

SOUTH AFRICAN



Section/division

Accident and Incident Investigations Division

Form Number: CA 12-12a

## AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9284	
<b>Aircraft Registration</b>	<b>ZS-CLT</b>	<b>Date of Accident</b>	3 February 2014		<b>Time of Accident</b>	04:54Z
<b>Type of Aircraft</b>	Beechcraft C90GTx (BE9I)		<b>Type of Operation</b>	Private (Part 91)		
<b>Pilot-in-command Licence Type</b>		ATPL	<b>Age</b>	58	<b>Licence Valid</b>	Yes
<b>Pilot-in-command Flying Experience</b>		Total Flying Hours	1 936		Hours on Type	101,5
<b>Last point of departure</b>		Rand Airport (FAGM), Gauteng Province				
<b>Next point of intended landing</b>		Lanseria Int. Airport (FALA), Gauteng Province				
<b>Location of the accident site with reference to easily defined geographical points (GPS readings if possible)</b>						
At Lanseria Inter. Airport (FALA) to the north of RWY 07 near the boundary fence (GPS S25° 56' 18" E027° 55' 18")						
<b>Meteorological Information</b>		Wind 090/10 Visibility 0800 Overcast 008 Temp 19/19				
<b>Number of people on board</b>	1+2	<b>No. of people injured</b>	0	<b>No. of people killed</b>	3	
<b>Synopsis</b>						
<p>The pilot and two passengers were planning to fly from Rand Airport to Lanseria International Airport (FALA) in the early hours of the morning with the intention to clear customs. It was still dark and the weather forecast thunderstorms with rain for most areas of Gauteng. Rand Tower requested clearance from FAOR approach before departure. The aircraft took off from Runway 29 following the clearance given and proceeded in a westerly direction.</p> <p>At 6500 feet above mean sea level (AMSL), Rand handed the aircraft over to Approach for further clearances. Reported visibility at FALA was 600m and the cloud base was 600 feet AGL. The pilot then requested a VHF Omnidirectional range (VOR) Z approach for Runway 07. He started the approach at 8000 feet and approximately 14nm from LIV. At 12nm and established on Radial 245 Approach handed him over to FALA. Once in contact with FALA the pilot was advised of the heading to turn to at missed approach point (MAP). At MAP the pilot did not have the runway in sight and advised tower that they were going around. They turned left 360° and climbed to 8000 feet as instructed by FALA. FALA handed them back to Approach for repositioning for Radial 245. Approach advised the aircraft that visibility at Wonderboom was better but the pilot said if not successful they would route to Polokwane. At 12nm the aircraft was handed over to FALA. During the descent, the pilot started repeating messages more than twice. Close to MAP the pilot indicated that he had the field in sight. FALA gave them landing clearance. Soon after, the pilot said he did not have it in sight. When FALA instructed him to go around and route Polokwane, the pilot came back on frequency indicating that the aircraft was in distress. After that, the tower heard a loud bang accompanied by black smoke from behind a hangar.</p> <p>The investigation discovered that the pilot had stalled, lost control and entered into vertical dive. The aircraft crashed near Taxiway A. The three occupants were fatally wounded and the aircraft was destroyed.</p>						
<b>Probable Cause</b>						
Stalling an aircraft in adverse weather conditions						
<b>Contributory factor</b>						
Spatial disorientation during missed approach						
<b>RSP Date</b>				<b>Release Date</b>		

## AIRCRAFT ACCIDENT REPORT

**Name of Owner** : Crane Load Technologies cc  
**Name of Operator** : Crane Load Technologies cc  
**Manufacturer** : Hawker Beechcraft Corporation  
**Model** : C90GTx  
**Nationality** : South African  
**Registration Marks** : ZS-CLT  
**Place** : Lanseria Airport  
**Date** : 03 February 2014  
**Time** : 0454Z

*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 (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 establish legal liability.***

### **Disclaimer:**

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

## **1. FACTUAL INFORMATION**

### **1.1 History of Flight**

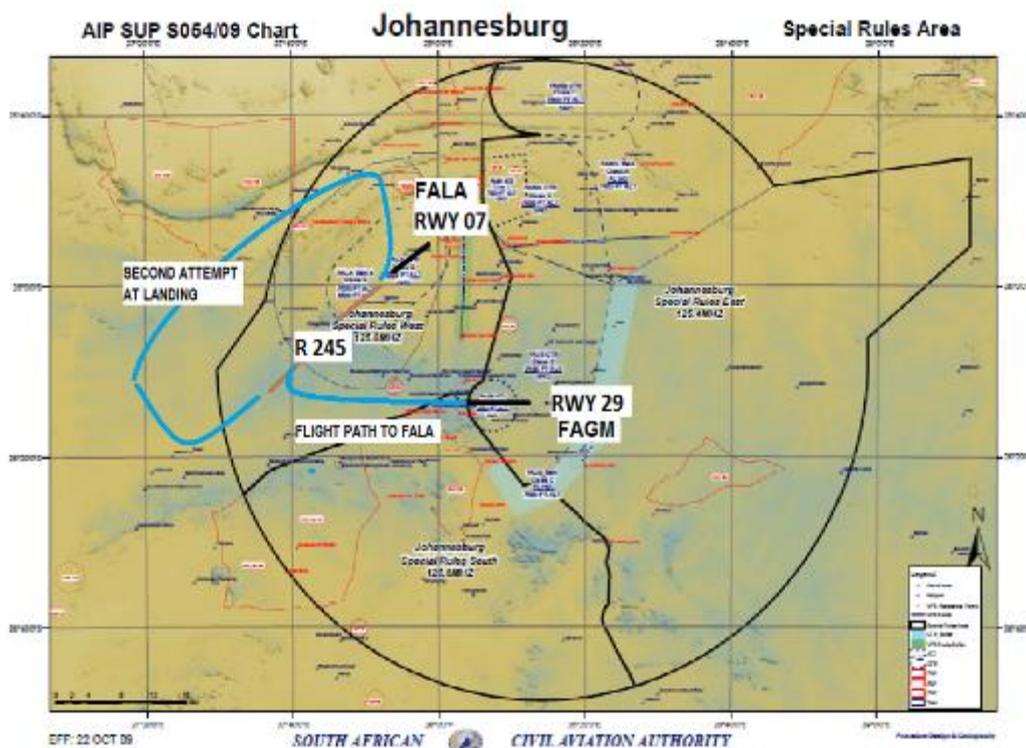
1.1.1 On the morning of 3 February 2014 at Rand Airport (FAGM), the pilot of a private flight and two passengers were preparing themselves for one of their regular international trips to Zambia for business. They first had to fly to Lanseria International Airport (FALA) or alternatively Polokwane International Airport (FAPP) to clear immigration formalities.

1.1.2 FAGM and FALA airports are smaller, controlled aerodromes located under the Johannesburg Terminal Movement Area (TMA), also known as Approach, which starts at FL076 to FL110 (Figure 1). All IFR traffic departing anywhere in the Terminal Movement Area (TMA) must get departure or joining clearances from Johannesburg (FAOR) Approach. At time 0410Z the pilot requested start and

clearance from Rand (FAGM) tower for an instrument flight rules (IFR) flight to Lanseria (FALA) at flight level 80 (FL080). The Rand (FAGM) controller in turn forwarded the requested to Johannesburg (FAOR) Approach. An instrument flight rules (IFR) departure clearance was requested and Approach cleared the CLT to climb to FL080 and route direct LIV, VOR at FALA, and squawk 6715.

1.1.3 The aircraft departed from Rand (FAGM) at 0620B and it climbed to FL080 successfully. Passing FL065, CLT was transferred to Johannesburg Approach on frequency 123,7MHz. Once the aircraft was in contact with Johannesburg Approach, the aircraft was advised that it was under radar control and to route direct Lima India Victor (LIV). The aircraft advised the controller that he preferred to do a VOR Zulu approach (Appendix A) to break cloud. The controller copied the request and advised the aircraft to plan for the arrival.

1.1.4 As the aircraft was getting closer to Lanseria at approximately 14 nm, Johannesburg Approach started giving the aircraft different headings in order to establish it on radial 245 for RWY 07. The first heading was to turn right 310 and the pilot responded correctly and said turn 310. The next instruction was to turn right again to 030 to intercept radial 245 (opposite of 065). He responded by saying turn right 030 to intercept localiser 065 ('localiser' is that portion of the ILS that gives left or right guidance information down the centre line. Notam A2360/13 is in force and states that the ILS has been permanently withdrawn from Lanseria). The Approach controller corrected him and asked him to confirm radial 245 LIV. The Aircraft confirmed 245.



**Figure 1: Johannesburg Special Rules Area and flight path of ZS-CLT**  
**Source: SACAA Aeronautical Information Publication**

1.1.5 After making the right turn for radial 245 while maintaining FL080, CLT failed to intercept the radial perfectly. He flew parallel to the radial, on the right-hand side, at approximately 0.5nm. The pilot then advised the controller that he was established on the localiser. The aircraft was then transferred to Lanseria. On first

contact with Lanseria tower, the aircraft was cleared for a straight in VOR Zulu approach RWY 07 and advised to report the field in sight. The student tower controller with his instructor listening in advised the pilot in the event of a go-around, to turn left 360 and then climb to 8 000 ft. Pilot's response was 'in the event of a go-around 260, 8 000 ft'. The student controller corrected him 'Charlie lima tango 360' and he acknowledged 360. Lanseria tower requested that he report field in sight and he agreed.

1.1.6 At some point when the aircraft was very close to the airfield, the pilot said they were 5nm, paused for 5 seconds and then said CLT was on a go-around. Controller then instructed the pilot to climb to 8 000ft and to turn left 360. The pilot acknowledged and while climbing out, the controller asked him to confirm his intentions as soon as they were known. He replied, 'we would like to try the approach again.' After that he was transferred back to Johannesburg approach for radar headings for VHF Omnidirectional range (VOR) Zulu approach. As soon as he had contact with the radar controller, he was given other sets of headings for joining radial 245 for the approach. The controller also advised the pilot that Wonderboom Airport cloud base was 1 000ft AGL and that visibility below was good (Wonderboom is 25 nm north of Lanseria. It is also under the Johannesburg Terminal Movement Area). The pilot thanked the controller and advised that they would divert to Polokwane if needed.

1.1.7 On the last instruction to intercept radial 245, the pilot did not mention radial 245 until the controller repeated it by saying 'confirm radial 245' and then he did so. He turned left 090 as instructed to intercept radial 245, but remained 1 nm to the north of the radial and parallel to it. The controller advised him of his position and transferred him to Lanseria tower on 124.0 MHz at 12.1 nm. On second contact with Lanseria tower, the aircraft was cleared for the straight in approach and advised to report at 7,5 nm. The tower advised that in the event of a go-around, he should climb to 8 000 ft. and route direct PPV (Polokwane VOR, location Limpopo, is 158-nm to the north of Lanseria). His response was, 'Copy that, in the event of a go-around, say heading again ...' the controller responded: 'Left turn routing direct Polokwane VOR (PPV).' The pilot then said: 'its direct routing PPV in the event of a go-around.' The controller had to remind the pilot about the climb to maintain 8 000 ft. which was acknowledged by the pilot.

1.1.8 On radar the aircraft is observed overhead Lanseria VOR (LIV), the pilot advised tower that he had the field in sight. The tower controller then gave the pilot landing clearance, but it was not acknowledged. A few seconds later, the pilot said he did not have the field in sight any more. The controller said: 'Charlie lima tango, copy that, climb to 8 000 feet passing 6 500 feet contact Radar 123.7 bye, bye ...' the pilot did not respond to the last instruction. That was the tower controller's last transmission to the pilot and a few seconds later there was a bang and black smoke coming from behind the Executive Jet hangars, where the aircraft had crashed and exploded on impact. All three occupants suffered fatal injuries and the aircraft was completely destroyed in the accident.

## 1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	1	–	2	–
Serious	–	–	–	–
Minor	–	–	–	–
None	–	–	–	–

### 1.3 Damage to Aircraft

1.3.1 The damage to the aircraft was destroyed and completely engulfed by fire. The right-hand propeller to the explosion that threw some aircraft's parts to some distance and a passenger being flown to the left wing. Fire then completely engulfed the aircraft.

### 1.4 Other Damage

1.4.1 The remaining fuel and other liquids such as hydraulic oil escaped into a stream of water that was flowing underneath the final resting place of the aircraft.

### 1.5 Personnel Information

Nationality	South African	Gender	Male	Age	58
Licence Number	027 046 3243	Licence Type	ATPL		
Licence valid	30/11/2014	Type Endorsed	Yes		
Ratings	Test pilot, Instrument and Night, Grade III instructor				
Medical Expiry Date	31/05/2014				
Restrictions	Corrective lenses				
Previous Accidents	Unknown				

Flying Experience:

Total Hours	1 936,1
Total Past 90 Days	23.3
Total on Type Past 90 Days	10.1
Total on Type	101,5

### 1.6 Aircraft Information

**Airframe:**

Type	King Air C90GTx	
Serial Number	LJ-2011	
Manufacturer	Hawker Beechcraft Corporation	
Date of Manufacture	2011	
Total Airframe Hours (At time of Accident)	500	
Last MPI (Date & Hours)	14/01/2014	497,6
Hours since Last MPI	2.4	
C of A (Issue Date)	13/01/2012 Exp. 12/01/2015	
C of R (Issue Date) (Present owner)	12/12/2011	
Operating Categories	Part 91	

**Engine R/H:**

Type	Turboprop, Pratt & Whitney
Serial Number	PCE-PZ1120
Hours since New	500
Hours since Overhaul	TBO not reached

**Engine L/H:**

Type	Turboprop, Pratt & Whitney
Serial Number	PCE-PZ1119
Hours since New	500
Hours since Overhaul	TBO not reached

**Propeller R/H:**

Type	4-blade propeller, Hartzell
Serial Number	HH-4244
Hours since New	500
Hours since Overhaul	TBO not reached

**Propeller L/H:**

Type	4 Blade propeller, Hartzell
Serial Number	HH-4178
Hours since New	500
Hours since Overhaul	TBO not reached

- 1.6.1 The aircraft refuelled with 822 litres (L) of Jet A1 fuel at Rand airport on 1 February 2014 (Appendix C). When the pilot was talking to Rand Tower, he indicated that he had three hours' endurance and their flights to FALA and Lusaka combined were only two hours long.
- 1.6.2 The aircraft was fitted with terrain awareness warning system (TAWS) from L3 Communication Company. The TAWS provides terrain prediction and avoidance in the cockpit. Its key features include avoid terrain, engine out, turn extrapolation and TAWS + TCAS (traffic collision avoidance system).
- 1.6.3 The TAWS provides enhanced situational awareness with its unique terrain advisory line (TAL). Relative to the current aircraft altitude, the TAL reaches out to 30° on either side of the aircraft flight path and out as far as two minutes ahead of the aircraft. If there is threat to the aircraft's flight path in the form of terrain or aircraft, it would produce an aural or visual alert to the pilot.

**1.7 Meteorological Information:**

Wind direction	090	Wind speed	10	Visibility	800m
Temperature	19	Cloud cover	Overcast	Cloud base	800 feet
Dew point	19				

- 1.7.1 The meteorological information in the table above was provided by Air Traffic Information Services (ATIS), recorded for all aircraft operating from Lanseria Airport. New ATIS which may include all relevant traffic information is recorded at every hour of the day.
- 1.7.2 Below is an extract from an official weather report compiled by the South African Weather Services, detailing weather conditions at the time of the accident. A full report is attached as Annexure F. IFR minimums (*visibility > 1500m. cloud ceiling of 600ft*)

## 1.8 Aids to Navigation:

- 1.8.1 The aircraft was fitted with a Rockwell Collins Pro Line 21 glass cockpit navigational aid, which comes standard with integrated flight information systems (IFIS) and a flight management system (FMS). The Pro Line system claims to reduce pilot workload and improve situational awareness. The IFIS incorporates all essential flight situation input, including attitude, heading, indicated airspeed, altitude, vertical speed, engine indicators, flight control, annunciation and navigational graphics, incorporated in one integrated picture.
- 1.8.2 The FMS combines workload-reducing automation on the flight deck with true multisensor navigational capability. The FMS synchronises operation of all lateral and vertical flight routes, supports time and fuel planning, and automatically flies en route, terminal and approach procedures. It also provides missed approach guidance.
- 1.8.3 The aircraft was not fitted with auto throttle or turbulence-detection weather radar (only found in BE200 and 350).
- 1.8.4 The flight folio did not have any entry.



**Figure 2:** Glass cockpit layout as found in BE9L

## 1.9 Communications.

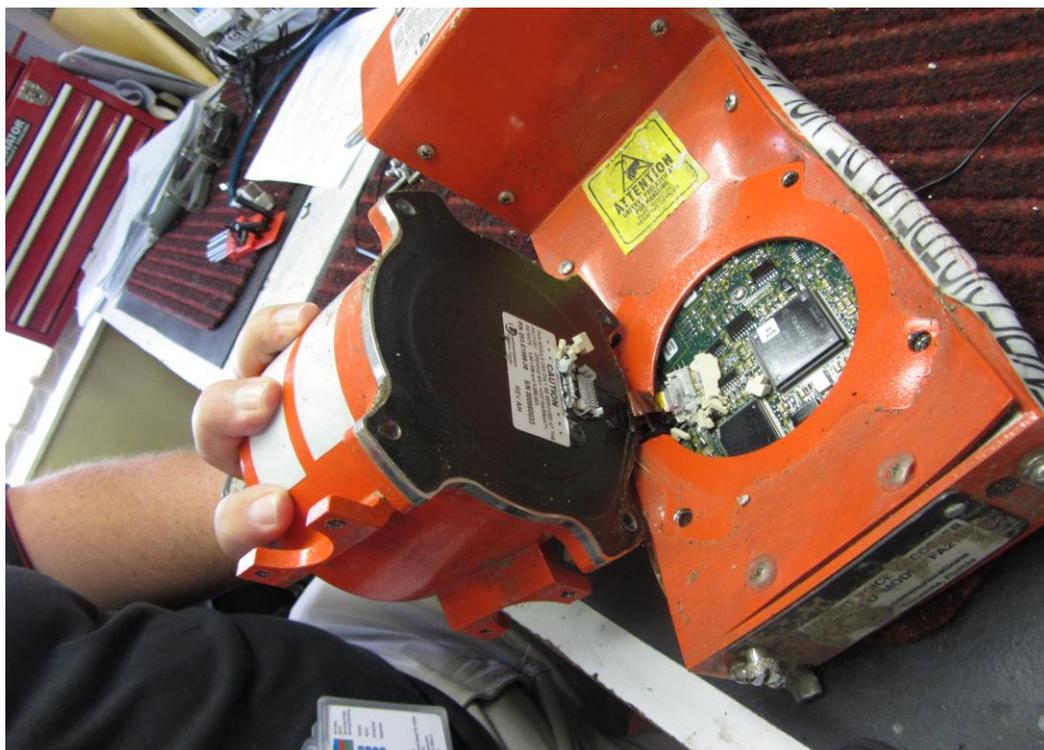
- 1.9.1 Communications equipment that was installed in the aircraft was found to be in accordance with the approved equipment list. There were no defects reported with the communications equipment prior to the accident.

## 1.10 Aerodrome Information

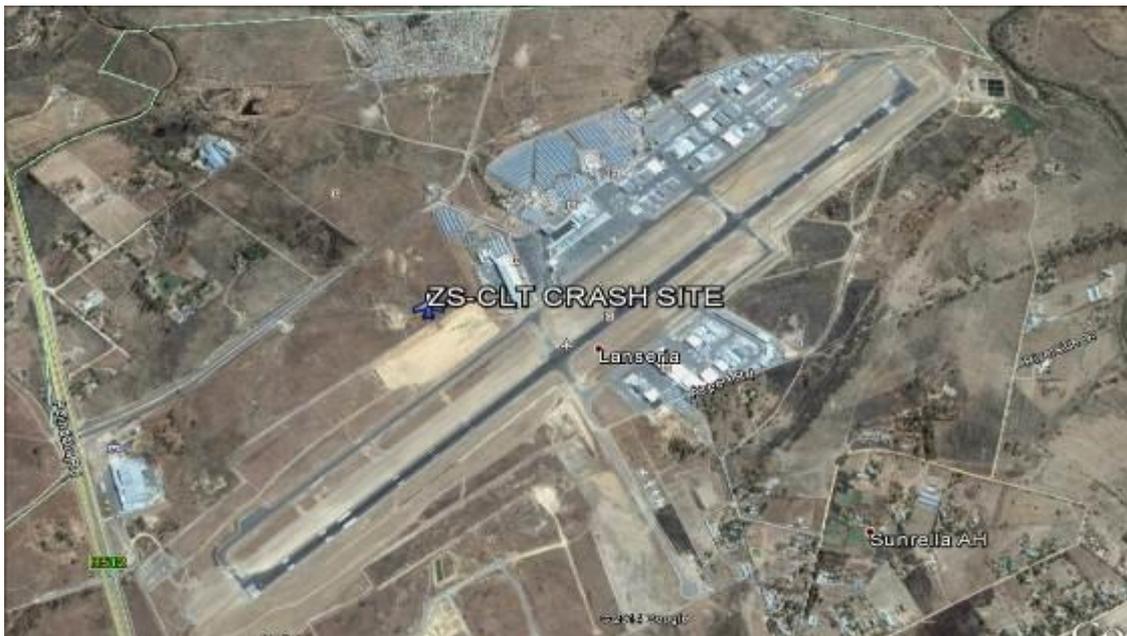
Aerodrome Location	FALA	
Aerodrome Co-ordinates	S25° 56' 56" E027° 54' 48"	
Aerodrome Elevation	4 521 feet	
Runway Designations	07/25	n/a
Runway Dimensions	2 996 X 45	n/a
Runway Used	07	
Runway Surface	Asphalt	
Approach Facilities	VOR	

## 1.11 Flight Recorders

- 1.11.1 The aircraft was fitted with L-3 Communications 2100-1020 cockpit voice recorder (CVR). A solid state CVR that records 120 minutes of digital audio. Specifically, it contains a 4-channel recording of the last 120 minutes of operation. One channel for each flight crew, one channel for cockpit observer and one channel for the cockpit area microphone (CAM)
- 1.11.2 The CVR sustained significant structural damage and was not exposed to fire or water. The damages made it impossible for a download here in South Africa hence a request was made to United States of America's National Transportation Board (NTSB) to do the download. They first had to replace the damaged female connector and then replace the damaged L-3 chassis (the bottom part). The audio information was extracted without any difficulty.
- 1.11.3 It was found that the Audio recordings from Air Traffic and Navigation Services (ATNS) did not differ at all with the downloaded CVR. The only thing new from the CVR tapes is the sound of the aircraft as it passes the outer marker and when the stall warning goes off.



**Figure 3:** Damages suffered by the Cockpit Voice Recorder.



**Figure 4:** Accident site as seen from above  
**Source:** Google Earth

## 1.12 Wreckage and Impact Information

- 1.12.1 After passing the missed approach point at LIV, the pilot was supposed to climb to 8 000 ft. and route direct PPV which was his chosen alternate. Instead, the aircraft climbed and turned at the same time, which resulted in the aircraft's stalling and entering into a spiral dive. The aircraft lost height rapidly and crashed on sloping ground in a southerly direction. A post-impact fire erupted immediately, followed by an explosion which resulted in the fuselage separating from the wings and two occupants being thrown out with their seats. The pilot and his passengers were fatally wounded and the aircraft was completely destroyed in the accident.
- 1.12.2 The accident site was inside FALA grounds and near the perimeter fence. It was 162 m away from the nearest taxiway and 383 m from the tower. The Executive Jet hangar between the crash site and the tower obscured the tower controller's view, hence he did not witness the aircraft falling.
- 1.12.3 When the aircraft crashed, the engines had power and the undercarriage was down. The marks on the propeller were perpendicular to its length. The propeller was bent into an S shape in the impact. The left-hand propeller was completely severed from its shaft. The nose wheel was found approximately 4 m from the wreckage. The wings' skin cover was severely burnt, and some parts were flung approximately 5 m from the wreckage by the explosion. The back of the fuselage was twisted as a result of the spiral dive.
- 1.12.4 The cockpit and its instruments and gauges were completely burnt. The CVR, which is located behind the rear pressure bulkhead, suffered serious damage.



**Figure 5:** ZS-CLT wreckage after the accident

### **1.13 Medical and Pathological Information**

1.13.1 The pilot held a valid SACAA medical certificate at the time of the accident. The post-mortem and blood toxicology reports were still outstanding at the time of compiling this report. Should any of the results have a bearing on the circumstances leading to this accident; it will be treated as new evidence that will necessitate the reopening of this investigation.

### **1.14 Fire**

1.14.1 It is not clear at which height the aircraft stalled, but immediately after the stall, the aircraft went into an uncontrollable spin and hit high sloping ground with the right-hand wing and engine first then the resultant forces pushed it back. A post-impact fire started on the right-hand engine, followed by a big explosion as seen through the Execujet security camera. The aircraft was completely destroyed by the fire.

### **1.15 Survival Aspects**

1.15.1 The accident was not survivable due to the magnitude of the deceleration forces and the severity of the explosion that followed. The pilot and passengers succumbed to the effects of the post-impact fire.

## 1.16 Tests and Research

### Engine Teardown

1.16.1 A company representative and air safety investigator from Pratt and Whitney, the engine manufacturer, arrived in South Africa in April to assist with the investigation. A teardown inspection of both engines was done to determine if they were producing power at the time of the accident and to check if they had played any role in the accident. The whole assessment took two (2) days to complete. As the investigators in charge I have received Pratt and Whitney's official report from the representative. See Annexure J



**Figure 6:** Left engine before and after teardown. The reduction gears had not been disturbed or affected.

1.16.2 The company representative's summarised findings were that the engines had power at the time of the accident and that there was enough fuel for the flight. The container rings of both engines had not been damaged. All the blades broke as a result of impact forces of an accident. The circular scarring on some engine parts indicated that the engine was producing power when it hit the ground.

### Planning ahead

1.16.3 According to Aeronautical Information Publication (AIP) ENR 1.8 all-weather operation (AWOP) requires pilot to obtain a report of the prevailing weather and Notice To Airmen (NOTAM) between departure and destination so that you are able to plan properly for things such as:

- The type of flight from take-off to landing, weather permitting.
- Study the destination's standard terminal arrival route (STAR).
- Minimum Safe Altitude (MSA)
- Missed approach procedure and intentions thereafter.
- The Navigational Aid frequency and its serviceability.
- Alternate aerodrome and its suitability.
- Open to suggestions of other alternates other than yours
- Briefing passengers of what might happen if unable to land.

### Cockpit high workload and distraction during approach

1.16.4 Workload refers to the interaction between a specific individual and the demands associated with the tasks they are performing. It varies as a function of the number and complexity of task demands and the capacity of the individual to meet those demands. High workloads lead to a reduction in the number of information sources an individual will search. It can also result in an individual's performance degrading (Staal 2004).

1.16.5 Studies have shown that when workload increases, attention tends to narrow. Pilots are required to be able to divide their attention across a number of different tasks even if the weather is extremely bad. Maintaining control of the aircraft, navigation, communicating, scanning for traffic and scanning instruments are all, not exhaustive, necessary tasks for a pilot to perform. The requirement to divide one's attention between so many tasks means that the narrowing of attention that occurs under high workload will inevitably reduce the attentional resources available for some of the tasks, resulting in decreased performance (Beal, Weiss, Barros & MacDermid, 2005).

## **1.17 Organizational and Management Information**

1.17.1 The pilot who was rated on this aircraft had 101.5 hours and had a valid ATP licence until 31 November 2014.

1.17.2 The maintenance records indicated that the aircraft was equipped and maintained in accordance with existing regulations and approved procedures.

1.17.3 The last MPI was certified on 14 January 2014 by AMO No 198 at 497,6 airframe hours and the aircraft had flown a further three hours.

## **1.18 Additional Information**

1.18.1 VOR Zulu approach (Annexure A) is a straight in instrument approach which starts at 12nm. The aircraft are routed on this arrival route through radar vectors from the approach controller. The pilot using VOR instruments will intercept and maintain radial (R) 245 and continue with the descent until overhead LIV at height of 700 feet AGL, known as the minimum safe altitude (MSA). If the pilot is overhead LIV and has the runway in sight, he advises the tower controller that 'I have the runway in sight' and then the controller issues a landing clearance. The pilot continues and lands, but if he encounters any problems, like losing sight of the runway, he must execute a Missed Approach Procedure (MAP) as laid down on the approach plate or as instructed by the controller.

1.18.2 The MAP of VOR Zulu states that if the pilot does not have the runway in sight or chooses to do a go-around while on the descent, he must climb straight ahead to 8 000 ft. and at 3 DME turn left route direct HBV.

## **1.19 Useful or Effective Investigation Techniques**

1.19.1 None

## **2. ANALYSIS**

2.1 CLT requested start and joining clearance from Rand Tower for the flight to FALA. The purposes of the flight were to clear customs and continue flying to Zambia for a business meeting. Rand Tower was advised by FAOR that the aircraft was cleared to climb to flight level 080 and to route LIV squawking 6715. The same clearance was passed on to CLT before departure.

- 2.2 Before departure, Rand Tower advised the pilot that the surface wind was from 080° at 12 knots and the pilot accepted the tailwind for a take-off from Runway 29. At 0620B the aircraft departed from Rand Airport and contacted FAOR Approach (App) passing Flight Level 065 on 123.7 MHz. On contact with App, the aircraft was identified with the squawk and advised that he was under radar control. The pilot then requested a VOR Zulu approach for a cloud-break procedure due to the adverse weather and reduced visibility. Approach acknowledged the request and informed the pilot to plan accordingly.
- 2.3 When the aircraft was approximately 14 nm from LIV and still on a runway heading, the approach controller gave the pilot, the first heading was to turn right to 310. The second was 'turn right heading 030 to intercept radial 245' and his reply was '030 to intercept localiser 065 LIV'. The approach controller had to correct him by asking him to confirm radial 245 LIV. The pilot confirmed 'radial 245'. When the pilot stated that he was established, the controller transferred him to Lanseria Tower.
- 2.4 FALA Tower instructed the aircraft in the event of a go-around to turn left 360 and climb 8 000 ft. The pilot responded '260 8 000 feet'. The tower had to correct the pilot about the 260 heading.
- NB: All aircrafts that are on an instrument approach and under radar control must be given a missed approach instruction before reaching the MAP for planning to reduce confusion and workload while executing the manoeuvre.
- 2.5 The aircraft had descended to 700 feet and was close to the airfield. The pilot then made a very confusing statement when he said they were 5 nm, then pausing for about five seconds then said we are on a go-around. This statement is indicative of someone who lost some situational awareness. His go-around was executed perfectly, because he followed the tower instructions properly, which were climb to 8 000 ft. and turn left 360. The pilot then requested to try again. At 8 000 ft. FALA Tower transferred the aircraft back to Approach for radar vectors. At this point in time, low clouds and heavy rain were coming in from the west and intensifying.
- 2.6 When in contact with Approach controller, the pilot was advised that Wonderboom's cloud base was 1 000 feet and visibility was good. However, he informed Approach that they would divert to Polokwane if need be. At approximately 14 nm the aircraft was given a set of headings to intercept R245 while maintaining 8 000 ft. On the last heading, the aircraft was instructed 'turn left 090 to intercept R245.' His reply was '090 and intercept radial inbound' but left out 'R245' until prompted by the controller.
- 2.7 After turning left heading 090, the aircraft for the second time did not intercept the radial properly but remained to the north of the radial by 1 nm. The controller advised the aircraft that the aircraft one mile north of the radial. At 12,1 nm, the aircraft was transferred to FALA Tower and once in contact, FALA instructed the pilot to report 7,5 nm LIV. For planning purposes, the aircraft was advised that in the event of a go-around he must climb to 8000 feet and route direct PPV (Polokwane VOR 158 nm north of FALA), passing 6 500 feet to contact radar on 123,7. The pilot responded by saying 'copy that in the event of a go-around (*pause*) say heading again'. At this point it was clear that he did not understand the tower at all.
- 2.8 Below is the last portion of the transcript before the aircraft crashed.

06:51:00	FALA ATC	ZS-CLT	Charlie lima tango in the event of a go-around climb to 8 000 feet route direct PPV, passing 6 500 feet contact Radar 123,7 ...
06:51:10	ZS-CLT	FALA ATC	Copy that, in the event of a go-around say heading again ... (heading is incorrect. The controller said route PPV)
06:51:12	FALA ATC	ZS-CLT	Left turn routing direct to PPV...(climb to 8 000 feet is not mentioned in this transmission)
06:51:18	ZS-CLT	FALA ATC	Copy that it's a routing direct PPV in the event of a go-around, Radar 123,7 charlie lima tango...(no mention of climb to 8 000 feet)
06:51:24	FALA ATC	ZS-CLT	Correct, charlie lima tango climb to maintain 8 000 feet ... (reminder)
06:51:26	ZS-CLT	FALA ATC	Copy that we'll climb to maintain 8 000 feet ...
<b>06:52:03</b>	<b>Sound in the cockpit</b>		<b>ZS-CLT crosses the Outer Marker</b>
06:52:54	ZS-CLT	FALA ATC	Charlie lima tango we have the runway in sight ...
06:52:58	FALA ATC	ZS-CLT	Charlie lima tango runway 07 cleared to land, surface wind is 060 at 10 knots (there is no response from the aircraft for eight seconds)
06:53:14	ZS-CLT	FALA ATC	Charlie lima tango no longer has the runway in sight aborting ... (the transmission is cut short and in the back round one can hear a stall warning going on)
<b>06:53:14</b>	<b>Stall warning goes off</b>		<b>Stall warning goes on and does not stop</b>
06:53:17	FALA ATC	ZS-CLT	Charlie lima tango copy that climb to 8 000 feet passing 6 500 feet contact radar 123,7 bye bye...(silent for eight seconds silent)

2.9 The single instruction at time 06:51:01 which contained a **level** to climb to, a **route** to follow and **who** to contact, was repeated at least three times by tower. While all of this is happening, the pilot must pay attention to his descent, flight path and proper aircraft configuration (speed, undercarriage, flaps and landing checks) as well as the worsening weather conditions. The amount of workload in that cockpit increased tremendously. Remove the spiral dive and put the vertical dive

2.10 The pilot advised tower that he had the runway in sight and the tower as expected gave him the wind speed and cleared him to land. For approximately eight seconds, there was no reply and the aircraft then came back with 'we no longer have ...' and that transmission was cut short. In the aircraft's CVR this is the time when the stall warning starts going off indicating that the aircraft is in some sort of trouble. FALA Tower thought that they might be going around and advised the pilot to climb to 8 000 ft. and to contact radar on 123.7 MHz, no response was received from the aircraft and after approximately 12 seconds, FALA tower heard a disturbing transmission indicating that they were in distress, followed by a very loud bang and black smoke billowing from behind the Executive Jet hangar.

- 2.11 A security video from an aircraft maintenance organisation (AMO) showed low clouds and heavy rain with reduced visibility passing through the airport from west to east, before the aircraft is seen in a spiral dive, crashing into the ground and exploding. This is confirmed by the Cockpit Voice Recorder (CVR) where at approximately 06:53:14 the stall warning goes off and if you listen to the tapes the stall goes on until the aircraft impacts the ground.

### **3. CONCLUSION**

#### **3.1 Findings**

##### **Man**

- 3.1 The aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures. The flight was conducted under IFR conditions.
- 3.2 The purpose of this flight was to attend business meetings between Crane Load Technologies and its clients in Lusaka. A flight plan and overflying requests for this flight were filed on the 27 January 2014.
- 3.3 The pilot was licensed and qualified for the flight in accordance with existing regulations.

##### **Weather**

- 3.4 It was an overcast morning in most parts of the province. At the departure aerodrome, the visibility was 3 000 metres and the cloud base broken at 200 ft. AGL and temperature was 15 °C and dew point 15 °C.
- 3.5 During the first attempt to land on Runway 07 at FALA, the pilot did not have enough visibility, hence he went around. According to the official weather report from SAWS, FALA had light thundershowers and rain observed. The cloud base was approximately 400 feet AGL.
- 3.6 On the second attempt while in contact with the FAOR Approach, the pilot was advised that the cloud base at Wonderboom Airport was 1 000 feet but visibility was good. The pilot chooses not to consider it and indicated they would go to Polokwane instead.
- 3.7 Weather conditions worsened as the aircraft came close to the second landing. The pilot declared that he had the runway in sight, and then it disappeared.

##### **Aircraft**

- 3.8 The aircraft uplifted 3, 5 hours of JET A1 as indicated by the PIC during the initial call to FAGM ATC.
- 3.9 During the investigation there was no evidence of airframe failure or system malfunction prior to the accident. The damage to all control surfaces and linkages was attributed to the severe impact forces and post-impact fire.
- 3.10 At the point of impact, the engines were still running. Engine damage was consistent

with engines with symmetrical power.

3.11 The scarring on the propeller blades was perpendicular to its vertical axis. The blades were also bent into an S shape, which was consistent with the engine producing power on impact.

3.12 The aircraft was broken in several places and the tail deformation travelled forward in the direction of the crash.

3.13 The position of the fuel selectors could not be determined due to the extensive fire damage to the instrument panel.

3.14 The destruction of the aircraft by impact and fire excluded determination of any material failure or system malfunction.

### **3.2 Probable Cause/s**

3.2.1 Stalling an aircraft in adverse weather conditions.

### **3.3 Contributing Factors**

3.3.1 Spatial disorientation during missed approach.

## **4. SAFETY RECOMMENDATIONS**

4.1 Not Applicable.

## **5. Annexures**

Annexure A: Lanseria instrument approach chart – VOR Z RWY 07

Annexure B: Notice To Airmen (NOTAM) issued by ATNS on the 21 February 2014

Annexure C: Refuelling Receipt dated 01 February 2014

Annexure D: Controller on duty statement – Mr W.G. Gonslaves, ATCO 2 (Student)

Annexure E: Controller on duty statement – Mr B.L. Potgieter, ATCO2 (ATS 1046)

Annexure F: Transcript between ZS-CLT, Rand tower, FAOR Approach and Lanseria tower.

Annexure G: Summary of weather report supplied by SAWS

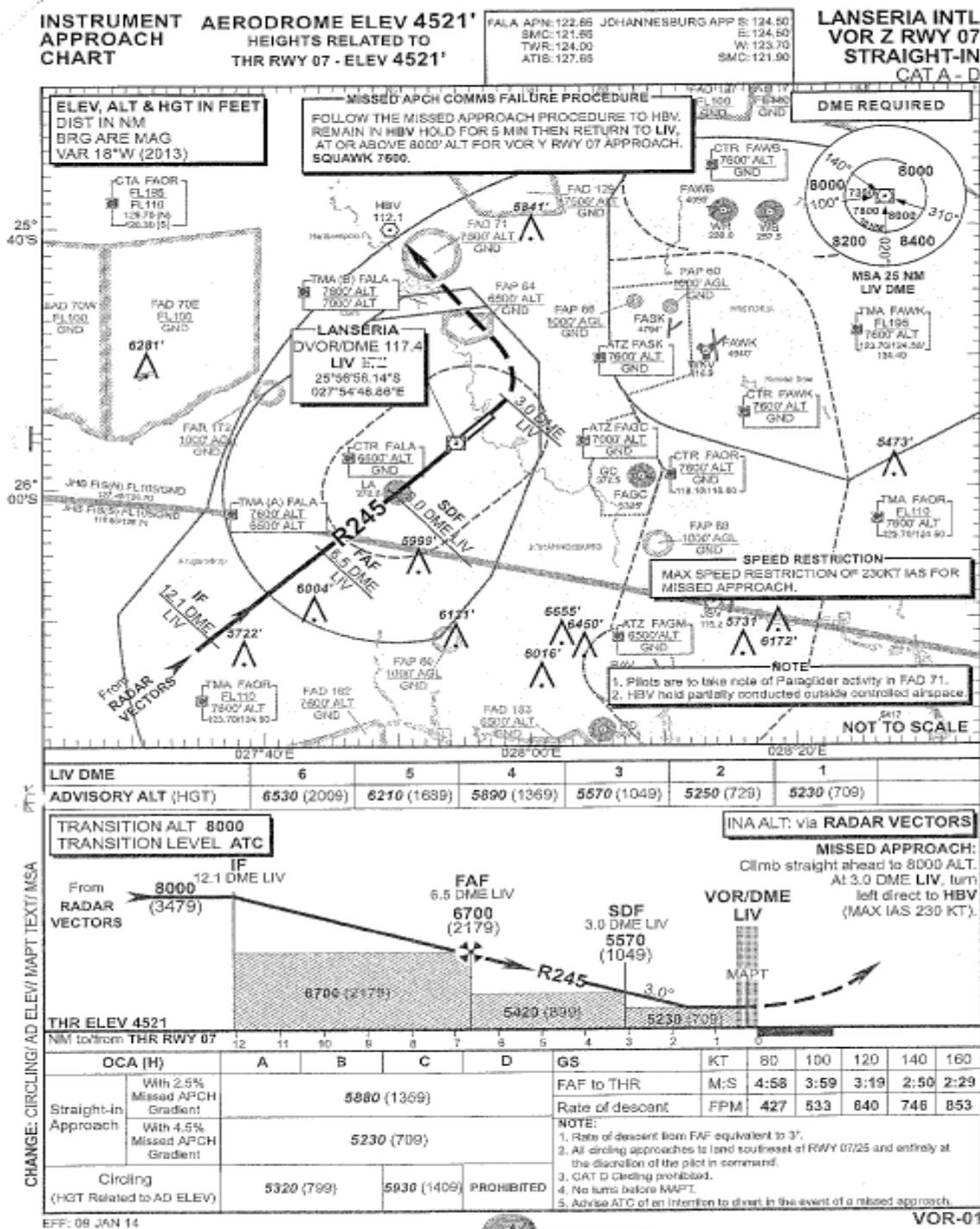
Annexure H: Metar forecast for FAGM and FAWB between 03:00 and 06:00 on the 03 February 2014.

Annexure I: Before landing check list.

Annexure J: Pratt and Whitney engines teardown analysis and findings

Annexure K: NTSB CVR Report

Annexure A





Annexure C



PO Box 18013  
Rand Airport  
419

**RAND AIRPORTS MANAGEMENT CO (PTY) LTD**  
Reg No. 2000/010407/07

**TAX INVOICE**  
VAT Reg. No. 4710189046

131756

Accounts Tel: (011) 827-8884  
Depot Tel: (011) 827-8120  
Fax Tel: (011) 824-4475

*The highlighted blocks must be completed by the person requesting the fuel*

CREDIT CARD	<input checked="" type="checkbox"/>	CASH	<input type="checkbox"/>	ACCOUNT	<input type="checkbox"/>	BP CARD	<input type="checkbox"/>
SUPPLIED TO:	CRANE WAA TREET					DATE:	01-02-2014
PILOT'S NAME:	C. GARNETT						
WEATHER CONDITIONS:	DRY	<input checked="" type="checkbox"/>	WET	<input type="checkbox"/>			
AIRCRAFT REG. NO.:	ZS-CLT			METER READING			
CUSTOMER VAT REG NO.:	4060119403			CLOSING	5146659		
CUSTOMER ORDER NO.:				OPENING	5145837		
CUSTOMER TEL. NO.:	011 3239600			DELIVERED	822		
PRODUCT	SIGNATURE	QUANTITY	UNIT PRICE	R	c		
AVGAS	/ /	LITRES					
		822	LITRES	12.30	10110	60	
LUBRICANTS	/ /	UNITS					
		UNITS					
JET A1		LEVY					
				SUB TOTAL	10110	60	
				VAT	1415	48	
				<b>TOTAL</b>	<b>11526</b>	<b>08</b>	

I / We the Purchaser of the fuel hereby agree to indemnify BP and Rand Airport Fuel Servicing Centre at all times and keep indemnified against all claims, damages and cost which I / We or any third party may sustain as a result of the non-observance of the procedures stipulated in this Indemnity and the said "Recommended Procedures" for the Handling of Aviation Fuel Products. I / We the Customer / Representative that signed this Invoice / Order acknowledge that the above is binding at all times. I the authorized recipient certify that I have received the above quantities of Aviation products and I have inspected a fuel sample for correct grade and absence of water and sediment.

  
 CUSTOMER OR REPRESENTATIVE

  
 REFUELLING ATTENDANT

## Annexure D

Air Traffic and Navigation Services SOC Limited

Executive Office, Floor, Block C, South Boulevard Road, Gurgaon, 12100  
 Private Bag 115, Kensington Park 1520  
 Tel: +27 11 607 1000  
 Fax: +27 11 607 1570  
 www.atns.com



Mr A.J. Kemp  
 Pool Manager Lanseria.

On 3<sup>rd</sup> February 2014, I was rostered a morning tower shift with Bradwin Potgieter (OJT) as it was my first shift back from a 2 week vacation and I needed to be checked out.

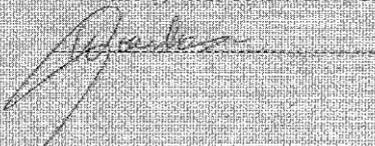
I spent the morning signing my memo's, then took over from Brad to start controlling.

ZS-CLT was at 8000' and established on radial 244 LIM inbound for the VOR Z approach. Pilot requested the approach and was cleared. He did not get the runway in sight because the weather was IMC with 2000m visibility and cloud base estimated at 500' foot and was given a go-around clearance. The pilot requested to attempt another VOR Z approach with radar vectors.

Again the pilot was cleared for the straight in VOR Z approach. At 4nm, a non standard missed approach instruction was given to the pilot in the event of him going around. The clearance was left turn direct PPV climb to maintain 8000 feet. During most of the pilots transmissions, it could be heard that the pilots work load was significant. The pilot reported field in sight. I cleared him to land, then he reported the "field no longer". I told him to climb to 8000 feet on the clearance and contact radar 123.7.

That was when I heard him in distress and observed on the radar screen that the aircrafts speed reduced. I was under the assumption that the aircraft stalled. Then I saw the black smoke and pushed the crash alarm.

Submitted by W.G. Gonsalves, ATCO 2 (Student) AT5 0931



ATNS/OM/07/03 Accident ZS-CLT	Page 1	09 February 2014
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Company Registration No. 1989/044150/06

Directors: M. Manjivani (Chairman), DST Mathana (Chief Executive Officer), M.V. Salovey (Chief Financial Officer)  
 ZZ Nairany, M. Manjivani, P.K. Unnikrishnan, T.H. Narendran, S.V. Zelev, S.G. Moolan  
 Company Secretary: E. Muralidharan

## Annexure E

Air Traffic and Navigation Services Company Limited Private Bag 215 Kesterton Park 1620 Tel: +27 11 951 0100 Fax: +27 11 292 1966 www.atns.com		
<b>Mr A.J. Kemp Pool Manager Lanseria</b>		
<b>REF: ACCIDENT ZS-CLT ON 03-02-2014</b>		
<p>I B.L. Potgieter, was rostered as the check out instructor for W.G. Gonsalves. ZS-CLT was attempting his second VOR Z approach because the weather at Lanseria was IMC due to low cloud. Cloud base was estimated at 500 foot and the visibility was 2000 meters in light rain and fog. When he was at 1nm he said he had the field in sight and I looked up but I didn't see him. My student cleared ZS-CLT to land on RWY07. He thereafter came back to us and said that He had lost the field visually. My student then re-cleared ZS-CLT to comply with the go-around clearance that He gave him when he was on a 4nm final and to contact FAOR Radar.</p>		
<p>The next 2 transmissions sounded as though the pilot was struggling and in trouble. I looked at the radar screen and saw his speed drop incredibly quickly and then the target flashed. I thereafter heard a bang noise and saw smoke from behind ExecuJet, which hinders our view of the point of impact. At no stage did we see ZS-CLT fall to the ground because of the bad weather. I pressed the crash alarm and the fire vehicles proceeded to the scene.</p>		
<p>This is a true indication of what I experienced.</p>		
<p>God Bless B.L. POTGIETER ATCOZ FALA (ATS 1046)</p>		
		
ATNS/OW/97/03 Accident ZS-CLT	P.1	05 February 2014
Company Registration No: 1992/004150/06 Directors: M.C. Mwanetshe (Chairman) P.K. Dlamini (Chief Executive Officer) B.E. Chirwa (J.M. Maseko) (M. Makochane) Company Secretary: S. Mngomezulu		

## Annexure F

Transcript between Rand Tower, FAOR Approach controller, Lanseria Tower and the pilot of ZS-CLT on several frequencies. The first one is Rand Tower 118,7 MHz

Date: 3 February 2014

Time	From	To	Message
06:06:03	ZS-CLT	RAND ATC	Rand charlie lima tango good morning...
06:06:05	T	ZS-CLT	Charlie lima tango tower good morning go ahead...
06:06:10	ZS-CLT	RAND ATC	Madam we are BE9L Bumpers hangar 54 flight to Lanseria. 1+2 and we've got 3 hours endurance 8000 feet
06:06:20	RAND ATC	ZS-CLT	Charlie lima tango standby start runway 29 QNH 1020...
06:06:23	ZS-CLT	RAND ATC	Runway 29, 1020 charlie lima tango...
06:06:35	RAND ATC	ZS-CLT	Charlie lima tango please confirm runway surface wind is 080 at 12 knots
06:06:41	ZS-CLT	RAND ATC	Copy that no problem madam we'll take 29...
06:07:03	RAND ATC	ZS-CLT	Charlie lima tango start approved report ready for taxi...
06:07:05	ZS-CLT	RAND ATC	Start approved ready for taxi next charlie lima tango...
06:12:02	ZS-CLT	RAND ATC	Charlie lima tango ready for taxi...
06:12:04	RAND ATC	ZS-CLT	Charlie lima tango taxi holding point runway 29...
06:12:08	ZS-CLT	RAND ATC	Holding point runway 29 charlie lima tango...
06:17:01	ZS-CLT	RAND ATC	Tower charlie lima tango ready for departure...
06:17:05	RAND ATC	ZS-CLT	Charlie lima tango cleared direct to Lanseria after departure runway 29 maintain runway heading to 8000 feet passing 6500 feet. Approach 123.7 MHz Squawk 6715
06:17:16	ZS-CLT	RAND ATC	Copy that could you just give me the squawk again please?
06:17:19	RAND ATC	ZS-CLT	6715
06:17:21	ZS-CLT	RAND ATC	Cleared from to Lanseria after take-off maintain runway heading to 8000 feet passing 6500 123.7 squawk 6715. Charlie lima tango....
06:17:31	RAND ATC	ZS-CLT	Charlie lima tango read back correct line-up and wait runway 29...
06:17:34	ZS-CLT	RAND ATC	Line-up and wait runway 29 charlie lima tango...
06:17:42	RAND ATC	ZS-CLT	Charlie lima tango runway 29 cleared for take-off surface wind 090 at 08 knots report passing 6500 feet...

06:17:47	ZS-CLT	RAND ATC	Cleared for take-off 65 next charlie lima tango...
06:20:00	RAND ATC	ZS-CLT	Charlie lima tango 123,7 bye bye...
06:20:04	ZS-CLT	RAND ATC	123.7 Charlie lima tango...
<b>ZS-CLT is now transferred from Rand Tower to OR Tambo Approach which controls from F080 to F110 under the FAOR Terminal Movement Area (TMA) on Freq. 123,7 MHz</b>			
06:20:15	RADAR ATC	ZS-CLT	Charlie lima tango you 3 miles to the west. You under radar maintain 8000 feet...
06:20:19	ZS-CLT	RADAR ATC	Under radar control maintaining 8000 feet charlie lima tango...
06:20:21	RADAR ATC	ZS-CLT	Charlie lima tango are you looking for straight in VOR or ILS...
06:20:24	ZS-CLT	RADAR ATC	If you could give us a straight in VOR we would appreciate it...
06:20:27	RADAR ATC	ZS-CLT	Plan for later...
06:20:30	ZS-CLT	RADAR ATC	Thank you very much charlie lima tango...
06:21:12	RADAR ATC	ZS-CLT	Charlie lima tango turn heading 310...
06:21:15	ZS-CLT	RADAR ATC	310 charlie lima tango...
06:26:45	RADAR ATC	ZS-CLT	Charlie lima tango turn heading 030 to intercept radial 245 LIV...
06:26:47	ZS-CLT	RADAR ATC	030 to intercept localiser 065 LIV... (pilot refers to the opposite radial)
06:26:51	RADAR ATC	ZS-CLT	Confirm that's radial 245 LIV...
06:26:55	ZS-CLT	RADAR ATC	Correction radial 245 turning 030 charlie lima tango...
06:27:00	RADAR ATC	ZS-CLT	Thank you Sir...(at this point the aircraft makes a full turn but flies parallel to the radial at a distance of a half-mile)
06:29:10	ZS-CLT	RADAR ATC	Charlie lima tango is established on the localiser for LIV
06:29:15	RADAR ATC	ZS-CLT	Thank you charlie lima tango Lanseria 124.0 morning...
06:29:20	ZS-CLT	RADAR ATC	124.0 have a nice day charlie lima tango...

<b>ZS-CLT transferred from OR Tambo Approach for the first time to Lanseria Tower at 8000 feet for landing. FALA frequency is 124,0 MHz</b>			
06:30:02	ZS-CLT	FALA ATC	Lanseria, charlie lima tango very good morning
06:30:05	FALA ATC	ZS-CLT	Charlie lima tango, good morning confirm requesting VOR straight in approach runway 07?
06:30:10	ZS-CLT	FALA ATC	We're established on the localiser for lima india victor (LIV) for a straight in approach charlie lima tango...
06:30:15	FALA ATC	ZS-CLT	Charlie lima tango cleared straight in VOR Z approach runway 07, QNH 1019 report field in sight...
06:30:22	ZS-CLT	FALA ATC	Copy that field in sight next 1019 charlie lima tango...
06:30:25	FALA ATC	ZS-CLT	( ATC not clear but warns CLT of an aircraft in the area)
06:30:35	ZS-CLT	FALA ATC	Copy that we'll keep a look out for them, charlie lima tango...
06:33:03	FALA ATC	ZS-CLT	Charlie lima tango in the event of a go-around turn left heading 360 degrees climb 8000 feet...
06:33:08	ZS-CLT	FALA ATC	In the event of a go-around 260 degrees 8000 feet (wrong heading and no direction of turn i.e. left or right)
06:33:11	FALA ATC	ZS-CLT	Charlie lima tango 360
06:33:14	ZS-CLT	FALA ATC	Correction 360 charlie lima tango...
06:33:18	FALA ATC	ZS-CLT	Charlie lima tango report field in sight or go-around ...
06:33:21	ZS-CLT	FALA ATC	Copy that field in sight next. Or go around. We are established on the localiser. We are 7.1 DME
06:36:39	ZS-CLT	FALA ATC	Charlie lima tango is a 5 miles (pause for 5 sec) correction ahh and charlie lima tango is on a go-around
06:36:56	FALA ATC	ZS-CLT	Charlie lima tango climb to 8000 feet heading 360, please report your intentions (this is not the part where you ask intentions. The workload and concentration required has doubled)
06:37:10	ZS-CLT	FALA ATC	Copy that heading 360 and climbing to 8000 charlie lima tango...
06:37:15	FALA ATC	ZS-CLT	Charlie lima tango report your intentions when known...

06:37:22	ZS-CLT	FALA ATC	We would like try the approach again...
06:37:25	FALA ATC	ZS-CLT	Copy charlie lima tango standby a handover to Radar...
06:37:27	ZS-CLT	FALA ATC	Copy that charlie lima tango...
06:38:06	FALA ATC	ZS-CLT	Charlie lima tango confirm you want vectors for the VOR straight in approach or would like to head back to LIV for the reduced turn app?
06:38:23	ZS-CLT	FALA ATC	Affirmative Sir for the straight in approach. LIV if possible... (the pilot does not seem to understand the offer. Short approach LIV or Long approach VOR Z. He must choose one, yet still leaves the choice with the controller)
06:38:24	FALA ATC	ZS-CLT	Charlie lima tango contact radar now 123,7 speak to you later
06:38:35	ZS-CLT	FALA ATC	123.7 Charlie lima tango...
<p><b>ZS-CLT is transferred back to OR Approach for vectors to line up for another VOR Z straight in approach.</b> (On Radar ZS-CLT seems to follow the missed approach procedure properly i.e. climb to 8000 feet then turn left routing HBV)</p>			
06:39:20	ZS-CLT	RADAR ATC	Radar charlie lima tango good morning again...
06:39:25	RADAR ATC	ZS-CLT	Charlie lima tango, good day to you under radar control left heading 260...
06:39:30	ZS-CLT	RADAR ATC	260 charlie lima tango...
06:40:12	RADAR ATC	ZS-CLT	Charlie lima tango, confirm you like to try again?
06:40:15	ZS-CLT	RADAR ATC	Affirmative sir...
06:40:17	RADAR ATC	ZS-CLT	Thank you...
06:43:12	RADAR ATC	ZS-CLT	Just for your planning Wonderboom cloud base is a 1000 feet and visibility is good below...
06:43:15	ZS-CLT	RADAR ATC	Thank you very much otherwise we'll divert to Polokwane (FAPP) (FAPP is 150 nm north of FALA and can help clear customs)
06:45:22	RADAR ATC	ZS-CLT	Charlie lima tango turn left 230 ...
06:45:25	ZS-CLT	RADAR ATC	230 charlie lima tango ...
06:47:10	RADAR	ZS-CLT	Charlie lima tango left turn 190 ...

	ATC		
06:47:12	ZS-CLT	RADAR ATC	Left 190 charlie lima tango ...
06:47:50	RADAR ATC	ZS-CLT	Charlie lima tango left 090 you can intercept radial 245 inbound ...
06:47:52	ZS-CLT	RADAR ATC	090 and intercept radial inbound... (the pilot does not mention the number 245)
06:47:55	RADAR ATC	ZS-CLT	Just confirm radial 245...
06:47:58	ZS-CLT	RADAR ATC	Affirm radial 245...
06:48:05	RADAR ATC	ZS-CLT	(When trying to intercept radial 245. The aircraft never came close or crossed it, but remained parallel to it) charlie lima tango you are a mile to the north of the radial...
06:48:10	ZS-CLT	RADAR ATC	Copy that we will establish on the radial...
06:48:50	RADAR ATC	ZS-CLT	Charlie lima tango contact Lanseria 124,0 for the cheers now...
06:48:55	ZS-CLT	RADAR ATC	124,0 For the descent charlie lima tango...

**ZS-CLT is transferred from Approach to Lanseria tower for the second time at 7,5 miles, one mile north of radial 250 or north RWY 07 centreline (during the first and second contact with the aircraft, Lanseria Tower never updated the weather. The visibility was 1000 m and cloud base 200 ft at the time)**

06:49:41	ZS-CLT	FALA ATC	Lanseria charlie lima tango is established on the radial for LIV and is 12 miles out. 8000 feet
06:49:45	FALA ATC	ZS-CLT	Thanks charlie lima tango cleared straight in VOR Z approach runway 07 QNH 1019 report 7,5 miles ...
06:49:50	ZS-CLT	FALA ATC	Cleared for the straight in approach, 1019. 7,5 is next charlie lima tango ...
06:51:00	FALA ATC	ZS-CLT	Charlie lima tango in the event of a go-around climb to 8 000 feet route direct PPV, passing 6 500 feet contact Radar 123,7 ...
06:51:10	ZS-CLT	FALA ATC	Copy that, in the event of a go-around say heading again ... (heading is incorrect. The controller said route PPV)
06:51:12	FALA ATC	ZS-CLT	Left turn routing direct to PPV...(climb to 8 000 feet is not mentioned in this transmission)
06:51:18	ZS-CLT	FALA ATC	Copy that it's a routing direct PPV in the event of a

			go-around, Radar 123,7 charlie lima tango...(no mention of climb to 8 000 feet)
06:51:24	FALA ATC	ZS-CLT	Correct, charlie lima tango climb to maintain 8 000 feet ... (reminder)
06:51:26	ZS-CLT	FALA ATC	Copy that we'll climb to maintain 8 000 feet ...
<b>06:52:03</b>	<b>Sound in the cockpit</b>		<b>ZS-CLT crosses the Outer Marker</b>
06:52:54	ZS-CLT	FALA ATC	Charlie lima tango we have the runway in sight ...
06:52:58	FALA ATC	ZS-CLT	Charlie lima tango runway 07 cleared to land, surface wind is 060 at 10 knots (there is no response from the aircraft for eight seconds)
06:53:14	ZS-CLT	FALA ATC	Charlie lima tango no longer has the runway in sight aborting ... (the transmission is cut short and in the back round one can hear a stall warning going on
<b>06:53:14</b>	<b>Stall warning goes off</b>		<b>Stall warning goes on and does not stop</b>
06:53:17	FALA ATC	ZS-CLT	Charlie lima tango copy that climb to 8 000 feet passing 6 500 feet contact radar 123,7 bye bye...(silent for eight seconds silent)
06:53:51	ZS-CLT	FALA ATC	OH LORD (seven seconds later) AHA...

## Annexure G

### SUMMARY OF THE OBSERVED WEATHER CONDITIONS CLOSER TO THE TIME OF THE ACCIDENT

#### (i) Satellite image

The satellite image in Attachment A shows cloudy conditions with embedded thunderstorms over the accident area (circled area). FALA is the closest weather station to the accident area and -TSRA with scattered cumulonimbus clouds (CB) at 3000ft AGL was reported at 0500Z. METARs are provided as attachment B below.

#### (ii) Surface data

FALA is the closest reporting weather station (see METARS in Attachment B). The METAR's from 0400Z to 0500Z for this weather station are included in attachment B. The 0500Z METAR reported -TSRA with scattered cumulonimbus clouds (CB) at 3000ft AGL. The low level cloud was also reported (broken at 400ft AGL at 0400Z to scattered at 500ft AGL at 0500Z). 0500Z METAR closest to the time of accident contains the following weather variables:

Dry-bulb temperature: 19 °C  
 Dew-point temperature: 19 °C  
 Wind direction and speed: 08009KT 030V170  
 Weather phenomenon: -TSRA  
 Clouds amount and height: SCT005 SCT030CB BKN060  
 Pressure reduced to mean sea level: Q1019hPa

#### (iii) Significant Weather Chart

The 0600Z Significant Weather Chart shows that broken and stratocumulus (SC) clouds were forecasted at 6000ft above mean sea level and isolated embedded CB at 8000ft above mean sea level, over the accident area, see the area indicated in attachment C below.

#### (iv) Radar Image

Radar Image at 04:58:51Z indicates thunderstorms over FALA moving southwards, see

## Annexure H

ory request

<http://aviation.weathersa.co.za/aviation/historyreq.php>



South African  
Weather Service

ISO 9001 Certified Organisation

Weatherline 083 123 0500

**Searching for historic data between 2014-03-03 and 2014-03-03**

**Results for Terminal Aerodrome Forecast (6 to 30 hrs)**

**Station: FAWB**  
**Date: 2014-03-03 - Time: 04:00**  
TAF FAWB 030300Z 0304/0315 NIL=

**Results for Terminal Aerodrome Forecast (18 to 30 hrs)**

No data

**Results for Meteorological Aerodrome Report(s)**

**Station: FAGM**  
**Date: 2014-03-03 - Time: 04:00**  
FAGM 030400Z 04003KT 3000 // BKN002 15/15 Q1020=  
**Date: 2014-03-03 - Time: 06:00**  
FAGM 030600Z 03006KT 1000 DZ OVC002 16/16 Q1021=

**Station: FAWB**  
**Date: 2014-03-03 - Time: 03:00**  
COR FAWB 030300Z AUTO 10003KT //// // // 18/16 Q1017=  
**Date: 2014-03-03 - Time: 02:00**  
FAWB 030200Z AUTO 07004KT //// // // 18/16 Q1017=  
**Date: 2014-03-03 - Time: 03:00**  
FAWB 030300Z AUTO 10003KT //// // // 18/16 Q1017=  
**Date: 2014-03-03 - Time: 04:00**  
FAWB 030400Z 07005KT 2000 RA OVC050 18/16 Q1017=  
**Date: 2014-03-03 - Time: 04:00**  
FAWB 030400Z AUTO 06005KT //// // // 18/16 Q1017=  
**Date: 2014-03-03 - Time: 05:00**  
FAWB 030500Z 06010G12KT 3000 RA OVC007 18/16 Q1018=  
**Date: 2014-03-03 - Time: 05:00**  
FAWB 030500Z AUTO 06007KT //// // // 17/16 Q1017=  
**Date: 2014-03-03 - Time: 06:00**  
FAWB 030600Z 06007KT 4000 RA OVC007 18/17 Q1018 =  
**Date: 2014-03-03 - Time: 06:00**  
FAWB 030600Z AUTO 07006KT //// // // 18/16 Q1018=

**Results for Special Meteorological Aerodrome Report(s)**

No data

[About](#)

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3/18/2014 2:15 PM

## Annexure I

### ***Before landing***

Pressurisation: Check  
Cabin sign: FSB or NS/FSB  
Prop autofeather: Arm  
Prop synchrophaser: As desired  
Flaps: Approach  
Landing gear: Down  
Lights: As required  
Radar: Standby or off  
Short final:  
    Props: High rpm  
    Power: Beta or reverse  
    Remove reverse at 40 kts

### ***Balked landing***

Power: Maximum  
Props: Full forward  
Airspeed: 95 kts until clear of obstacles  
Flaps: Up  
Gear: Up

### ***After landing***

Landing and taxi lights: As required  
Ice protection: Off  
Auto-ignition: Off  
Electrics: Observe load limits  
Trim: Set  
Flaps: Up  
Transponder and radar: Off  
Strobes: Off

**Source:** [www.atlasaviation.com/checklists/beechnair/BE90Cproc.pdf](http://www.atlasaviation.com/checklists/beechnair/BE90Cproc.pdf)

## Annexure J

Service Investigation  
 Accident / Incident Report  
 PSWC 8114 (11-98)



Report No.: 14-009  
 Page: 1 of 65

## I ANALYSIS

### 1.0 ACCIDENT SYNOPSIS

On 03 February, 2014, during a second attempt to land following a missed approach in low visibility, the Beechcraft King Air 90, registration ZS-CLT, The aircraft crashed on a steep incline within airport perimeter. Post crash fire occurred and the two crew and one passenger suffered fatal injuries.

### 2.0 SUMMARY OF FINDINGS

Both engines suffered significant impact damage resulting in compressive bending of the exhaust case and causing axial displacement of the front portion of the engine. Consequential axial bending of the Power Turbine (PT) shaft housing resulted in the fracture of the No. 3 bearing and subsequent release of rollers, one of each being found on the engine's chip detectors. This axial bending of the exhaust case and PT shaft housing caused the PT disk and blades to rub against their shrouds, fracturing the PT blades, and the disk to impact their respective PT vanes.

As such, both engines displayed similar damage to their hot section components where significant circular scoring and rubbing was found on the compressor and power turbine disks, respective vanes and baffles.

No evidence of any pre-impact anomalies was found on any of the compressor components, bearings, reduction or accessories gearbox gears on either engine.

### 3.0 CONCLUSIONS

Both engines displayed rotational signatures to their internal components characteristic of producing symmetrical power at impact in the low to mid power range.

There were no anomalies observed which could have prevented the engines from producing power prior to impact.

This document is subject to the restriction contained in the cover page.

## Annexure K:

## NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division  
Washington, D.C. 20594

January 11, 2016

## Cockpit Voice Recorder

Specialist's Factual Report  
By Joseph A. Gregor, Ph.D.

### A. EVENT

Location: Lanseria, South Africa  
Date: February 2, 2014  
Aircraft: Beechcraft C90GTx (BE91), ZS-CLT  
Operator: Crane Load Technology  
NTSB Number: DCA14WA179

### C. SUMMARY

On February 2, 2014, a Beechcraft C90, ZS-CLT, crashed after go-around from an attempted landing at Lanseria International Airport (FALA) in Gauteng Province, South Africa. The accident is being investigated by the South African Civil Aviation Authority.

### D. DETAILS OF INVESTIGATION

On January 11, 2016, Frank Masoga, Investigator of the South African Civil Aviation Authority, hand carried the following CVR to the National Transportation Safety Board (NTSB) Vehicle Recorder Division:

Recorder Manufacturer/Model: **L-3 Communications 2100-1020**  
Recorder Serial Number: **000659142**

#### **Recorder Description**

This model CVR, the L-3 Communications 2100-1020, is a solid state CVR that records 120 minutes of digital audio. Specifically, it contains a 4-channel recording of the last 120 minutes of operation: one channel for each flight crew, one channel for a cockpit observer, and one channel for the CAM.

#### **Recorder Damage**

Upon arrival at the audio laboratory, it was evident that the CVR had sustained significant structural damage. The internal memory module was removed from the crash survivable memory unit (CSMU) and a new female connector temporarily attached to the 3-V ribbon cable leading to the module. The module was then interfaced with the NTSB surrogate L-3 chassis configured as a 2-hour, 4-channel high quality CVR. The audio information was subsequently extracted from the recording normally, without

DCA14WA179  
CVR Factual Report, Page 1