three sections of the support structure used to secure the actuator to the wing structure, two appeared intact though deformed and the third one was fractured into two pieces and extensively deformed.

1.16.4 It was concluded from the metallurgical examination that the actuator failed to extend the undercarriage as a result of extensive wear and tooth breakage in both the bevel gears where failure would have occurred when a fragment became trapped between the gears, preventing them from meshing and causing the undercarriage drive motor to trip on overload.

1.16.5 During disassembly of the actuator, the actuator gearbox was well lubricated.

1.16.6. An enquiry was made to the manufacturer regarding the findings which arose from the investigation (of the actuator failure) and the manufacturer indicated to the investigator-in-charge that when this aircraft S/N BB 961 left the factory, it was equipped with a mechanical landing gear system. After the aircraft was in service, the manufacturer introduced a field service kit No. 101-8018(a hydraulic landing gear installation kit) which the operator of ZS-ACS opted not to adopt.

1.17 Organizational and Management Information

1.17.1 This was an approved training flight.

1.17.2The training school was in possession of an accredited aviation training organisation (ATO) flight training approval.

1.17.3The aircraft was maintained by an approved aircraft maintenance organisation (AMO), which was in possession of a valid AMO approval certificate at the time of the incident.

1.17.4The training school had a valid ATO (Aviation Training Organisation) accreditation and the author sheet was signed. The author sheet indicates the purpose of the flight as per training.

1.18 Additional Information

1.18.1 None.

1.19 Useful or Effective Investigation Techniques

1.19.1 None

2. ANALYSIS

2.1 During exercises in the General Flying Area, the right main landing gear of the Beech King Air 200 (ZS-ACS) failed to extend.

2.2 The crew were correctly licensed and held valid medical certificates. The pilot's corrective diagnosis and troubleshooting actions performed in an attempt to restore the aircraft's right main landing gear extension was appropriate for the circumstances.

2.3The prevailing weather conditions at the time of the incident were considered not to have been a factor in this incident, with the reported surface wind being calm and "CAVOK" weather conditions reported at the time of the incident.

- 2.4 Retraction tests performed by the AMO in the presence of the Investigator-In-Charge revealed that the right hand main landing gear failed to extend due to internal damage caused to the right hand main landing gear actuator.
- 2.5 The landing gear hydraulic system configuration of the Beech King Air 200 is such that should the actuator cease to function, extension of the landing gear would not have been possible. Failure of this component would produce a “lock-up” and disable any attempt (normal or emergency) by the pilot to retract or extend the gear.
- 2.6 Due to the fact that the right hand main landing actuator was defective, it was not possible to extend the right hand main landing gear with both the normal and emergency system.

3. CONCLUSION

3.1 Findings

- 3.1 The crew held valid pilot’s licences. Both the student pilots held valid commercial pilot’s licenses and valid aviation medical certificates issued by a CAA-approved medical examiner.
- 3.2 This was an approved training flight and the training school involved had a valid accreditation by the SACAA.
- 3.3 CAVOK weather conditions prevailed at the time of the occurrence, and were not considered to be a factor in this incident.
- 3.4 The aircraft was maintained by an approved aircraft maintenance organisation (AMO), which was in possession of a valid AMO approval certificate at the time of the incident.
- 3.5 The right hand main landing gear failed to extend during exercises and landing due to internal damage to the right hand main landing gear actuator.

3.2 Probable Cause/s

3.2.1 The aircraft landed with the right main landing gear retracted.

3.2.2 Contributory Factor: mechanical failure.

4. SAFETY RECOMMENDATIONS

4.1 None

5. APPENDICES

5.1 None

Compiled by:L Boya

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For: Director of Civil Aviation

Date:

Investigator-in-charge :

Date:

Co-Investigator :

Date: