AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/8858		
Aircraft Registration	**ZS-KIN** **ZU-BXA**	**Date of Accident**	26 October 2010		**Time of Accident**	1530Z	
Type of Aircraft	Piper PA-28-180 Jabiru SK		**Type of Operation**		Training		
Pilot-in-command Licence Type	Student Pilot Commercial Pilot	**Age**	25 50		**Licence Valid**	Yes Yes	
Pilot-in-command Flying Experience	Total Flying Hours	34,4 1046,7			Hours on Type	34,4 417,9	
Last point of departure	Wonderboom Aerodrome (FAWB); Gauteng province Kitty Hawk Aerodrome (FAKT); Gauteng province						
Next point of intended landing	Wonderboom Aerodrome (FAWB); Gauteng Province Kitty Hawk Aerodrome (FAKT); Gauteng Province						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
On Runway 29 at Wonderboom Aerodrome, approximately 200 meters to the west of the intersection with Runway 06/24 at a GPS position; South 25º39'12" East 028º13'22'							
Meteorological Information	Surface wind: 270°/5 knots, Temperature: 30°C, Cloud cover: Visibility: 8 000 m Scattered clouds.						
Number of people on board	1 + 0 2 + 0	**No. of people injured**	1 2		**No. of people killed**	0	

Synopsis

On 26 October 2010 at approximately 1530Z two aircraft, a Piper PA-28-180, registration ZS-KIN and a Jabiru, ZU-BXA were conducting circuit training at Wonderboom Aerodrome (FAWB). Runway 29 was in use, and right-hand circuits were flown.

The Jabiru was being flown by an instructor pilot and a qualified pilot on a revalidation check-flight and the Piper was being flown solo by a student pilot. The student pilot had previously conducted three circuits with an instructor pilot onboard and, following those circuits, the instructor pilot assessed the student pilot as being at a standard that would allow him to conduct further solo circuits. That required a full stop landing for the instructor pilot to exit the aircraft.

After the flight instructor had disembarked from the aircraft, the student pilot took-off and re-entered the circuit to conduct solo circuit training. The total circuit traffic at the time the student pilot re-entered the circuit was seven aircraft.

Sometimes later, ZU-BXA was cleared on final approach for a touch-and-go landing onto Runway 29 at FAWB. The aircraft ZS-KIN, which was on a base leg for a touch-and-go landing Runway 29 was cleared, after he confirmed he had the Jabiru in sight, he was instructed to position himself behind the Jabiru, and was number two on final approach for a touch-and-go landing.

Shortly after ZU-BXA became airborne following the touch-and-go landing, the two aircraft ZS-KIN and ZU-BXA collided in midair, approximately 30 feet above the runway. The pilots of both aircraft lost control of their respective aircraft and impacted with the ground.

Both aircraft was substantially damage during the sequence of the accident.

The flight instructor that was onboard ZU-BXA was seriously injured during the sequence of the accident. The private pilot under instruction in ZU-BXA as well as the student pilot flying ZS-KIN sustained minor injuries.

Probable Cause

Midair collision between two aircraft overhead runway 29.

Contributing Factors

Failure by the student pilot flying ZS-KIN to execute an immediate go-around as instructed by ATC.

ATC had to call the aircraft ZS-KIN three times before the pilot acknowledge during a critical phase of the flight.

Instructions by ATC to the aircraft ZS-KIN to execute an immediate go-around was not assertive enough for the student pilot to react.

The ATC had been operating in a high workload environment in the period leading up to the midair collision (only one ATC in the tower).

The student pilot of ZS-KIN did not see ZU-BXA in time to prevent the collision (loss of situational awareness).

Neither pilot in ZU-BXA saw ZS-KIN in sufficient time to avoid the collision.

The decision by the aviation training organisation (ATO) to send the student pilot in ZS-KIN solo during a busy traffic period should be regarded as a significant contributory factor to this accident as it placed the student in a high workload environment whereby he lost situational awareness. (Disregard for standard/safe operating procedures as contained in the ATO operations manual).

The student pilot of ZS-KIN had a low level of experience on which to base operational decisions.

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner	**:** I and M Croukamp (ZS-KIN)
	: Elbe Air CC (ZU-BXA)
Name of Operator	**:** Eagle Aviation (ZS-KIN)
	: Superb Flight Training (ZU-BXA)
Manufacturer	**:** Piper Aircraft Corporation
	: Shadow Lite CC
Model	**:** Piper PA-28-180
	: Jabiru SK
Nationality	**:** South African
Registration Marks	**:** ZS-KIN and ZU-BXA
Place	**:** Wonderboom Aerodrome (Gauteng province)
Date	**:** 26 October 2010
Time	**:** 1530Z

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 produced without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On 26 October 2010, a Piper PA-28-180 registration, ZS-KIN and a Jabiru aircraft, registration, ZU-BXA were engaged in circuit operations at Wonderboom Aerodrome (FAWB). The right-hand circuit for Runway 29 was in use at the time. **(See Fig. 1).** The aircraft ZU-BXA was being flown by a private pilot under supervision of a flight instructor, doing a revalidation check-flight. The aircraft ZS-KIN was being flown by a student pilot flying solo, doing circuits.

1.1.2 During the initial part of the flight, the student pilot, flying ZS-KIN conducted three (3) circuits with a flight instructor on board. During these three circuits, the flight instructor assed the student pilot as being at a standard that would allow him to conduct solo circuits. After the three circuits a full stop landing followed and the flight instructor disembarked from the aircraft and went to the control tower to monitor the student pilot. The student pilot then called for taxi clearance and taxied the aircraft to the holding point of runway 29 without clearance. This was observed by the ATC but not challenged. The student pilot then reported ready for departure at the holding point after completing the required pre-departure checks. The controller instructed the student pilot to standby initially and cleared the pilot for take-off at 1510Z to position himself in the right-hand circuit for Runway 29.

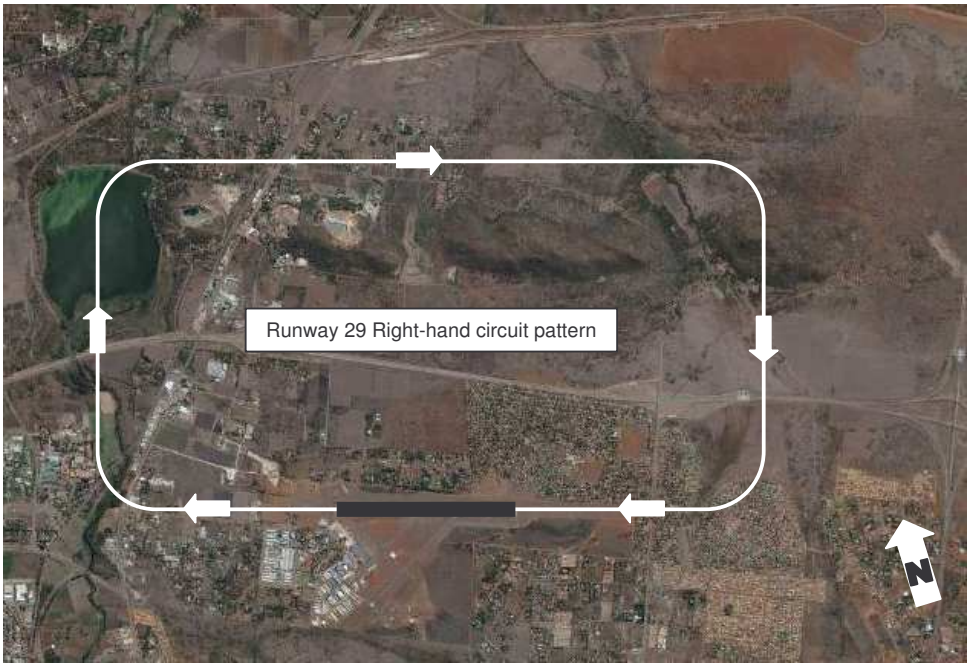

Figure 1. Wonderboom Aerodrome, Runway 29 right-hand circuit.

1.1.3 The circuit was fairly congested at the time the student pilot took-off, with seven (7) aircraft on frequency, comprising of the following:

(i) ZS-PMX, a Cessna 172, doing touch and go landings,
(ii) ZS-SPL, a Piper PA-28-161, doing touch and go landings,
(iii) Genair 884, a Cessna 208, inbound for landing,
(iv) ZS-ONA, a Piper PA 28-181, inbound for landing,
(v) ZS-VET, a Cessna 172, inbound for landing,
(vi) ZS-RUP, a Robinson R44, inbound for landing and,
(vii) ZS-STN, a Cessna 206, inbound for landing.

1.1.4 When the student pilot flying ZS-KIN was on a late downwind for Runway 29 on his first circuit, the aircraft ZU-BXA reported in bound from Kitty Hawk Aerodrome (FAKT). The aircraft ZU-BXA was cleared in bound by air traffic control (ATC) and was instructed to report south of the Roodeplaat dam on a long final approach for Runway 29.

1.1.5 After ZS-KIN completed his first solo circuit, while positioned on a late downwind for his second circuit, the aircraft ZU-BXA was on long final approach for a touch-and-go Runway 29. When ZU-BXA was positioned one nautical mile east of the N1 high-way, which is located to the east of FAWB, ZS-KIN was cleared to turn onto the base leg for Runway 29. **(See Fig 2)**

Figure 2. Relative position of the aircraft before ZS-KIN was cleared to turn base leg Runway 29.[1]

1.1.6 At the time ZU-BXA crossed the N1 high-way to the east of FAWB, ZS-KIN was cleared to follow ZU-BXA, number two on final approach. The student pilot acknowledged this communciation and indicated to ATC that he had the aircraft ZU-BXA on final approach in sight. **(See Fig. 3)**

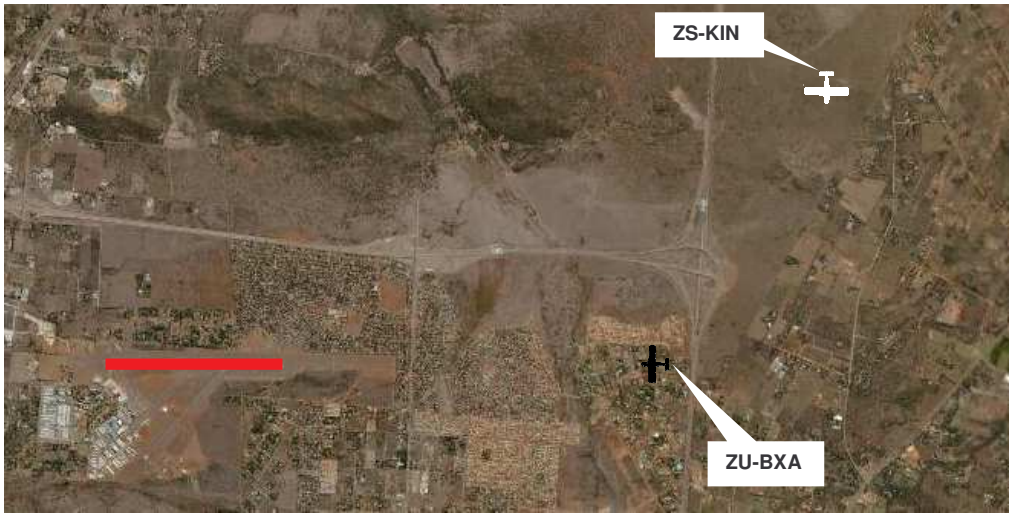

Figure 3. Relative positions of both aircraft, ZS-KIN was cleared to follow ZU-BXA onto final approach Runway 29 [2]

1.1.7 At 15:27:25 the aircarft ZU-BXA was cleared by ATC for the touch-and-go on Runway 29 and instructed to turn out right after the touch-and-go and to route to the Petroport. This instrcution was not correctly readback by the crew and the controller re-interates the clearance, which was then readback correctly.

At 15:28:32 ATC asked the student pilot of ZS-KIN if he is still maintaining behind the aircaft ZU-BXA. The student pilot only responds was that he is on final approach for Runway 29.

At 15:29:31 ATC called the student pilot of ZS-KIN three times, he only

[1] The depicted aircraft positions are not to scale
[2] The depicted aircraft positions are not to scale

acknowledge ATC after the third attempt. ATC then immediately instructed him to execute a go-around, "turn out right and position on a late right-hand downwind for Runway 29". This was correctly readback by the student pilot but he failed to perform the go-around as instructed to do, and instead continue with the descend.

At 15:30:27 ATC again instructed the student pilot of ZS-KIN to commence a right-hand turn, and again the student pilot acknowledge the instruction but continue with the descend.

Shortly after the student pilot of ZS-KIN acknowledge the ATC command the aircraft ZU-BXA became airborne following the touch-and-go and struck the aircraft ZS-KIN from below at a height of approximately 30 feet above the runway surface. **(See Fig 4)**

Figure 4 Relative position of the collision between ZU-BXA and ZS-KIN[3]

1.1.8 Following the midair collision the pilots of both aircraft loss control of their respective aircraft and impacted with the runway surface.

1.1.9 At 15:30:43 ATC advised all traffic on frequency to maintain radio silence. At this time he also activated the crash alarm and the aerodrome rescue and fire-fighting (ARFF) personnel responded swiftly to the accident scene under his guidance.

1.1.10 All elevated traffic were then instructed by ATC to reposition for landing onto Runway 06.

1.1.11 All three occupants were treated on the scene by paramedics and were admitted to hospital where they underwent a detailed medical examination. The flight instructor that was on board the aircraft ZU-BXA sustained serious back injuries and remained in hospital for several weeks after the accident. The other two pilots were discharged later the same evening.

[3] The depicted aircraft positions are not to scale

1.2 Injuries to Persons

1.2.1 ZS-KIN

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

1.2.2 ZU-BXA

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

1.3 Damage to Aircraft

1.3.1 Both aircraft sustained substantial damaged during the midair collision and the subsequent collision with the ground (runway). **(See Fig. 5)**

Figure 5. A view of the two aircraft as they came to rest to the left of Runway 29.

1.4 Other Damage

1.4.1 One runway light (light A15) was damaged by one of the aircraft during the sequence of the accident and minor damage was caused to the runway surface by the propeller of one of the aircraft. **(See Fig. 6)**

Figure 6. Propeller strike markings visible on the runway centre line.

1.5 Personnel Information

1.5.1 Student pilot flying ZS-KIN

Nationality	Zambian	Gender	Male	Age	25
Licence Number	0272339607	Licence Type	Student Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	30 June 2011				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	34,0
Total Past 90 Days	19,4
Total on Type Past 90 Days	19,4
Total on Type	34,0

According to available information the student pilot started his flying career in Tanzania where he apparently flew 32 hours. He could not provide the local aviation training organization (ATO) with evidence of his training and the flying school made the decision to treat him as a new student with no previous flying training.

On the preceding dual flight, the student was assessed by a flight instructor and found to meet an expectable standard that would allow him to conduct a solo flight (circuit work).

1.5.2 Flight Instructor flying ZU-BXA

Nationality	South African	Gender	Male	Age	50
Licence Number	0270447899	Licence Type	Commercial Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Instructors rating Grade II, Night Rating and Instrument rating				
Medical Expiry Date	31 March 2011				
Restrictions	None				
Previous Accidents	Yes				

The flight instructor was involved in one previous accident that occurred on 5 November 2005. He was flying a Cessna R172K, during flight the engine failed due to fuel exhaustion. During an attempted forced landing on rough uneven terrain the aircraft nosed over, coming to rest in an inverted attitude.

Flying Experience:

Total Hours	1046,7
Total Past 90 Days	88,8
Total on Type Past 90 Days	24,3
Total on Type	417,9

1.5.3 Pilot under training flying ZU-BXA

Nationality	Congolese	Gender	Male	Age	22
Licence Number	0272298944	Licence Type	Private Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	31 October 2011				
Restrictions	Corrective lenses				
Previous Accidents	None				

Flying Experience:

Total Hours	199,7
Total Past 90 Days	6,6
Total on Type Past 90 Days	6,6
Total on Type	199,7

1.5.4 Air Traffic Controller

Licence Number	ATS 0706
Position and Frequency	Tower/Procedural Approach 120.6 MHz
Date of last standard evaluation	4 February 2010
Date of medical expiry	30 November 2010
Previous Incidents	None

On the day of the accident, the event controller reported for duty at 1030Z and started pre-shift briefing activities. The event controller then took over controlling

duties at 1100Z and provided a combined approach and aerodrome control service on Frequency 120.6

The event controller worked until 1200Z when he was relieved from his position for a break.

The event controller was on a break for two (2) hours and return to controlling duties at 1400Z. At this time, the relief controller providing breaks in the Tower came to the end of the relief shift and signed off duty and departed the facility.

The event controller was assisted by two (2) Air Traffic Service Assistants (ATSAs) who provided the required support from the ATSA position at the back of the Control Tower.

1.6 Aircraft Information

1.6.1 Piper PA-28-180 (ZS-KIN)

Figure 7 A single engine, low-mounted PA-28-180 aircraft (Similar to ZS-KIN)

Airframe:

Type	Piper PA-28-180	
Serial Number	28-2981	
Manufacturer	Piper Aircraft Corporation	
Year of Manufacture	1965	
Total Airframe Hours (At time of Accident)	8 401,5	
Last MPI (Hours & Date)	8 327,3	21 July 2010
Hours since Last MPI	74,2	
C of A (Issue Date)	16 November 2007	
C of R (Issue Date) (Present owner)	21 November 2008	
Operating Categories	Standard Part 135	

Engine:

Type	Lycoming 0-360-A3A
Serial Number	L-9111-36A
Hours since New	8 401,5
Hours since Overhaul	904,5

Propeller:

Type	Sensenich 76EM8S5-0-60
Serial Number	2910K
Hours since New	3 160,5
Hours since Overhaul	904,9

1.6.2 Jabiru SK (ZU-BXA)

Figure 8 The single engine high-mounted wing Jabiru SK (Similar to ZU-BXA)

Airframe:

Type	Jabiru SK	
Serial Number	231	
Manufacturer	Shadow Lite CC	
Year of Manufacture	1999	
Total Airframe Hours (At time of Accident)	3 802,8	
Last Annual Inspection (Hours & Date)	3 763,0	23 August 2010
Hours since Last Annual Inspection	39,8	
Authority to Fly (Issue Date)	24 August 2010	
C of R (Issue Date) (Present owner)	21 January 2003	
Operating Categories	Standard Part 141	

Engine:

Type	Jabiru 22A
Serial Number	22A/432
Hours since New	996,4
Hours since Overhaul	TBO not yet reached

Propeller:

Type	Jabiru JJ 2186
Serial Number	0000242
Hours since New	18,7
Hours since Overhaul	No TBO

1.7 Meteorological Information

1.7.1 Meteorological information was obtained from the South African Weather Service. The most likely weather conditions at the time of the accident are given in the table below.

Wind direction	270ºM	Wind speed	5 knots	Visibility	8000 m
Temperature	30°C	Cloud cover	SCT	Cloud base	N/A
Dew point	-5°C				

At a pressure altitude of 4 095 feet, and an ambient temperature of 30°C, the density altitude was calculated to be 6 814 feet.

1.7.2 According to the website: www.SunEarthTools.com the position of the sun at the time of the accident was at an elevation[4] of 10.74° above the horizon at an azimuth[5] of 261.13°.

1.8 Aids to Navigation

1.8.1 The aircraft, ZS-KIN, was equipped with standard navigational equipment as per Minimum Equipment List approved by the Regulator. There were no recorded defects to the navigational equipment prior to the flight.

1.8.2 The aircraft ZU-BXA, was equipped with standard navigational equipment which was required as per Part 91.04.4 of the Civil Aviation Regulation of 1997 as amended. There were no recorded defects reported prior to the accident.

1.9 Communications

1.9.1 The aircraft ZS-KIN was equipped with standard communication equipment as per Minimum Equipment List approved by the Regulator. There were no recorded defects to the communication equipment prior to the flight. The pilot did communicate with Wonderboom tower on the VHF (Very High Frequency) radio frequency 120.6 MHz before the accident.

[4] Elevation is the vertical angle in degrees from the horizon.
[5] Azimuth is the clockwise horizontal angle in degrees from true north.

1.9.2 The aircraft ZU-BXA, was equipped with one (1) VHF (Very High Frequency) radio, which was required by Part 91.05.1 Civil Aviation Regulation of 1997 as amended. There were no recorded defects to the communication equipment prior to the flight. The pilot did communicate with Wonderboom tower on the VHF radio frequency 120.6 MHz before the accident.

A transcript of the communication between ATC and the circuit traffic, including the two accident aircraft can be found attached to this report as Appendix A.

1.10 Aerodrome Information (See Fig 9)

Aerodrome Location	6 nm North of Pretoria	
Aerodrome Co-ordinates	S 25º39'19.1" E 028º13'16.8"	
Aerodrome Elevation	4 095 ft	
Runway Designations	11/29	06/24
Runway Dimensions	1 828 x 30 m	1 280 x 22 m
Runway Used	29	
Runway Surface	Asphalt	
Approach Facilities	Runway lights, PAPI, NDB	

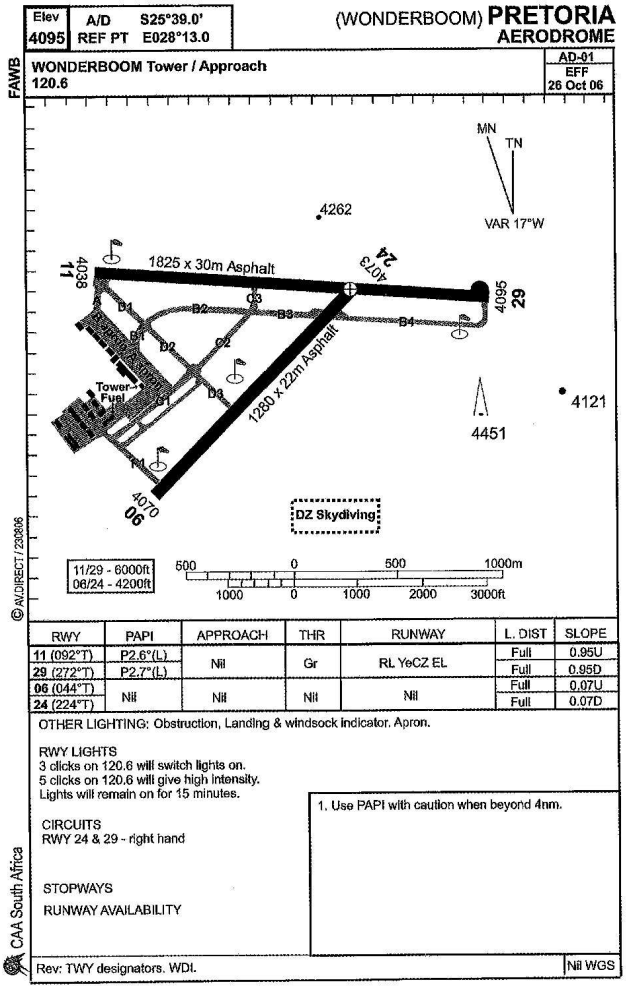

Figure 9 Aerodrome layout of Wonderboom aerodrome (FAWB)

1.11 Flight Recorders

1.11.1 Neither of the aircraft was equipped with a cockpit voice recorder (CVR) or a flight data recorder (FDR). Neither was required by regulation to be fitted to this type of aircraft.

1.12 Wreckage and Impact Information

1.12.1 Wreckage trail **(See Fig 10 for site plan)**

The wreckage trail of both aircraft was aligned in a generally east-to-west direction along Runway 29, with the heaviest items located on the western end of the trail. The lightweight items at the eastern end of the trail were scattered in a radius of approximately 20 meters, consisted of low density foam filling from the Jabiru aircrafts aileron[6] and wing.

The wreckage trail started approximately 200 meter to the west of the intersection between the two runways.

From this point onwards, alongside Runway 29, various heavier pieces of debris were found scattered along a trail of 115 meters. This includes items such as landing gear wheels and a fire extinguisher.

[6] Primary flight control surface near the tip of the wing used to control roll of the aircraft about the longitudinal axis.

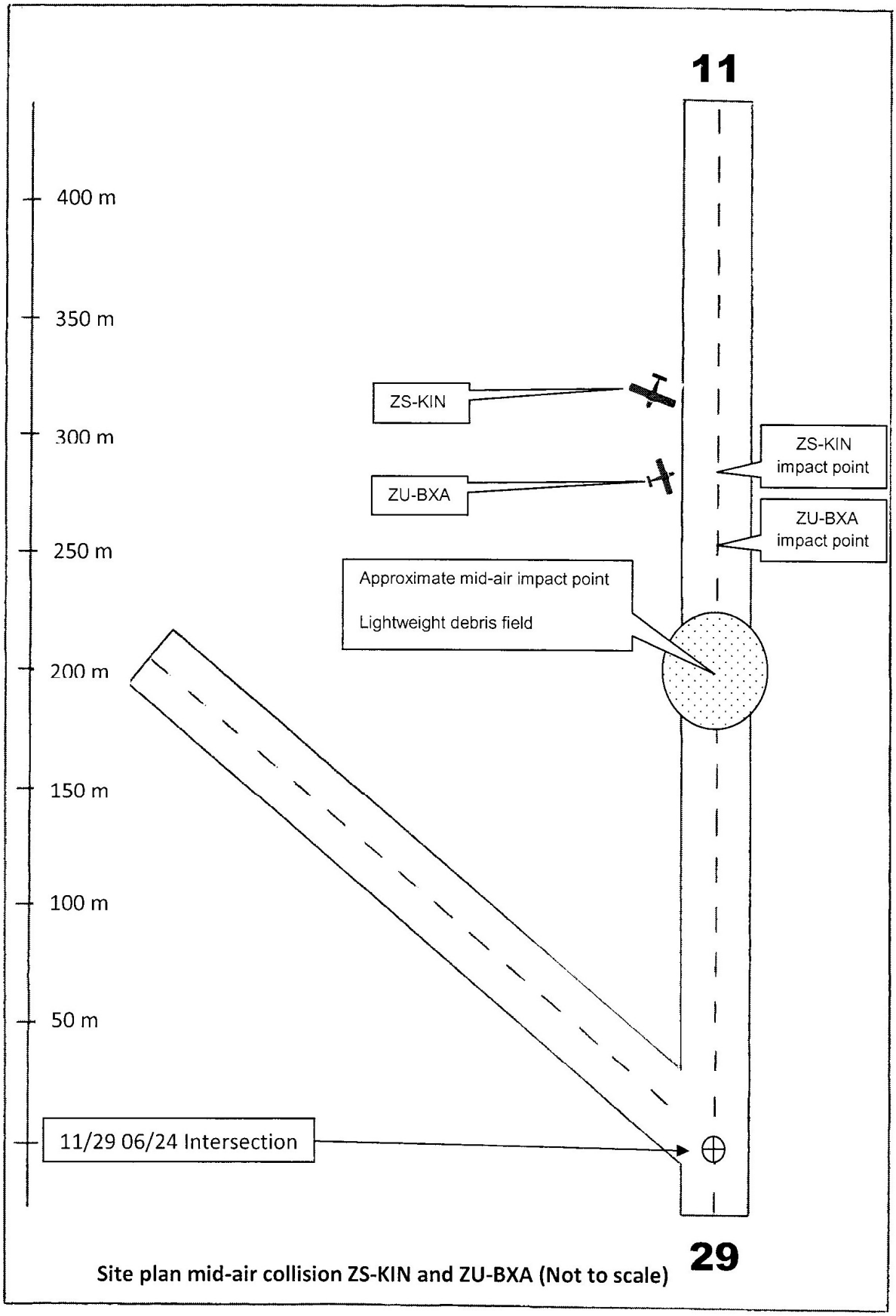

Figure 10. Accident site plan (not to scale).

Available evidence indicate that the propeller of ZS-KIN made contact with the outer wing surface of ZU-BXA, which caused substantial damage to the lifting surface, including destroying the right aileron as can be seen in Figure 8. This resulted in a loss of control of the aircraft ZU-BXA, which was found to have impacted with the runway surface approximately 280 m pass the intersection of the two runways. **(See Fig. 11)**

Figure 11. Damage caused to the right and aileron of ZU-BXA.

Abrasion marks on the canopy substantiate the instructor's account that was in the control tower that the aircraft ZS-KIN had rolled about its longitudinal axis as the pilot lost control of the aircraft. Diagonal abrasions and ground smear marks just to the left edge of the runway substantiate the observation. **(See Fig. 12)**

Figure 12. Abrasion and ground smear marks on the canopy of ZS-KIN.

The rolling moment carried the aircraft ZS-KIN to a position where it came to rest in an uneven keel position facing into a south-easterly direction. **(See Fig. 13)**

Figure 13. Final position of ZS-KIN.

The aircraft ZU-BXA was impacted from behind by the aircraft ZS-KIN. The propeller of ZS-KIN made contact with the right wing aileron of ZU-BXA and control was lost. The aircraft ZU-BXA impacted the runway surface approximately 250 meters pass the runway intersection and approximately 5 meters to the left of centre line where after the aircraft skidded forward and sideways coming to rest at a point to the left of the runway approximately 279 meters from the intersection. **(See Fig 14)**

Figure 14. Final position of ZU-BXA.

1.12.2 Final position of the flight path

The final position of the flight path was at a point 200 meter to the west of the intersection, approximately on the centreline of the runway where the two aircraft collided.

1.12.3 Approximate position of the two aircraft at the time of initial impact

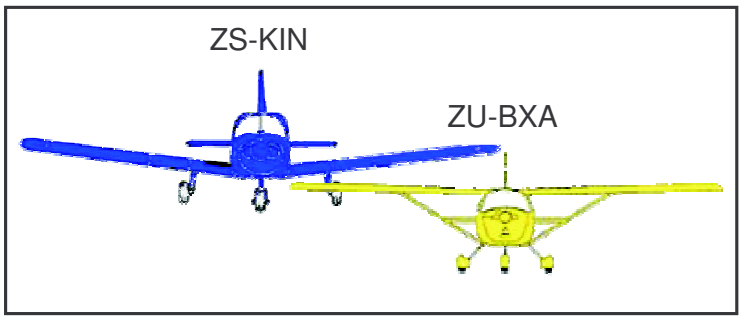

Figure 15. Approximate position of the two aircraft looking towards them.

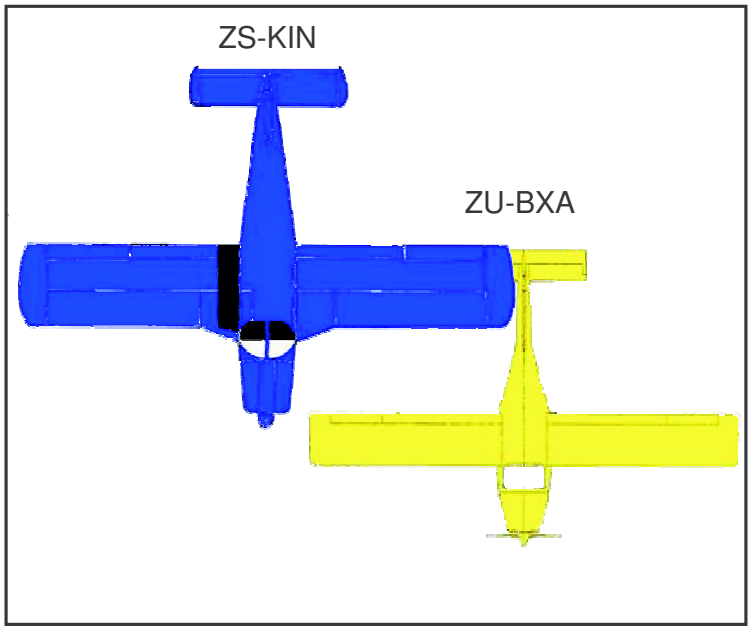

Figure 16. Approximate position of the aircraft as seen from the top.

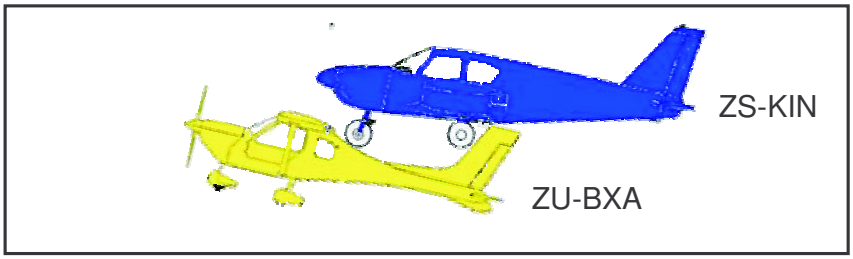

Figure 17. Approximate position of the aircraft as seen from the side.

1.12.4 Location of impact impressions on the ground, trees, buildings and other objects:

The impact impression of ZS-KIN was on the centre line of Runway 29, approximately 280 meters pass the intersection of the two runways (80 meters after the mid-air impact point). The impact impression of ZU-BXA was approximately 250 meters pass the intersection of the two runways (50 meters after the mid-air impact point) and approximately 5 meters to the left of runway centre line.

1.12.5 Aircraft attitude during impact

Both aircraft were in a slight nose up attitude at the time of the collision as the aircraft ZU-BXA was becoming airborne following a touch-and-go and the aircraft ZS-KIN being in the landing attitude.

1.12.6 Aircraft configuration during impact

The aircraft ZS-KIN was in the landing configuration with the flaps fully extended. The aircraft ZU-BXA was in the take-off configuration with a flap selection of 15°.

1.13 Medical and Pathological Information

1.13.1 The flight instructor of the aircraft ZU-BXA sustained back injuries, a cracked pelvis, cracked sternum and a sprain ankle while his student and the student pilot in the aircraft ZS-KIN sustained minor injuries during the sequence of the accident.

All three pilots were taken to hospital by ambulance after the accident.

1.14 Fire

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

1.15 Survival Aspects

1.15.1 The accident was considered survivable as it was associated with relative low kinetic energy, with the cockpit and fuselage areas remaining fairly intact. The occupants on board the respective aircraft were making use of the aircraft equipped safety harnesses, which did not fail during the sequence of the accident.

1.15.2 The ATC immediately activated the crash alarm with the first rescue vehicle from the aerodrome rescue and fire-fighting (ARFF) department arriving on scene within 45 seconds after the accident.

1.15.3 The ARFF covered the accident scene with a foam layer to prevent the possibility of the spilled fuel to ignite. Approximately 11 000 litres of water and approximately 300 litres of Tridol Light Water Foam was used to cover the scene.

1.15.4 This type of accident involving low wing and high wing type aircraft in a circuit is not unique and does occur globally as can be seen on the photos below. **(See Fig 18)**.

Figure 18. Example of a collision between a high-wing and low-wing aircraft.

1.16 Tests and Research

1.16.1 None was considered necessary.

1.17 Organizational and Management Information

1.17.1 Maintenance

The last mandatory periodic inspection (MPI) that was carried out on ZS-KIN prior to the accident was certified on 21 July 2010 at 8 327,3 airframe hours by a CAA approved aircraft maintenance organization (AMO) which was in possession of a valid AMO approval certificate.

The last Annual Inspection that was carried on ZU-BXA was certified on 23 August 2010 at 3 763,0 airframe hours by a CAA approved aircraft maintenance organization (AMO), which was in possession of a valid AMO approval certificate.

1.17.2 Training

Both aircraft was operated by CAA approved Aviation Training Organizations (ATO). Both these facilities complied with the requirements of Part 141 of the CARs being in possession of valid ATO approval certificates.

1.17.2.1 Student pilot of ZS-KIN

- The student pilot started his flying training in Tanzania. He apparently completed 32-hours of flight training in Tanzania before he commenced with flight training in South Africa. As no records could be provided with reference to his previous training in Tanzania, he started his training in South Africa as a new student, with no flying experience.

  An overview of his training file revealed the following:

- After his first flying lesson at the ATO in South Africa, he had a basic idea of flying but has a definite communication barrier as his first language was not English and had to spend a lot of time on the ground in preparation for flying.

- As the student pilot progressed with his training, several comments were entered in his training file. Some of the areas that were highlighted were as follow:

(i) Communication problems (language barrier),
(ii) Situational awareness,
(iii) Underperformance,
(iv) Multitasking as well as him getting "flustered" during training scenarios.

- At 15.6 flying hours, a dual check was performed on the student after he had not flown for nearly three months. The following remarks followed: the student was not up to standard and he has a problem with radio procedures, he does not know how to read a compass and did not know what an Artificial Horizon (AH) or Directional Indicator (DI) was.

- At 23.2 hours the students training file reveals he had a problem maintaining heading and his radio procedures was still a problem.

- At 30.2 hours the Chief Flying Instructor (CFI) conducts a solo check flight with the student, which he failed.

- The following day further flight training of 0.6 hours followed where after he was recommended for another solo check flight with the CFI.

- During the second check flight with the CFI at 32 hours, it was noted in the students training file the student does not react at all when more than one thing happened at a time in the cockpit. It was also noted the student get flustered resulting in him losing situational awareness. It was suggested the student should take one thing at a time but no remedial action was taken before the student was signed out to fly a solo session. After this flight the student was cleared by the CFI to fly solo but the following restrictions was imposed on his solo flight:

  1) The solo session was limited to quiet time only and conditions should be well above minimum conditions.
  2) A maximum of three aircraft are allowed on frequency.
  3) Wind must be well below 10 knots.
  4) Solo flights must be conducted early morning or late afternoon.
  5) Solo flights are limited to runway 11/29.

  At 33.6 hours, during the circuits flown with the student before his solo circuits, it was sited out the student should show more interest and pay more attention while flying. The student's radio procedures were again pointed out as being problematic.

- The student completed his pre-solo questionnaire more than a year before conducting his solo flight. Only one question pertaining to a go-around formed part of this questionnaire, which did not cover all the relevant aspects of a go-around. No reference was made in any of the given answers as to the setting of a climb attitude as part of the go-around procedure.

- Only one entry could be found in the students training file indicating he has done a go-around exercise. During this exercise a month before the accident flight, flaps were not set to optimum. No remedial action could be found in the student's training file indicating this procedure was corrected.

1.17.2.2 Pilot under instruction ZU-BXA

- The pilot under instruction flying the aircraft ZU-BXA was a qualified private pilot doing a revalidation check flight.

- The pilot failed his initial private pilot flight test. After remedial training was given to the pilot, he successfully completed his second private pilot flight test. After the pilot completed the second test successfully he was warned by his flight test instructor to be watchful not to become over confident and lazy.

- The pilot then went to another SACAA approved ATO to do his private pilot renewal test. Evidence from his training file indicates that he completed two flights before his test. After these two flights it was recorded in his training file that he had a serious problem with his "vital checks" and radio procedures.

- On the day of his renewal test, he passed the oral ground evaluation test but failed the flying test. Comments in the pilot's training file indicate he still had a problem doing his vital checks and his radio procedures were not up to an acceptable standard.

- During the flight following his failed test, the pilot was informed about the importance of proper preparation and planning before each flight.

1.17.2.3 ATC on duty

- The ATC on duty at the time of the accident was a qualified ATC with the following ratings for Wonderboom aerodrome:

  (a) Approach Procedural Controller
  (b) Aerodrome Controller

- The ATC was also a Grade 2 Instructor with the following ratings at Wonderboom aerodrome:

  (a) Approach Procedural Controller
  (b) Aerodrome Controller.

- Proficiency Checks for both ratings was done by the ATC on 5 February 2010

1.18 Additional Information

1.18.1 Information obtained from the student pilot flying ZS-KIN during an interview:

The student pilot that was flying the aircraft ZS-KIN stated his take-off from Runway 29 at FAWB was normal and he completed a normal circuit onto the downwind leg for Runway 29. He further stated, as he was cleared by ATC to turn onto the base leg for Runway 29, he had difficulties in seeing the Jabiru who was on final approach for Runway 29 at that stage.

Once he observed the Jabiru on final approach, he confirmed the sighting with ATC and was then cleared by ATC to follow the Jabiru onto final approach for Runway

29.

The student pilot further stated that once he had when established himself on final approach for Runway 29 he had difficulty in observing the Jabiru initially as he was flying into the setting sun. He observed the Jabiru once it crossed the threshold of Runway 29 and was still in the air. At approximately the same time, the pilot of ZS-KIN was instructed by ATC to perform a go-around and to turn right. He stated he was not aware that the Jabiru was cleared for a touch-and-go and was under the impression the Jabiru was going to perform a full stop landing.

The student pilot flying ZS-KIN stated, when he was given the go-around instruction by ATC he was worried as he was not sure how to execute a go-around from his current position. This caused the student pilot to stress and he experience a high level of anxiety as he was uncertain of what to do at the time. He then applied full power and decreased the flap setting by two (2) notches. He kept runway heading and the next he can remember the Jabiru approached his flight path from underneath and he collided with the Jabiru.

At various times during the interview with the student pilot he failed to understand the investigator's questions. It took some time from the investigator to explain to the student what was required from him by the questions asked. In answering the questions, especially when the question was of a more technical nature, the student could not answer basic questions. He also had a problem expressing himself in the English language.

The student pilot was only interviewed once after the accident where after left the country to recuperate at home in Tanzania. By the time this report was concluded the student however had not returned to South Africa to continue with his flying training there for no further information could be obtained from him to assist in the investigation.

1.18.2 Evidence obtain from the student pilots training file

No proof could be found in the students training file indicating he was subjected to five go-around procedures as indicated by him during his interview with the Investigator-in-charge (IIC). According to his training file he was subjected to one (1) go-around procedure approximately a month before the accident. During this single exercise of a go-around, the student did not follow the correct procedure in retracting the flaps. No evidence could be found in the students training file of any correctional action from the instructor to correct the problems that were experienced during the go-around exercise.

The student pilot completed his pre-solo questionnaire on 20 October 2009, which was more than a year before the accident flight. Included in this questionnaire was one question pertaining to the go-around procedure, "The sequence for the GO AROUND is". The question was answered correctly by the student.

(a) At the time of the accident, the student pilot of ZS-KIN was conducting his second solo circuit.

(b) The student had 29 hours of circuit training and two periods lasting 0.3 of an hour each of solo flying. Evidence in the student's training file revealed evidence of repeated errors and he was cited for underperforming frequently.

During an interview with the student pilot flying ZS-KIN after the accident, he

could not describe to the investigator the correct procedure to be followed in the event a go-around is required. He indicated he had done approximately five (5) go-around exercises since he started his flying training, however, he indicated during the interview with the investigator he was worried and not comfortable in performing a go-around. This, according to the student pilot, caused him to stress and he experience a high level of anxiety as he was not certain what to do at the time.

No evidence indicating the student pilot has done five (5) go-around exercises could be found in his training file.

(c) The students training file revealed various problems with his radio procedures, from his first day of training until his dual flight check before the accident flight. No proof of any remedial actions to correct this problem could be found. During the student pilot's first solo circuit on the day of the accident, he was taxiing to the holding point Runway 29 without any clearance from ATC. During his last circuit, the students instructor was heard saying on ATC radio he is not concerned about his students flying but about his radio work. Seconds before the accident, the student pilot was called three times by ATC. He only answered on the third call whereby he was instructed to perform the go-around. After the go-around instruction was given to the student pilot, he acknowledged the instruction but failed to execute the instruction.

1.18.3 It appears that the student pilot flying ZS-KIN did attempt to slow his aircraft down. According to an eye witness, the aircraft was flying with a higher than normal nose attitude during the final approach phase of the flight.

1.18.4 When ATC decided to give the student pilot flying ZS-KIN the go-around instruction, he called the student three times before he received acknowledgement from the student. The go-around instruction was given to the student twice but he failed to acknowledge or execute the go-around procedure in the correct manner. The correct procedure would be to commence a climb under full power, off-set but still parallel to the extended runway centre line to a safe height of 500 feet above ground level (AGL) before turning right onto the crosswind leg; then to continue climbing to circuit height of 1000 feet along roughly a racecourse pattern to the right-hand downwind position. The rest of the circuit would then be completed and another landing attempted.

1.18.5 Before the student started his flying training in South Africa, he had done 32 hours of flying training in Tanzania. No official record of these training was available. The student completed 32 hours of flying training in South Africa but struggled to be released for solo flying. 32 Hours is almost double the amount of hours needed by most students before being released to fly solo.

1.18.6 After turning onto base-leg, the student did not follow a race-coarse pattern onto the final approach path but diagonally followed the Jabiru traffic in front of him as instructed by ATC.

1.18.7 While turning onto final approach, the student employed an incorrect flying technique by deviating from his final approach path. (overshooting the imaginary runway extended landing-centre line as seen by ATC)

1.18.8 Flight Instructor flying ZU-BXA

(a) The flight instructor had to make several corrections to the tower transmissions

by his student during the approach of ZU-BXA onto Runway 29. Instructor had to clarify instructions from ATC to the pilot

1.18.9 Pilot under training flying ZU-BXA

(a) The pilot flying ZU-BXA at the time of the accident was a qualified private pilot who was doing recurrent training at the time of the accident. The pilot under training was flying the aircraft at the time of the accident.

(b) The pilot flying ZU-BXA made several incorrect altitude and position reports while communicating with Wonderboom ATC. Place names were confused twice in the short space of time the student was on frequency with Wonderboom ATC. During one radio transmission the instructor flying BXA had to make two corrections in this regard.

(c) From the radio transmissions, the French accent of the pilot of ZU-BXA was clearly noticeable. It was also evident he (the pilot of BXA) appeared to have been flustered, while experiencing difficulties to maintain overall positional awareness.

(d) The training file, for the period 2008-2009, of the pilot flying ZU-BXA, suggests a tendency in as many words to have been both “lazy and overconfident” during the final rounding-off phases of his private pilot training.

1.18.10 Air Traffic Controller

(a) The ATC did not reprimand the student flying ZS-KIN on at least four occasions for taking actions without specific clearances. Under normal circumstances, should a qualified pilot make such mistakes, the norm would be to take action against such pilot.

(b) There was some misconception on the part of the ATC as he and some ancillary staff members on several occasions incorrectly referred to the Cherokee 180 as an Arrow. This heavier, more powerful version of the Piper PA-28 series of aircraft would fly faster than the Cherokee.

(c) A faster six seater Piper PA 46 Piper Malibu was positioned closely behind ZS-KIN during his first circuit and was required to reduce to minimum safe approach speed and accept a late landing clearance.

(d) Several incorrect position and altitude reports were given to ATC by the pilot of ZU-BXA as revealed by the ATC tapes.

(e) ATC observed ZS-KIN to fly a “zig zag” pattern once on final approach (student was flying his final approach not in a straight line but was turning to the left and to the right while on his final approach). The student’s flight instructor was asked about his student’s competency to do such manoeuvres whereby he replied the student was fine.

1.18.11 Aviation Training Organization operating ZS-KIN

(a) The student pilot’s training file contains one written entry pertaining to a go-around exercise a month before the accident, during which a problem to retract the flaps to “optimum” was encountered. No reference was made to corrective training that followed the entry.

(b) The student completed his pre-solo written examination on 20 October 2009, which was more than a year before the accident flight.

(c) No evidence could be found in the students training file on the go-around procedure, nor was any evidence obtained to indicate that such a procedure was rehearsed during the students training.

(d) Several shortcomings in the training progress reports appeared to suggest problems during the training of the student but some of these problems have never been corrected.

(e) The CFI of the ATO imposed several restrictions that were required to be adhered to before the student pilot could fly solo. The student was only allowed to fly at quiet times, conditions must be well above minimum thus only 3 aircraft on frequency and the wind below 10 knots. The flight instructor did not adhere to these restrictions when allowed to send the student pilot solo. The turbulence should be minimum, visibility excellent, and the student pilot was limited to the main runway being 11/29 at FAWB.

(f) Although evidence was found of the student completed an aircraft technical and pre-solo examination, neither examinations nor a weight and balance calculation completion was certified in his training file.

(g) The CFI and flight instructor of the ATO were interviewed with reference to the student's inability to communicate and understand the English language, which had a profound effect in the training process. According to them it was only a problem during the initial stages of his training, once he got used to a person's accent he could clearly understand and communicate with that person.

1.18.712 Aviation Training Organization operating ZU-BXA

(a) The pilot flying ZU-BXA was a qualified private pilot (PPL). His initial PPL training was conducted at an ATO in the Western Cape. During the final stages of his PPL training, his flight instructor at the time made an entry into his training file, warning him to pay attention not to become lazy and overconfident during flight.

(b) At the time of the accident, the pilot was the holder of a valid private pilot licence. He had only flown 3.5 hours at the current ATO prior to the accident flight.

1.18.13 Wonderboom Aerodrome

(a) At the time of the accident the Air Traffic Service Unit (ATSU) at Wonderboom aerodrome was operating without the aid of a ground movement control frequency and staff to manage such system to alleviate problems associated with congestion in Class C airspace has been a negative disposition for years. Transitory Instrument Flight Rules (IFR) to Visual Flight Rules (VFR) situations add to difficulties both pilots and ATC are faced with.

(b) Certain upgrades were done to the Wonderboom aerodrome in the time preceding the accident. Included was the start of scheduled domestic flights (Part 121) to and from the aerodrome. This was implemented most probably

without a proper assessing and governing of the air safety situation by providing certain additional and upgraded facilities needed to deal with the type of frequent traffic.

(c) Several projects were launched at the aerodrome in the 24 months preceding the accident. Financial resources were made available for several projects to upgrade the aerodrome infrastructure but very little to no financial resources was devoted to the upgrade and improvement of the ATSU facility at the aerodrome, including the appointment of additional personnel to man the tower.

1.18.14 SACAA Air Safety Infrastructure investigation

The following findings were made during the Air Safety Infrastructure investigation following the accident in question.

(a) The Air Traffic Controller (ATC) on duty at the time of the accident was medically fit and held a valid Air Traffic Service license.

(b) The busyness level of the aircraft traffic circuit was "heavy", indicating that the ATC workload was high.

(c) When ATC noticed ZS-KIN was catching up with the aircraft ZU-BXA, he attempted to avert the pending accident by issuing two instructions to the aircraft ZS-KIN to "go-around" which were blatantly ignored by the pilot of ZS-KIN.

(d) Prior to the ATC giving the "go-around" instructions, he asked the student's flight instructor who was with him in the tower at the time, if his student was capable of executing such a manoeuvre whereupon the flight instructor replied that his student was capable.

(e) The primary task of the ATC was to provide aircraft separation on the runway. An aerodrome controller is also required to provide traffic information to all potential aircraft conflicts in the circuit. Furthermore, it should be noted that it remains the responsibility of the pilot to "look out" for other aircraft in their vicinity using the information passed by the ATC as stipulated in the Civil Aviation Regulations:

Operation on and in the vicinity of aerodromes

Part 91.06.12

(1) The pilot-in-command of an aircraft operating on or in the vicinity of an aerodrome shall be responsible for compliance with the following rules:

(a) Observe other aerodrome traffic for the purpose of avoiding collision;

(2) If an aerodrome control tower is in operation, the pilot-in-command shall also, whilst the aircraft is in the aerodrome traffic zone –

(a) Maintain a continuous radio watch on the frequency of the aerodrome control tower responsible for the providing aerodrome control service at the aerodrome, establish two way communication as necessary for aerodrome control purposes and obtain such clearances for his or her

movements as may be necessary for the protection of aerodrome traffic;

1.18.15 Air Traffic and Navigation Services preliminary investigation report findings

The following findings were made during the Air Traffic and Navigation Services preliminary investigation:

(a) The controller provided the required traffic information to the pilot flying the aircraft ZS-KIN.

(b) The controller confirmed that the pilot of the aircraft ZS-KIN had the preceding aircraft, ZU-BXA in sight.

(c) The controller was aware of the fact that one aircraft had student pilots on board and the other one by a private pilot under training, and as a result allowed lenience in requiring read backs from the crew. According to this report it is standard practice that solo students are treated at a different level by ATC in an attempt not to panic the student(s).

(d) The controller attempted to obtain the required read backs from both crews on numerous occasions however this was done on a priority basis where the controller would issue priority instructions to aircraft before returning and re-issuing the instructions to the crew who failed to read back correctly.

(e) After the aircraft ZS-KIN was observed to have stopped “zig-zagging” on final approach and stabilised on the approach, the controller was able to assess the spacing on final approach and realised that there was insufficient spacing between the aircraft ZU-BXA and ZS-KIN.

(f) The controller issued the missed approach instruction (after consultation with the student pilot of ZS-KIN flight instructor) with sufficient time when the controller became aware that there was inadequate spacing between the two aircraft.

(g) The controller re-issued the missed-approach instruction when it was observed that the student pilot in ZS-KIN was not responding to the initial go-around instruction.

1.18.16 General overview of circuit traffic

(a) The aircraft ZS-KIN was conducting circuits and landings while the aircraft ZU-BXA joined the circuit on a long final approach from Kitty Hawk aerodrome, situated southeast of FAWB with the intention to perform a touch-and-go at FAWB. The intention thereafter was to fly to the general flying area, located to the north-east of the aerodrome.

(b) At the time of the accident the following aircraft were in the circuit:

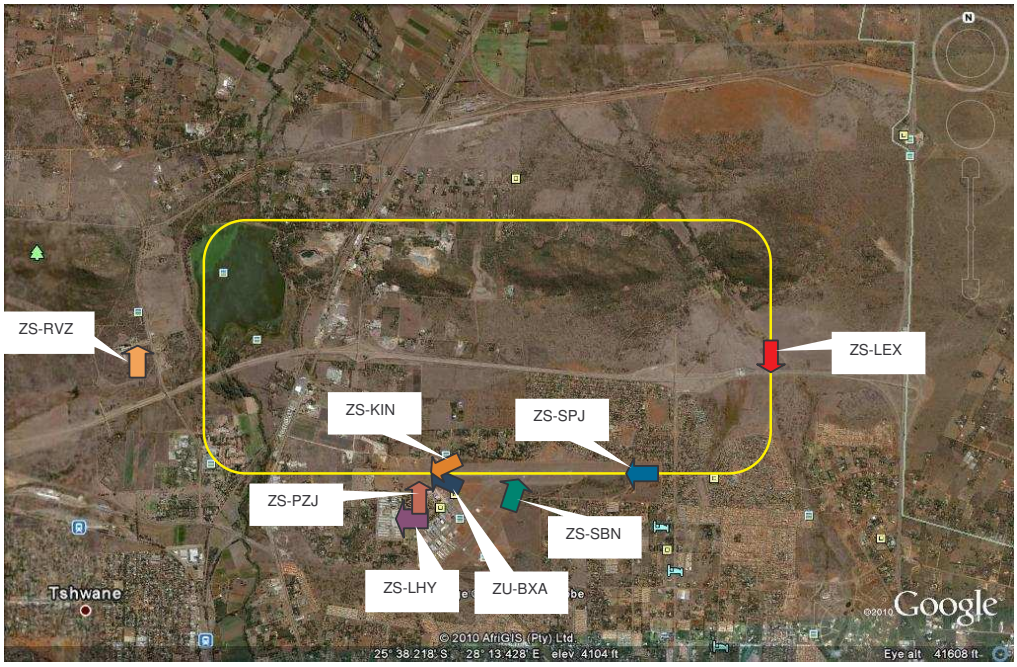

Figure 19. Graphic representation of circuit traffic leading up to the accident.

Reference to the Graphic representation of circuit traffic leading up to the accident

- ZS-RVZ crossing the extended centreline of RWY 29 for Rooiwal Power Station.
- ZS-LHY called but was told to stand by.
- ZS-PZJ requested a helicopter circuit but was instructed to report before crossing RWY 29.
- ZU-BXA involved in the mid-air collision.
- ZS-KIN involved in the mid-air collision.
- ZS-SBN was holding at the holding point RWY 29.
- ZS-SPJ was on final approach RWY 29.
- ZS-LEX was on base leg RWY 29.

1.18.12Position of the sun

The position of the sun at the time of the accident was established via the website www.sunearttools.com as:

- Elevation + 10.74º (Elevation is the vertical angle in degrees from the horizon).
- Azimuth 261.13º (Azimuth is the clockwise horizontal angle in degrees from true north).

All aircraft approaching runway 29 at the time would have been flying into the setting sun.

1.18.13 Eye-witness statements:

Witness 1

This statement was obtained from a micro-light pilot that was standing next to the aerodrome perimeter fence at the time of the accident.

According to the witness, who was listening to his aviation hand held radio, he saw two aircraft approaching runway 29. He could hear ATC communicating with both aircraft. The aircraft in front (ZU-BXA), made several positioning reports to ATC. According to the witness the pilot did not sound if he was very certain of his position.

The witness could hear ATC giving clearance to the aircraft ZU-BXA for a touch-and-go landing, number one, and then asked the second aircraft on final approach, being ZS-KIN, if he had the aircraft ahead of him in sight.

The witness stated, at this stage, the two aircraft were close to each other. When the aircraft ZU-BXA had landed, the witness could hear on the radio that the Cherokee (ZS-KIN) was instructed by ATC not to land but to immediately commence a turn to the right. He stated this instruction was given to the pilot of the Cherokee several times but he did not acknowledge the instruction. According to the witness the pilot of the Cherokee then made a slight turn to the right but immediately turn left again to position himself slightly right and above the aircraft ZU-BXA, who was at this stage on the runway.

The Jabiru (ZU-BXA) then took off from Runway 29. The Cherokee then caught up with the Jabiru and the two aircraft collided above the runway. After the collision both aircraft tumbled towards the ground. Once on the ground, the witness could see a person getting out of the Jabiru and walked towards the Cherokee but before he could reach the Cherokee, he stopped and sat down on the ground between the two aircraft.

Witness 2

This statement was obtained from a flight instructor who was seated in an aircraft positioned at the holding point of Runway 29, preparing for take-off with a student.

The witness stated while at the threshold of Runway 29, he saw a Jabiru (ZU-BXA) aircraft that was on short final approach for Runway 29. Approximately 200-300 meters behind the Jabiru was a Cherokee (ZS-KIN). It was noticeable to the witness that the Cherokee was catching up with the Jabiru.

Shortly thereafter he saw the spacing between the two aircraft was not sufficient, the control tower called the Cherokee. There was no reply from the pilot flying the Cherokee and only after the second call from the control tower did the pilot in the Cherokee reply. The witness stated the tower advised the pilot of the Cherokee to commence with the go-around as follow: “Kilo India November go around, I say go around”. The pilot flying the Cherokee only replies with the word “OK”.
The witness stated the Jabiru was cleared for a touch-and-go landing. He noticed the Cherokee was in an unstable flight attitude and was flying slow for the approach to land. It seems to the witness the pilot flying the Cherokee was unsure of the go-around instruction that was given to him. It was evident that the pilot flying the Cherokee did not apply full power immediately nor did he turn to fly to the right of the runway to maintain visual contact with the Jabiru. He was then again advised the early right hand turnout was approved.

According to the witness, the ATC again advised the Cherokee that the Jabiru was commencing a touch-and-go landing without receiving acknowledgement from the Cherokee. The Jabiru then completed the touch-and-go landing not realizing the Cherokee was slightly behind and above him. At this stage the Cherokee was maintaining its course and altitude.

The Jabiru got airborne from Runway 29 and it seemed if the pilot flying the Cherokee lost visual contact of the Jabiru. The pilot of the Cherokee only realized he was going to collide with the Jabiru once the Jabiru was airborn and approximately 8 meters above the ground. The Cherokee then banked to the right but collided with the Jabiru.

The Jabiru then dived straight into the ground while the Cherokee did a spiral to the left before impacting the runway.

When asked what he meant by unstable flight, the witness stated the aircraft had a higher than normal nose attitude and was flying slowly at the time.

1.18.14 Situational awareness

In simple terms, situational awareness can be described as knowing what is going on around you. More formally, situational awareness has been defined as:

The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future.

Maintaining a high level of situational awareness is essential to flight safety. In practice, that means that a pilot must continuously monitor his or her environment, and be alert for any significant changes and the possible effect they might have on flight safety.

Developing and maintaining situational awareness involved three aspects:

- Perception – gathering relevant information.
- Integration – interpreting the information
- Projection – anticipating future states.

For example, a pilot may receive information from an instrument scan, from looking out of for conflicting traffic, from radio communications, and from other sources. He/she must then process that information to make sense of it, and then plan and prioritise their subsequent actions in order to maintain situational awareness.

Factors that can influence situational awareness

Situational awareness is very context specific, relating to a particular task and operating environment. The maintenance of situational awareness is dependent on a pilot's attention and working memory. Therefore, factors such as workload, fatigue, stress, and distraction can have a detrimental effect on situational awareness. Good task management is essential to minimise the effect of workload or distraction, and fitness for duty is essential to minimise the possible effects of

fatigue or stress on pilot performance.

A pilot's level of experience can also affect their ability to maintain situational awareness. More experienced pilots are better able to recognise what information it is important to seek or to attend to; to integrate various pieces of information to understand the 'big picture'; and to anticipate likely outcomes and hence stay conscious effort to the primary flight tasks, freeing up mental resources that can be used to maintain situational awareness.

See-and-avoid

To see and then avoid another aircraft requires a pilot to perform a number of tasks. The 'see' component involves the following steps:

- **Search:** The pilot looks outside the aircraft, and searches the available visual field. That search may or may not be in response to traffic information, or can be based on previous information about another aircraft's position.

- **Detection:** The pilot may detect possible conflicting aircraft or objects of interest.

- **Identification:** If an object is then detected, it is then examined to determine if it is an aircraft or other potential collision threat.

The 'avoid' component involves the following steps:

- **Threat assessment:** If an object is identified as an aircraft, its altitude, heading and speed must be assessed to determine whether or not it is a collision threat.

- **Development of an avoidance plan:** If the aircraft is assessed as a collision threat, a decision must be made as to what type of response is appropriate.

- **Avoidance response:** The pilot must initiate the necessary control movements to take evasive action. There will also be a time period required for the aircraft to respond to the pilot's input and move away from a collision path.

For each of these six steps, there are many factors that can limit the timeless and effectiveness of pilot performance. In some instances at may take up to 12.5 seconds to complete all of the steps. Detailed information on these limitations is provided in a number of sources, including the ATSB 2004 research report *Limitations of the See-and-Avoid Principle.*

The factors that can affect the likelihood of a pilot seeing another conflicting aircraft in sufficient time to make the necessary control movements and allow the aircraft to respond and avoid the aircraft include:

- A prior knowledge of the existence and relative location of the other aircraft (alerted see-and-avoid)

- The size, conspicuity and speed of the other aircraft

- The different types and operational characteristics of aircraft operating within a defined airspace, and the number of aircraft in that airspace

- Cockpit visibility, blind spots and background contrast
- Fatigue and stress.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1 During normal operations at the Wonderboom aerodrome, a Piper PA-28-180 aircraft, registered ZS-KIN, and a Jabiru SK aircraft, ZU-BXA collided in midair above runway 29. No technical factors were identified in either aircraft that might have contributed to the collision.

The collision occurred during daylight conditions with the sun at an elevation of approximately 10.74° above the horizon at an azimuth of 261.13°, which was approximately 30° to the left off runway heading.

All three pilots were found to have complied with license regulatory requirements and were found to be medically fit.

The investigation had found that the student pilot that was flying ZS-KIN was not fluent in the English language, nor was the private pilot flying ZU-BXA, which first language was French. This was assessed to be have had a detrimental effect during communication with the tower, as it resulted in delayed communication, which in some cases was followed by repetition or corrections, or just not responding to radio communication timeously.

2.2 The student pilot of ZS-KIN – situational awareness

The student pilot's low experience meant that the workload associated with the operation of the aircraft and skills consolidation during the flight was inherently high. In combination with the emphasis placed by the student's flying instructor on improving flying technique during the solo flight, it could be expected that just operating the aircraft would have consumed a large amount of the student's attention.

In additional to the high workload associated with solo flight, circuit operations required pilots to visually search for traffic and to monitor the transmission in order to sequence themselves properly in the circuit and to maintain situational awareness. The pilot would have heard the radio transmission between the controller and the other aircraft operating in the same circuit pattern. While the comprehension and interpretation of the content of those radio transmissions would have enhanced the pilot's situational awareness, that activity would also have increased the pilot's workload.

In that context, any action by the aerodrome controller to pass traffic on the approaching aircraft ZU-BXA could have added greatly to the student's situational awareness. In addition, a foreknowledge of the existence and relative location of another aircraft has been shown to affect the likelihood of a pilot seeing that aircraft in sufficient time to initiate avoidance action. Any action to alert the student of the

position of the aircraft ZU-BXA had the potential to assist the student to see ZU-BXA in sufficient time to make the necessary control movement to avoid a collision.

The student had difficulty maintaining situational awareness and monitoring radio transmission, it was further noted that in some instances substantial time passed before he responded to radio communication. This student workload increased markedly during the solo, his situational awareness would be adversely affected. The fact that the aerodrome controller called him three times before he *acknowledged* would suggest that was the case. That could explain the lack of any evidence to indicate that the student pilot of ZS-KIN was aware of ZU-BXA as the aircraft converged.

The lack of any direction from the student's flying school and flight instructor about actions to be taken when there is elevated circuit traffic increased the risk that the student might become overloaded and lose situational awareness.

The student pilot proficiency in the execution of a go-around could not be proved to meet the minimum standard and was considered to have had a profound effect on his ability to execute the go-around manoeuvre as instructed by ATC in order to have avoided this midair collision.

2.3 Factors affecting visual acquisition

The display of additional lighting by the aircraft ZU-BXA would probably not have made a significant change in aircraft visibility because of the likely overwhelming brightness of the ambient conditions, which might have been aggravated by the position of the sun at the time. Similarly, the lack of significant colour, background contrast or relative movement of the aircraft increased the risk that the student pilot would have detected it while on short final approach.

2.4 Air traffic controller workload

The fact that both surface movement control and the elevated traffic was being dealt with on the same frequency by one aerodrome controller increased the controller's workload, which could have been classified as high / heavy at the time.

The controller was found to be well rested. He reported for duty at 1040Z, controlled for a period of one-hour, followed by a two-hour break. He resumed duty at approximately 1400Z, and by the time the accident occurred he was controlling for approximately 1½ hours again.

He had both aircraft in sight from the time ZU-BXA reported 1 nm east of the N1 high-way. He was able to assess the spacing on final approach but noted that the aircraft ZS-KIN was gaining distance on the aircraft ZU-BXA ahead of him. He then issued the go-around instruction to the pilot of ZS-KIN, who failed to react (ignored) such an instruction. This was followed by a second instruction to the student pilot of ZS-KIN to perform a go-around, which again ignored the instruction. Shortly after the second instruction was issued the two aircraft collided above the runway.

It should be noted that the controller had no alternative assistance (i.e., in the form of radar) whereby he could determine the actual separation between the two aircraft but was purely depended on line of sight, utilising binoculars.

2.5 The student pilot of ZS-KIN

The student pilot flying ZS-KIN was the holder of a student pilot license which was valid at the time of the accident. The student pilot was rated on the aircraft he was flying at the time and was in possession of a valid medical certificate.

During the final stages of flight, the student pilot most probably experienced a high level of anxiety. He was also presented with an unusually demanding and unfamiliar situation. The student was unable to recognize and deal with the various stages of the unsafe situation developing, especially at the most critical stage just before the collision.

The student had exposure to 34 flying hours but struggled to be released on solo flying. This is almost double the hours needed by most and four times as many if previous hours can be validated.

The student pilot had spend no fewer than 29 periods in the circuit, he had 34.4 hours at the time which includes two solo flights of 0.3 hours each at the time of the accident.

The student had difficulty in understanding and expressing himself to the IIC during the interview conducted.

The student did not comply with the solo conditions as stipulated by the CFI before the solo flight.

2.6 Private pilot flying ZU-BXA

The pilot under instruction flying BXA was the holder of a private pilot license which was valid at the time of the accident. The pilot was rated on the aircraft he was flying at the time and was in possession of a valid medical certificate.

Although a qualified pilot, the pilot of BXA was under instruction at the time of the accident. He was doing a revalidation flight with an instructor.

Several incorrect altitude and position reports was made by the pilot flying BXA which would indicate he did not do proper flight planning before his flight whereby he could familiarize himself with his route and applicable heights.

The pilot flying BXA was previously sited out as having a tendency of being “lazy and overconfident” which could have an effect on the lack of flight planning for this flight.

2.7 Instructor pilot in ZU-BXA

The instructor pilot flying BXA was the holder of a commercial pilot license which was valid at the time of the accident. The pilot was rated on the aircraft and was in possession of a valid medical certificate.

The instructor pilot was involved in one previous accident which was the result of fuel exhaustion

2.8 ATC

The student was allowed to taxi to the threshold without being cleared or challenged

and by allowing and condoning a touch and go without actual landing clearance on the preceding circuit. This effectively increases the pressure on the student as it had an influence on the student's behavioural style.

This overly accommodating/lenient behaviour on the part of the ATC may have been deprived the student of a yardstick to asses or measure the degree of deviance from safety margins.

The discrepancy between the position reported to ATC and the actual geographic position and in time and position may have significantly contributed to misconstrued mental picture of traffic on the part of the ATC. Position reports are invariably position estimates influenced by a myriad of factors like the aircraft moving during radio transmission, etc. This could support the notion that ATC may originally have anticipated that the Jabiru was considerably faster than in reality.

2.9 ZS-KIN

Maintenance records indicate the engine, airframe and propeller were properly maintained and that all work carried out had been properly certified. Maintenance documentation indicates that the last MPI that was carried out on this aircraft was certified on 21 July 2010 at 8 327,3 airframe hours by a CAA-approved AMO, which was in possession of a valid AMO certificate at the time. The aircraft had flown a further 74,2 hours since the MPI was certified.

ZS-KIN was not reconfigured from the landing configuration to the go-around configuration. In conditions of relatively high density altitude of 6 814 feet, the lift energy would have been significantly reduced.

The pilot of ZS-KIN appeared to have attempted to avoid the collision by initially attempted to fly as slowly as possible. The slow speed of the aircraft would also add to an overall increase in induced drag[7]. The unusual high nose attitude, reported by an eye-witness (who is a pilot), would add to an increase in form drag[8] while the fully extended flaps add to profile drag[9].

ZS-KIN was a low wing aircraft, which could result in the pilot having difficulties to see other traffic especially those flying at a lower level than his own.

2.10 Aircraft ZU-BXA

Maintenance records indicate the engine, airframe and propeller were properly maintained and that all work carried out had been properly certified. Maintenance documentation indicates that the last Annual inspection carried out on this aircraft prior to the accident flight was certified on 23 August 2010 at 3 763,.0 airframe hours by a CAA approved Aircraft Maintenance Organization which was in possession of a valid AMO certificate.

2.11 Aviation Training Organization operating ZS-KIN

Go around exercises required repeated training to be conducted proficiently. The

[7] Induced drag – Drag created as a result of the wing developing lift
[8] Form drag – Arises as a result of the form of the object which causes the separation of airflow from the surface of the object.
[9] Profile drag – Drag incurred from frictional resistance.

solo student's file contains one written entry pertaining to a go-around exercise, during which a problem to retract flaps to "optimum" was encountered. No reference is made to corrective training. A multiple choice written question about the procedure was answered correctly, however this exam was written over a year prior the accident. The correct option did not cover all vital elements of the procedure. The completion of the mentioned questionnaire more than a year prior before the student was sent on his first solo flight, might raise a question as to the value of the questionnaire might have on the testing of the students flying knowledge at the time he was sent on his first solo flight.

2.12 Environment

At the time of the accident the relative position of the sun was at a position where it could make it difficult for both pilot's to see other traffic.

3. CONCLUSION

3.1 Findings

3.1.1 The student pilot flying ZS-KIN was the holder of a valid student pilot license and was certified according to current regulations to perform this flight. CFI restrictions were not complied with.

3.1.2 The flight instructor (pilot-in-command) of ZU-BXA was the holder of a commercial pilot license with an instructor rating. He was certified and qualified according to current regulations to perform this flight.

3.1.3 The pilot flying ZU-BXA was the holder of a valid private pilot license. Although under instruction, he was certified and qualified according to current regulations to perform this flight.

3.1.4 The ATC controlling at the time of the accident was certified and qualified according to current regulations to perform ATC duties.

3.1.5 The aircraft ZS-KIN had a valid Certificate of Airworthiness and was recorded as being serviceable for flight before the accident flight.

3.1.6 The aircraft ZU-BXA had a valid Authority to Fly and was recorded as being serviceable for flight before the accident flight.

3.1.7 The solo student appeared to have attempted to avoid the collision by initially flying as slow as possible. This was ineffective and trapped the student in a situation in which he was unable to either land or climb safely. He was pressurised with a unusual situation that he was unable to deal with, possibly due to inadequate training methods and procedures prevailing in the training industry and overall culture and there for on the part of the ATO, in turn, subsequent to general under-performance and possible lack of aptitude on the part of the solo student during training.

3.1.8 The student pilot in ZS-KIN appeared to have been unable to fully recognize or interpret what was required of him for a critical period before the collision. When he eventually reacted to ATC instructions he used an incorrect flying technique and procedure which appeared to have never adequately rehearsed in training.

3.1.9 The pilots of both aircraft at times revealing both positional and situational unawareness.

3.1.10 Both pilots during communication with the tower used incorrect radio-telephony procedures, which was further impaired by not being fluent in the English language.

3.1.11 The ATO some time before and in the period immediately preceding the accident revealing inadequate safety oversight to effectively deal with earlier detected shortcomings in aptitude, dedication and training deficiencies and/or to implement a training termination policy.

3.1.12 The flight instructor, overseeing the of student pilot flying ZS-KIN, in the period immediately preceding the accident revealed insufficient judgement and deviated from the restrictions imposed by the CFI.

3.1.13 The ATC on duty at the time of the accident and in the period immediately preceding the accident revealing ineffective air space management to effect an overall safe traffic separation and flow control situation.

3.2 Probable Cause/s

3.2.1 Midair collision between two aircraft overhead runway 29.

3.3 Contributing Factors

Failure by the student pilot flying ZS-KIN to execute an immediate go-around as instructed by ATC.

ATC had to call the aircraft ZS-KIN three times before the pilot acknowledge during a critical phase of the flight.

The ATC had been operating in a high workload environment in the period leading up to the midair collision (only one ATC in the tower).

The student pilot of ZS-KIN did not see ZU-BXA in time to prevent the collision (loss of situational awareness).

Neither pilot in ZU-BXA saw ZS-KIN in sufficient time to avoid the collision.

The decision by the aviation training organisation (ATO) to send the student pilot in ZS-KIN solo during a busy traffic period should be regarded as a significant contributory factor to this accident as it placed the student in a high workload environment whereby he lost situational awareness. (Disregard for standard/safe operating procedures as contained in the ATO operations manual).

The student pilot of ZS-KIN had a low level of experience on which to base operational decisions.

Low position of the sun at the time of the accident (facing approaching traffic).

The low wing of the Cherokee obscuring the view of the Jabiru.

Misconstrued mental picture of the relative positions of the accident aircraft in time and space on the part of ATC.

No remedial training from the ATO after identifying shortcomings by the student pilot.

4. SAFETY RECOMMENDATIONS

4.1 It is recommended to the Director of Civil Aviation that the Flight Operations Department (FOD) within the SACAA compile a Aeronautical Information Circular (AIC) to alert all pilots to the potential hazards of midair collisions and emphasize those basic problem areas related to the human causal factors where improvements in pilot education, operating practices, procedures and improved scanning techniques are needed to reduce midair conflicts.

4.2 It is recommended to the Director of Civil Aviation that the Testing Standards Department within the SACAA research the Restricted Radio Telephonic license and the Language Proficiency test as a prerequisite to the issuing of a Student Pilot license.

4.3 It is recommended to the Director of Civil Aviation that the Testing Standards Department within the SACAA compile a policy pertaining to the accreditation and integration of foreign students for both initial and advanced flying training in South Africa to ensure eligible candidates share our airspace.

4.4 It is recommended to the Director of Civil Aviation that that a CAA approved flight examiner will assess the aptitude and potential for progress of respectively the solo student (should he return to South Africa to continue with further flying training) and the pilot under instruction of ZU-BXA, having both showed signs of situational and positional disorientation during the accident flight.

4.5 It is recommended to the Director of Civil Aviation that the Air Safety Infrastructure Department within the SACAA investigate the leniency of the ATC towards students as a matter of urgency. It should be determined if this is in line with international best practice and what influence this leniency will have on flight safety.

4.6 It is recommended to the Director of Civil Aviation that the Flight Operations Department (Part 141) set a minimum industry standard to which ATO training files must comply. Such file(s) should as a minimum contain adequate space to address all exercises, shortcomings and remedial actions that might be required. It should be emphasized that all data should be documented comprehensively during the training period.

5. APPENDICES

5.1 Appendix A (Audio transcript of communication with the FAWB tower and aircraft)

Appendix A

Time	Source	Text of transmission
14:54:47	ZSKIN	KIN IS RIGHT HAND DOWNWIND RWY 29
14:54:51	ATC	KIN REPORT FINAL APPROACH NO.2, RWY 29, NO.1 ARROW AHEAD LEFT DOWNWIND
14:55:03	ZSKIN	REPORT FINAL APPROACH RWY 29, NO.2
14:55:08	ZSHCD	WONDERBOOM AFTERNOON, HCD
14:55:11	ATC	HCD, WONDERBOOM, GOOD DAY, GO AHEAD
14:55:14	ZSHCD	WONDERBOOM, WE ARE A R44, WE ARE IN FRONT OF WE REQUEST LIFT OFF JUST FOR A SHORT LEFT HAND CIRCUIT OR A QUICK.....FOR TAM
14:55:22	ATC	HCD YOUR CIRCUIT IS APPROVED SOUTH OF RWY 29 AT ALL TIMES, QNH 1015, SURFACE WIND 330 DEGREES 05 KTS, REPORT SAFE
14:55:31	ZSHCD	QNH 1015, COPIED WIND, REPORTING SAFE BACK AT TAM, HCD
14:55:37	ZSPMX	PMX REQUEST SIMULATED
14:55:43	ATC	PMX REPORT RECOVERED
14:55:45	ZSPMX	RECOVERED NEXT PMX
14:56:37	ZSSPL	SPL IS ON FINALS RWY 29
14:56:50	ATC	SPL RWY 29, CLEARED TOUCH AND GO, SURFACE WIND 290 DEGREES 10 KTS
14:56:55	ZSSPL	CLEAR TOUCH AND GO RWY 29, SPL
14:57:25	ZSPMX	PMX RECOEVERED, DOWNWIND NEXT
14:57:29	ATC	PMX
14:57:48	ZSKIN	KIN IS FINAL APPROACH RWY 29 FOR FULL STOP LANDING
14:57:54	ATC	KIN CONTINUE APPROACH
14:57:57	ZSKIN	CONTINUE APPROACH, KIN
14:58:01	?????	.....INAUDIBLE.....
14:58:04	ATC	PMX REPORT FINAL APPROACH, NO.2 RWY 29, PARO ON FINAL
14:58:08	ZSPMX	REPORT FINAL APPROACH, NO.2 RWY 29, PMX
14:58:33	ATC	KIN RWY29, CLEARED TO LAND, SURFACE WIND 300 DEGREES 10 KTS
14:58:38	ZSKIN	CLEARED TO LAND RWY 29, KIN
14:58:44	ZSHCD	HCD IS ON THE DOWNWIND, THANK YOU
14:58:45	ATC	HCD, CHECK
14:58:55	ZSVET	WONDERBOOM FROM, VET
14:58:58	ATC	VET GO AHEAD FROM THE NORTH
14:58:02	ZSVET	TRAFFIC VET DETAIL COMPLETE AT MAMELODI, REQUESTING ROUTING BACK VIA MAGALIES REPORT.....NEXT IS THAT OKAY?
14:59:09	ATC	VET CLIMB NOW TO 6000', ROUTE ALONG THE RIDGE, CROSSING THE N1 HIGHWAY SIR, I AM GOING TO ROUTE YOU ALL THE WAY TO ROSLYN
14:59:17	ZSVET	AH, THANK YOU SIR, WE'LL CLIMB TO 6000' AND WE'LL CALL YOU THE N1 HIGHWAY NEXT VET
14:59:22	ATC	VET MAINTAIN ALONG THE RIDGE
14:59:24	ZSVET	AND WE'LL MAINTAIN ALONG THE RIDGE, THANK YOU SIR
15:00:26	ZSPMX	PMX IS FINAL APPROACH RWY 29, SURFACE WIND PLEASE
15:00:30	ATC	PMX, RWY 29, CLEAR TOUCH AND GO,SURFACE WIND 290 DEGREES 10 KTS
15:00:34	ZSPMX	CLEAR TOUCH AND GO RWY 29, PMX
15:00:41	ZSKIN	WONDERBOOM, KIN
15:00:43	ATC	KIN, GO AHEAD
15:00:45	ZSKIN	OKAY, 1 STUDENT, 1 SOLO STUDENT ON BOARD, HE WILL CALL YOU BACK SHORTLY IF YOU CAN ACCOMODATE HIM FOR A SHORT CIRCUIT, KIN
15:00:53	ATC	KIN, NO PROBLEM

Time	Source	Text of transmission
15:00:56	ZSKIN	THANK YOU SIR, I APPRECIATE IT
15:01:30	ZSSPL	SPL IS ON RIGHT DOWNWIND FOR RWY 29
15:01:36	ATC	SPL SAY AGAIN
15:01:38	ZSSPL	ON RIGHT DOWNWIND FOR RWY 29
15:01:40	ATC	SPL REPORT FINAL APPROACH NO.1 FOR RWY 29
15:01:43	ZSSPL	FINAL APPROACH RWY 29, NO.1, SPL
15:01:46	JEN884	WONDERBOOM JEN884 AFTERNOON
15:01:48	ATC	JEN884 WONDERBOOM GOOD DAY, GO AHEAD
15:01:51	JEN884	GOOD DAY TO YOU ZSOEV, C208, 2 CREW ONLY, MAINATINAING 8000', WE'RE COMMING UP 8 MILES NORTH EAST OF THE RADAR PATH, FIELD IN SIGHT FOR THE VISUAL
15:02:01	ATC	JEN884, CLEARED INBOUND WB 8000', STAND BY FOR THE VISUAL APPROACH, QNH 1015, RWY 29 IS IN USE
15:02:10	JEN884	THANK YOU, WE'RE CLEARED INBOUND 8000, 1015 FOR WB, RWY 29, STANDING BY THE VISUAL JEN884
15:02:16	ATC	VET REPORT YOUR POSITION NOW
15:02:19	ZSVET	VET, WE'VE GOT ANOTHER M ILE TO RUN FOR THE N1 HIGHWAY
15:02:25	ATC	VET, INSIGHT, REPORT PASSING THE PORT 6000'
15:02:29	ZSVET	COPIED THAT INSIGHT, THE PORT NEXT VET
15:02:32	ATC	JEN884, CLEARED STRAIGHT IN VISUAL APPROACH RWY29, DESCEND TO 7000', REPORT SOUTH OF ROODEPLAAT DAM LONG FINAL APPROACH
15:02:39	JEN884	THANK YOU, CLEARED STRAIGHT IN VISUAL 29, DESCENDING 7000' REPORT SOUTH OF ROODEPLAAT NEXT, JEN884
15:02:45	ATC	JEN884 HOW MANY ON BOARD?
15:02:47	JEN884	IT'S 2 CREW ONLY SIR
15:02:52	ZSOBJ	OBJ SAFE DANKIE
15:02:54	ATC	OBJ ENJOY YOUR DAY, CHEERS
15:03:12	?????	*MIC IS KEYED IN A FEW TIMES*
15:04:01	ZSONA	WONDERBOOM TOWER, GOOD DAY AGAIN, ONA
15:04:03	ATC	ONA, WONDERBOOM, GOOD DAY
15:04:05	ZSONA	GOOD DAY WE'RE TO THE EAST OF MAMELODI, 6000', YOUR JOINING FOR LANDING
15:04:09	ATC	ONA, HOLD YOUR POSITION, STAND BY FOR INBOUND CLEARANCE, I'VE GOT IFR IN YOUR VICINITY, ROUTING FOR THE LONG FINL APPROACH RWY 29, QNH 1015, I'LL CALL YOU BACK
15:04:19	ZSONA	QNH 1015, HOLDING.....GARBLED.....ONA
15:04:27	JEN884	JEN884 ROODEPLAAT 7000'
15:04:33	ATC	JEN 884 DESCEND TO 5600', REPORT 2 MILES EAST OF THE N1 HIGHWAY
15:04:40	JEN884	DESCEND 5600, 2 MILES EAST OF THE N1 NEXT, JEN884
15:04:44	ATC	JEN884 TRAFFIC IS A C172, AT THE N1 CALL IT 6000', ROUTING FOR ROSLYN, I DO HAVE THEM IN SIGHT
15:04:53	JEN884	COPIED SIR, JEN884
15:04:55	ZSSPL	SPL IS ON FINAL FOR RWY 29
15:04:58	ATC	SPL RWY 29, CLEAR TOUCH AND GO, SURFACE WIND 290 DEGREES 5 KTS
15:05:02	ZSSPL	CLEAR TOUCH AND GO, SPL
15:05:06	ZSPMX	PMX IS ON RIGHT DOWNWIND 29 FOR TOUCH AND GO
15:05:09	ATC	PMX YOU HAVE THE.....REPORT FINAL APPROACH RWY29, NO.2, NO.1 PARO ON SHORT FINAL APPROACH, KEEP THE CIRCUIT A BIT TIGHT, THERE'S A SC7 ROODEPLAAT DAM, DESCENDING FOR FINAL
15:05:20	ZSPMX	I WILL KEEP THE CIRCUIT TIGHT AND UH WE'LL REPORT FINAL APPROACH 29 NO.2, PMX

Time	Source	Text of transmission
15:05:27	ZSRUP	WONDERBOOM RUP
15:05:30	ATC	RUP, WONDERBOOM, GOOD DAY MA'AM
15:05:33	ZSRUP	UH,HELICOPTER RUP UH REQUEST UHM ROODEPOORT DAM, 4 MILES EAST OF ROODEPOORT DAM FOR YOUR JOINING AND LANDING, RUP
15:05:46	ATC	RUP, CLEARED INBOUND, NOT ABOVE 5500', ROUTE ALONG THE RIDGE, REPORT N1, CALL FOR JOINING, RWY 29 IS THE ACTIVE, QNH 1015
15:05:57	ZSRUP	QNH 1015, ROUTING ALONG THE RIDGE 5500' AND BELOW, REPORT BEFORE CROSSING 06, COPIED THE ACTIVE RWY, RUP
15:06:05	ATC	JEN884 IN SIGHT, DESCEND AS REQUIRED, REPORT CROSSING THE HIGHWAY NO.2, NO.1 C172 TIGHT RIGHT BASE TURNING ONTO FINAL
15:06:13	JEN884	COPIED, REPORT THE N1 NEXT, NO.2, JEN884
15:06:18	ATC	ONA THANKS FOR YOUR PATIENCE, CLEARED INBOUND 5600', REPORT SOUTH OF ROODEPLAAT DAM, REPORT LONG FINAL APPROACH RWY 29
15:06:26	ZSONA	CLEARED INBOUND 5600', CALL YOU SOUTH OF THE ROODEPLAAT DAM, NEXT ON FINAL APPROACH RWY29, WE'VE GOT THE R44 IN SIGHT, ONA
15:06:34	ZSVET	VET REPORT ROSSLYN 6000'
15:06:37	ATC	COPIED THAT SIR, ROSSLYN NEXT, VET
15:06:44	ATC	PMX, RWY 29, CLEARED TOUCH AND GO, SURFACE WIND 290 DEGREES 5 KTS
15:06:48	ZSPMX	CLEARED TOUCH AND GO RWY 29, PMX
15:06:53	JEN884	JEN884 CROSSING THE N1
15:06:54	ATC	JEN884 CONTINUE APPROACH, NO.2, NO.1 THE 172, SHORT FINAL DOING A TOUCH AND GO
15:07:00	JEN884	COPIED, CONTINUE THE APPROACH 29, NO.2 TO LAND
15:07:05	ATC	PMX MINIMUM TIME ON THE RWY, SC7 BEHIND YOU ON FINAL
15:07:09	ZSPMX	COPIED, MINIMUM TIME ON THE RWY, PMX
15:07:14	ZSKIN	KIN IS STILL WAITING
15:07:17	ATC	KIN, 2 AIRCRAFT TO LAND, STANDBY FOR DEPARTURE
15:07:52	ZSONA	ONA SOUTH OF THE ROODEPLAAT DAM 5600'
15:07:57	ATC	ONA, DESCEND AS REQUIRED, REPORT 1 MILE EAST OF THE N1 HIGHWAY LONG FINAL RWY 29
15:08:02	ZSONA	DESCEND AS REQUIRED, CALL YOU 1 MILE EAST N1 LONG FINAL 29, ONA
15:08:07	ATC	JEN884, RWY 29 CLEARED TO LAND, SURFACE WIND 300 DEGREES 10 KTS
15:08:10	JEN884	CLEARED TO LAND 29, JEN884
15:08:30	ATC	KIN, LINE UP AND WAIT RWY 29
15:08:33	ZSKIN	LINE UP AND WAIT, RWY 29, KIN
15:09:08	ZSSPL	SPL IS ON RIGHT DOWNWIND FOR RWY 29
15:09:12	ATC	SPL REPORT BEFORE TURNING BASE
15:09:15	ZSSPL	REPORT TO YOU BEFORE, REPORT BEFORE TURNING BASE SPL
15:09:20	ATC	KIN RWY 29 CLEAR TAKE OFF, SURFACE WIND IS 290 DEGREES 05 KTS, REPORT RIGHT HAND DOWNWIND
15:09:26	ZSKIN	CLEARED FOR TAKE OFF RWY29, REPORT RIGHT HAND DOWNWIND RWY 29, KIN
15:09:34	?????	.....DOUBLE TRANSMISSION....
15:09:37	ATC	DOUBLE TRANSMISSION, STN WONDERBOOM GOOD DAY
15:09:40	ZSSTN	GOOD DAY SIR, WE ARE NOW JUST COMMING UP TO THE SOUTH OF N1 QUARRY, REQUEST YOUR JOINING AND LANDING AND REQUEST IF YOU CAN MAYBE ACCOMODATE US FOR ONE LOW LEVEL CIRCUIT

Time	Source	Text of transmission
15:09:49	ATC	STN, CLEARED INBOUND, KEEP THE SPEED UP, DESCEND NOW AS REQUIRED, JOIN LEFT BASE RWY 29, REPORT FINAL APPROACH NO.1, QNH 1015
15:09:59	ZSSTN	QNH 1015, WE'LL KEEP THE SPEED UP, RWY 29,.....STN
15:10:01	ATC	ONA REPORT DISTANCE TO THE N1
15:10:04	ZSONA	WE'RE CROSSING WB NOW, ONE AND A HALF MILES, ONA
15:10:07	ATC	ONA DO YOU HAVE THE C206 AT THE N1 QUARRY IN SIGHT?
15:10:11	ZSONA	NEGATIVE SIR BUT WE'LL BE MINIMUM SAFE, ONA
15:10:14	ATC	ONA THANKS, REPORT ONCE YOU HAVE TRAFFIC IN SIGHT AND WHAT'S YOUR ALTITUDE NOW?
15:10:19	ZSONA	WE'RE DESCENDING NOW THROUGH 5300' FOR 5100'
15:10:23	ATC	STN REPORT YOUR ALTITUDE PASSING NOW
15:10:26	ZSSTN	5400 DESCENDING FOR 5100, COMMING UP THE RIDGE
15:10:32	ZSONA	ONA, WE'VE GOT THE 206 IN SIGHT, WE'LL MAINTAIN BEHIND
15:10:36	ATC	ONA, THANK YOU SIR, CONTINUE APPROACH, NO.2, RWY29
15:10:41	ZSONA	WE'LL CONTINUE FOR FINAL APPROACH 29, NO.2, ONA
15:10:44	ATC	PMX FOLLOW THE CHEROKEE 180 AT YOUR 11 O' CLOCK POSITION LATE DOWNWIND RWY 29, REPORT FINAL NO.4 BEHIND
15:10:51	ZSPMX	FOLLOW THE TRAFFIC REPORT FINAL, NO.4 BEHIND, PMX
15:10:54	ATC	SPL REPORT PIPER ARCHER, 1 MILE EAST OF THE N1, INSIDE LONG FINAL RWY 29
15:11:02	ZSSPL	UH WE'LL CALL YOU ARCHER IN SIGHT NEXT SPL
15:11:07	ZSLET	AND WONDERBOOM, LET WE'RE ON THE RIDGE 6000' CONTINUING 125 8, CHEERS
15:11:13	ZSRUP	RUP AT YOUR UH, AT THE N1 QUARRY
15:11:35	ZSSTN	STN IS NOW ON LEFT BASE, FINAL TOUCH FOR RWY 29
15:11:40	ATC	STN, CLEARED TOUCH AND GO RWY 29, SURFACE WIND IS 290 DEGREES 5 KTS, REPORT RIGHT DOWNWIND
15:11:46	ZSSTN	REPORT AT RIGHT HAND DOWNWIND STN
15:11:48	ATC	RUP CLEARED INBOUND LOW LEVEL, CROSS RWY 06, REPORT SAFE SOUTH OF 29, SURFACE WIND 290 DEGREES 5 KTS
15:11:56	ZSRUP	CLEARED TO CROSS 06, REPORT SAFE NEXT, RUP
15:12:12	ATC	SPL DO YOU HAVE THE TRAFFIC IN SIGHT YET?
15:12:20	ZSSPL	UH, NEGATIVE SIR, WE ARE NOW ABOUT 1 AND A HALF MILES EAST OF THE N1
15:12:25	ATC	SPL AFFIRM, TURN THE BASE, REPORT TURNING ONTO FINAL
15:12:29	ZSSPL	CALL YOU TURNING ONTO FINALS NEXT SPL
15:12:33	ATC	ONA, TRAFFIC IS DOING A TOUCH AND GO, CONFIRM YOU'LL ACCEPT A LATE CLEARANCE
15:12:37	ZSONA	AFFIRM SIBO,WE'LL CONTINUE BEHIND THE LANDING AND ACCEPT A LATE CLEARANCE ONA
15:12:43	ZSKIN	KIN IS RIGHT HAND DOWNWIND RWY 29 FOR A TOUCH AND GO
15:12:48	ATC	KIN REPORT BEFORE TURNING BASE
15:12:51	ZSKIN	REPORT BEFORE TURNING BASE KIN
15:12:54	ATC	PMX YOU ARE NOW NO.3 BEHIND THE PARO ON LATE BASE
15:12:58	ZSPMX	GOT THEM VISUAL, NO.3 PMX
15:13:03	ZSSPL	AND SPL TURNING FINAL, 1 MILE EAST OF N1
15:13:08	ATC	SPL CONTINUE APPROACH
15:13:10	ZSSPL	TO CONTINUE SPL AND THIS ONE WILL BE FOR A FULL STOP
15:13:14	?????	*MIC IS KEYED IN TWICE*
15:13:17	ATC	PMX TRAFFIC AHEAD WILL BE DOING A FULL STOP

Time	Source	Text of transmission
15:13:21	ZSPMX	COPIED PMX
15:13:23	ATC	ST...CORRECTION ONA, RWY29, CLEARED TO LAND SURFACE WIND 300 DEGREES 5 KTS
15:13:28	ZSONA	CLEARED TO LAND RWY 29, ONA
15:13:34	ZSLEX	WONDERBOOM TOWER, GOOD AFTERNOON AGAIN LEX
15:13:37	ATC	LEX WONDERBOOM, GOOD DAY MA'AM
15:13:40	ZSLEX	LEX, C172, 2 ON BOARD, REQUESTING UH YOUR...YOUR JOINING INSTRUCTIONS FOR 3 CIRCUITS IF YOU CAN....3 MILES, 3 MILES NORTH OF THE POWER STATION AND REQUESTING YOUR INSTRUCTIONS FOR JOINING FOR 3 CIRCUITS IF YOU CAN ACCOMODATE US 5600'
15:13:57	ATC	LEX, I'LL KEEP YOU ADVISED ON THE CIRCUITS, I'VE GOT A BIT OF CONGESTION RIGHT NOW, CLEARED INBOUND 5600', JOIN AND REPORT RIGHT DOWNWIND RWY 29, QNH 1015
15:14:10	?????	.....DOUBLE TRANSMISSION.....
15:14:15	ZSLEX	TRAFFIC TO AFFECT LEX
15:14:18	ATC	DOUBLE TRANSMISSION, LEX JUST TO SAY AGAIN MA'AM, THE READBACK
15:14:24	ZSLEX	QNH 1015, REPORT RIGHT DOWNWIND RWY29, 5600', LEX
15:14:32	ATC	SPL RWY 29, CLEAR TO LAND, SURFACE WIND 300 DEGREES 5 KTS
15:14:37	ZSSPL	CLEAR TO LAND RWY 29, SPL
15:14:39	ATC	PMX HAVE YOU CROSSED N1 ON FINAL?
15:14:41	ZSPMX	AFFIRM SIR, WE ARE ON FINAL APPROACH NOW FOR A FULL STOP
15:14:44	ATC	KIN, REPORT FINAL APPROACH RWY 29, NO.3, NO.1 AND 2 ARE ON FINAL APPROACH
15:14:51	ZSKIN	REPORT FINAL 29, NO.3, KIN
15:14:57	ZUBXA	WONDERBOOM GOOD DAY FROM BXA
15:15:00	ATC	BXA STANDBY, I'LL CALL YOU BACK SHORTLY, BREAK BREAK, KIN CONFIRM ARE YOU EAST OF THE N1 NOW?
15:15:07	ZSKIN	YES, I'M EAST OF THE N1, KIN
15:15:12	ATC	KIN NO PROBLEM, REPORT CROSSING THE N1 ON FINAL APPROACH
15:15:16	ZSKIN	OH, OKAY, REPORT CROSSING THE N1 ON FINAL APPROACH 29, KIN
15:15:24	ATC	BXA, WONDERBOOM GOOD DAY
15:15:30	ZSLLA	WONDERBOOM GOOD AFTERNOON FROM LLA
15:15:32	ATC	LLA, WONDERBOOM, GOOD DAY, GO AHEAD SIR
15:15:34	ZSLLA	YES SIR I'M AT THE QUARRY, YOUR JOINING AND LANDING PLEASE
15:15:37	ATC	LLA, QNH 1015 SIR, PLEASE MAKE 1 ORBIT AT THE N1 QUARY, DESCEND TO 5100', I'LL CALL YOU ON COMPLETION OF THE ORBIT FOR JOINING THE LEFT BASE RWY 29, I'VE GOT 2 ON FINAL AND 1 ON THE RIGHT BASE
15:15:51	ZSLLA	1 ORBIT AT THE QUARY, 1015, LLA
15:15:55	ATC	LLA DESCEND TO 5100'
15:15:58	ZSLLA	5100 LLA
15:16:01	ATC	BXA WONDERBOOM GO AHEAD
15:16:04	ZUBXA	C160 FROM SIVEN FLIGHT TRAINING AT 7500' EAST OF WONDERBOOM, REQUESTING YOUR JOINING AND LANDING INSTRUCTION FOR A TOUCH AND GO
15:16:13	ATC	BXA WHAT IS YOUR POINT OF DEPARTURE AND NO. ON BOARD
15:16:17	ZUBXA	WE'RE 2 ON BOARD BXA
15:16:19	ATC	BXA, CLEARED INBOUND 5600', REPORT SOUTH OF ROODEPLAAT DAM, LONG FINAL APPROACH RWY29, QNH 1015 AND WHAT IS YOUR POINT OF DEPARTURE
15:16:29	ZUBXA	KITTY HAWK

Time	Source	Text of transmission
15:16:30	ATC	KITTY HAWK
15:16:34	ZSSTN	STN IS 2 MILES RWY 29 FULL STOP
15:16:37	ATC	STN REPORT BEFORE TURNING BASE
15:16:39	ZSSTN	REPORT BEFORE TURNING BASE STN
15:16:43	ATC	KIN HAVE YOU CROSSED THE N1?
15:16:46	ZSKIN	NEGATIVE.....THE N1, KIN
15:16:53	ZSPMX	PMX, RWY29, CLEARED TO LAND, SURFACE WIND 300 DEGREES 5 KTS
15:16:57	ATC	CLEARED TO LAND 29 PMX
15:16:59	ATC	LLA REPORT FINAL APPROACH RWY 29, NO.2, NO.1 PA28, ½ A MILE EAST OF THE N1 ON FINAL
15:17:04	ZSLLA	COPIED WE'RE NO.2 LLA, I'LL KEEP A LOOKOUT FOR THE TRAFFIC
15:17:08	ATC	AND LLA, TO CHOOSE MINIMUM SAFE, IT'S A PIPER ARROW WITH A SOLO STUDENT
15:17:13	ZSLLA	COPIED SIR, REDUCE SPEED, LLA
15:17:15	ATC	STN, REPORT BEFORE TURNING THE BASE, I'VE GOT A JABARU JOINING ON THE NON-STANDARD LEFT BASE
15:17:20	ZSSTN	REPORT BEFORE TURNING THE BASE, WE ARE COMMING UP THE N1 HIGHWAY, WE ARE ACTUALLY READY FOR THE BASE, WE'VE GOT THE TRAFFIC ON FINAL IN SIGHT
15:17:26	ATC	STN COPIED THAT, MAKE ONE TURN ONLY TO THE REPORT, REPORT RE-ESTABLISHED LATE DOWNWIND
15:17:32	ZSSTN	1 TIGHT ORBIT TO THE LEFT, STN
15:17:34	ATC	BXA, REPORT SOUTH OF ROODEPLAAT DAM, LONG FINAL AT 5600'
15:17:43	ZSKIN	KIN IS FINAL APPROACH RWY29
15:17:48	ATC	KIN CONTINUE APPROACH
15:17:52	ZSKIN	CONTINUE APPROACH, KIN
15:18:03	ZSRUP	RUP SAFE
15:18:06	ATC	RUP CHEERS ENJOY
15:18:09	?????	*MIC IS KEYED IN TWICE*
15:18:13	ZSSTN	STN, RIGHT DOWNWIND RWY 29, 5600'
15:18:19	ATC	STN REPORT FINAL APPROACH RWY 29 NO.3, NO.1 CHEROKEE 180 ON SHORT FINAL AND NO.2 IS THE MALIBU OVERHEAD THE N1
15:18:32	ZSSTN	STN WE'VE GOT THE MALIBU IN SIGHT, REPORT FINAL APPROACH, NO.2 STN
15:18:41	ATC	LEX DESCEND TO CIRCUIT ALTITUDE, REPORT UH CORRECTION FOLLOW THE C206 CROSSING THE N1 ON DOWNWIND, REPORT FINAL, NO.4
15:18:49	ZSLEX	CALL YOU FINAL APPROACH NEXT, NO.4 AND CONFIRM OUR TRAFFIC IS TURNING THE BASE NOW OVER THE HIGHWAY? LEX
15:18:55	ATC	LEX AFFIRM SIR, YOU CAN CONTINUE TO FINALS FOR THE TOUCH AND GO
15:19:00	ZSLEX	THANK YOU, CONTINUE TO FINALS FOR THE TOUCH AND GO, TRAFFIC IN SIGHT, FINALS, NO.4 NEXT, LEX
15:19:05	ATC	LLA THANKS FOR YOUR HELP, EXPECT A LATE CLEARANCE
15:19:08	ZSLLA	THANK YOU SIR, WE'LL GIVE YOU A SHOUT AT FINAL APPROACH LLA
15:19:12	ZSMUN	WONDERBOOM GOOD DAY MUN
15:19:14	ATC	MUN, WONDERBOOM GOOD DAY
15:19:17	ZSMUN	GOOD DAY SIR, MUN A PASE, WERE COMMING UP ROSSLYN NOW 7000', I'D LIKE TO REQUEST ROUTING VIA YOUR AIRSPACE FOR THE PREFFERED ROUTING WATERKLOOF TO GRAND CENTRAL PLEASE, MUN
15:19:29	ATC	MUN WHAT IS YOUR POINT OF DEPARTURE SIR?

Time	Source	Text of transmission
15:19:32	ZSMUN	AIRBORNE GRAND CENTRAL AND WE'D LIKE TO ROUTE BACK TO GRAND CENTRAL, 2 CREW AND 2 HOURS ENDURANCE, MUN
15:19:38	ATC	MUN, CLEARED INBOUND 7000', REPORT POORT QNH 1015
15:19:42	ZSMUN	QNH 1015, WITH 7000' THAT'LL BE POORT NEXT MUN THANKS
15:19:46	ATC	LLA RWY 29 CLEARED TO LAND, SURFACE WIND IS 270 DEGREES 10 KTS
15:19:51	ZSLLA	THANK YOU SIR, CLEARED TO LAND 29, LLA
15:19:54	ATC	STN, CONTINUE APPROACH, NO.2, CONFIRM FOR ANOTHER TOUCH AND GO?
15:19:58	ZSSTN	CONTINUE APPROACH, NEGATIVE SIR, FULL STOP
15:20:02	ATC	LEX, C206 ON FINALS IS DOING A FULL STOP
15:20:06	ZSLEX	GOT THE TRAFFIC IN SIGHT, COPIED, LEX
15:20:09	ATC	BXA, CONFIRM AFTER THE TOUCH AND GO ROUTING BACK TO KITTY HAWK?
15:20:14	ZUBXA	CORRECTION ROUTING FOR THE.....GARBLED.....BXA
15:20:21	ATC	BXA
15:20:25	ZSSPJ	WONDERBOOM, SPJ, GOOD DAY AGAIN
15:20:29	ATC	SPJ WONDERBOOM GOOD DAY GO AHEAD
15:20:35	ZSSPJ	....SPJ 2 MILES NORTH OF THE POWER STATION, UH HEIGHT IS 6900', REQUEST JOINING FOR LANDING
15:20:42	ATC	SPJ CLEARED INBOUND, DESCEND TO 5600', REPORT RIGHT HAND DOWNWIND RWY 29, QNH 1015
15:20:51	ZSSPJ	CLEARED INBOUND NOW, DOWN TO 5600', QNH 1015, WE'LL CALL YOU RIGHT HAND DOWNWIND, RWY 29, SPJ
15:20:59	ATC	STN RWY 29, CLEARED TO LAND, SURFACE WIND 270 DEGRESS 5 KTS
15:21:03	ZSSTN	CLEARED TO LAND 29, STN
15:21:06	ZSSBN	WONDERBOOM TOWER GOOD AFTERNOON FROM SBN
15:21:09	ATC	SBN WONDERBOOM GOOD DAY GO AHEAD
15:21:12	ZSSBN	SBN, C172, 2 CREW ON BOARD, REQUESTING YOUR FLIGHT FOR TAXI CLEARANCE FOR CIRCUITS AND LANDINGS, ELAPSE TIME 1 HOUR, ENDURANCE 3 HOURS
15:21:21	ATC	SBN DO YOU HAVE A SECOND SLOT
15:21:23	ZSSBN	NEGATIVE SIR, SBN, ONLY IF YOU CAN ACCOMODATE
15:21:26	ATC	SBN TAXI TO THE HOLDING POINT RWY 29, CROSS RWY 24, QNH 1015
15:21:33	ZSSBN	QNH 1015, CLEAR TO CROSS 24, HOLDING POINT 29, SBN
15:21:59	ZUBXA	WONDERBOOM TOWER.....BXA.....INAUDIBLE.....
15:27:04	ATC	BXA MAINTAIN 5600', TO REPORT 1 MILE EAST OF THE N1 HIGHWAY
15:22:09	ZUBXA	MAINTAIN 5600', NEXT TO REPORT 1 MILE EAST OF THE N1 HIGHWAY BXA
15:22:14	ZSKIN	KIN, RIGHT HAND DOWNWIND RWY 29
15:22:18	ATC	KIN REPORT BEFORE TURNING THE RIGHT BASE RWY 29
15:22:22	ZSKIN	REPORT BEFORE TURNING RIGHT BASE 29, KIN
15:22:28	ATC	LEX RWY29, CLEAR TOUCH AND GO, SURFACE WIND 270 DEGREES 5 KTS
15:22:34	ZSLEX	CLEAR TOUCH AND GO LEX
15:22:36	ZSMUN	MUN DIE POORT NOW, 7000'
15:22:39	ATC	MUN BROADCAST ON FREQUENCY 124,1.....INAUDIBLE.....ENJOY
15:22:46	ZSMUN	BROADCAST 124 1, CHEERS GOOD DAY, MUN
15:23:16	ATC	BXA REPORT YOUR DISTANCE TO THE N1 HIGHWAY
15:23:21	ZUBXA	.....OVERHEAD THE N1 HIGHWAY

Time	Source	Text of transmission
15:23:26	ATC	BXA CONFIRM YOU ARE NOW CROSSING THE N1 HIGHWAY ON FINAL
15:23:31	ZUBXA	.....BXA
15:23:34	ATC	BXA WHAT IS YOUR DISTANCE TO THE N1 HIGHWAY?
15:23:42	ZUBXA	WE ARE PRESENTLY 2 MILES SOUTH OF THE N1 HIGHWAY
15:23:50	ATC	BXA DESCEND AS REQUIRED, REPORT CROSSING THE HIGHWAY
15:23:56	ZUBXA	.....INAUDIBLE.....
15:23:59	ATC	KIN DO YOU HAVE THE JABIRU THAT IS 1 MILE EAST OF THE N1 HIGHWAY IN SIGHT ON THE LONG FINAL?
15:24:10	ZSKIN	NEGATIVE
15:24:12	ATC	KIN, STANDBY FOR THE BASE, I WILL CALL YOU, CONTINUE ON DOWNWIND
15:24:16	ZSKIN	CONTINUE ON DOWNWIND, KIN
15:24:19	ATC	BXA DESCEND AS REQUIRED, REPORT CROSSING THE HIGHWAY
15:24:24	ZUBXA	DESCEND AS REQUIRED, REPORT CROSSING THE HIGHWAY, BXA
15:24:28	ATC	KIN, THE TRAFFIC SHOULD BE AT YOUR 2 O' CLOCK POSITION, IT'S A JABIRU
15:24:51	ATC	BXA WHAT IS YOUR DISTANCE NOW TO THE N1 HIGHWAY?
15:24:56	ZUBXA	WE ARE PRESENTLY 1 MILE EAST FROM THE RWY, UH...CORRECTION THE HIGHWAY, BXA
15:25:03	ATC	KIN, TURN BASE NOW, REPORT ESTABLISHED ON LONG FINAL
15:25:08	ZSKIN	TURN BASE, REPORT ESTABLISHED ON FINAL RWY 29, KIN
15:25:13	ZSSPJ	SPJ COMMING UP THE CROSS DOWNWIND 29
15:25:17	ATC	SPJ DESCEND TO CIRCUIT ALTITUDE, REPORT BEFORE TURNING BASE
15:25:20	ZSSPJ	5100' CALL YOU BEFORE BASE, SPJ
15:25:24	ZSRVZ	WONDERBOOM GOOD AFTERNOON, HELICOPTER RVZ
15:25:28	ATC	RVZ, WONDERBOOM, GOOD DAY GO AHEAD
15:25:30	ZSRVZ	RVZ IS 1 MILE SOUTH OF DIE POORT 4600, REQUEST YOUR ROUTING TO THE ROOIVAL POWER STATION, RVZ
15:25:40	ATC	RVZ, REPORT HELICOPTER TYPE, NUMBER ON BOARD, POINT OF DEPARTURE AND DESTINATION PLEASE
15:25:45	ZSRVZ	UH DESTINATION AND DEPARTURE POINT GRAND CENTRAL, 2 ON BOARD, R44, RVZ
15:25:51	ATC	RVZ, CLEARED INBOUND 4600' AND BELOW, QNH 1015, REPORT BEFORE CROSSING EXTENDED CENTRE LINE RWY29 TO THE WEST
15:26:02	ZSRVZ	1015 AND CROSSING THE EXTENDED CENTRELINE NEXT RVZ
15:26:11	ATC	BXA HAVE YOU CROSSED THE N1 HIGHWAY?
15:26:15	ZUBXA	AFFIRM BXA
15:26:17	ATC	KIN, DO YOU HAVE THE JABIRU AT YOUR 2 O'CLOCK POSITION ON FINAL IN SIGHT?
15:26:23	ZSKIN	YES
15:26:25	ATC	KIN, FOLLOW THE TRAFFIC, CONTINUE APPROACH, NO.2 RWY 29
15:26:29	ZSKIN	CONTINUE APPROACH RWY 29, NO.2, KIN
15:26:36	ZSSPJ	SPJ TURNING BASE
15:26:38	ATC	SPJ REPORT FINAL APPROACH RWY29, NO.3, NO.2 IS THE CHEROKEE 180 ½ MILE EAST OF THE N1
15:26:45	ZSSPJ	REPORT FINAL APPROACH, NO.2, SPJ
15:26:47	ATC	RVZ KEEP THE SPEED UP NOW 4600' AND BELOW, CROSS RWY 29, REPORT ROOIVAAL POWER STATION
15:26:54	ZSRVZ	ROOIVAAL POWER STATION NEXT 4600' AND BELOW, KEEPING UP THE SPEED, RVZ

Time	Source	Text of transmission
15:27:00	ATC	BXA CONTINUE APPROACH, I'VE GOT A HELICOPTER CROSSING LEFT TO RIGHT ON THE UPWIND, I'LL CLEAR YOU SHORTLY
15:27:06	ZUBXA	WE'LL CONTINUE APPROACH BXA
15:27:15	ATC	LAST CALL CARRIER WAVE ONLY
15:27:27	ATC	BXA RWY29, CLEAR TOUCH AND GO, SURFACE WIND 270 DEGREES 5 KTS, AFTER DEPARTURE CLIMB RIGHT TO 5000' REPORT TOP OF .....FOR FURTHER ROUTING
15:26:37	ZUBXA	CLEAR 29, AFTER DEPARTURE CLIMB.....REPORT NEXT BXA
15:27:48	ATC	BXA REPORT PETRO PORT NEXT AND YOU ARE CLEAR TOUCH AND GO RWY 29
15:27:54	ZUBXA	REPORT POTCHEFSTRROM....(INSTRUCTOR – PETRO PORT) NEXT, BXA
15:28:00	ZSLEX	LEX RIGHT DOWNWIND RWY 29, FULL STOP
15:28:04	ATC	LEX REPORT FINAL APPROACH RWY 29 AND NO.4, NO.3 C172, EARLY RIGHT HAND BASE ½ A MILE EAST OF THE N1
15:28:12	ZSLEX	COPIED TRAFFIC IN SIGHT, NO.4 REPORT FINAL APPROACH, LEX
15:28:20	ZSPZJ	WONDERBOOM UH, PZJ
15:28:24	ATC	PZJ STANDBY, I'LL CALL YOU BACK SHORTLY
15:28:31	ATC	KIN CONFIRM YOU ARE STILL MAINTAINING BEHIND THE JABIRU
15:28:35	ZSKIN	UH KIN IS FINAL APPROACH RWY 29
15:28:46	ZSLHY	WONDERBOOM LHY AFTERNOON
15:28:48	ATC	LXY CORRECTION LHY NO.2, BREAK BREAK PZJ GO AHEAD FOR WONDERBOOM
15:28:55	ZSPZJ	UH 2 CREW, R22, REQUEST PERMISSION FOR A CIRCUIT TEST FLIGHT
15:29:00	ATC	PZJ, TAXI TO RWY 29, QNH 1015, SURFACE WIND 270 DEGREES 5 KTS
15:29:25	ZSPZJ	QNH 1015 UH, TAXI TO RWY 29
15:29:33	ATC	KIN WONDERBOOM
15:29:36	ATC	KIN WONDERBOOM
15:29:41	ATC	KIN WONDERBOOM
15:29:44	ZSKIN	WONDERBOOM GO AHEAD
15:29:46	ATC	KIN GO AROUND, EXECUTE THE GO-AROUND NOW PLEASE, TURN RIGHT AND REPORT ON THE LATE DOWNWIND RWY 29
15:29:55	ZSKIN	GO-AROUND, REPORT RIGHT HAND DOWNWIND RWY 29, KIN
15:30:03	ATC	LHY, WONDERBOOM, GO AHEAD
15:30:06	ZSLHY	AFTERNOON WONDERBOOM, LHY, C303, REQUEST START UP AND FLIGHT PLAN REFERENCE 756, TO KIMBERLEY
15:30:13	ATC	KIN AND YOU CAN COMMENCE THE EARLY RIGHT WHEN READY, THE JABARU IS GOING TO GO BACK INTO THE CIRCUIT
15:30:21	ZSKIN	OKAY, I'LL TURN, KIN
15:30:26	?????	*MIC IS KEYED*
15:30:28	ATC	PZJ....THE AIRCRAFT.....
15:30:40	ZSPZJ	WONDERBOOM TOWER, PZJ READY TO CROSS.....
15:30:42	ATC	PZJ STANDBY, ALL AIRCRAFT MAINTAIN RADIO SILENCE, EMERGENCY IN PROGRESS, I'LL GET BACK TO YOU
15:31:06	ATC	SPJ WONDERBOOM
15:31:09	ZSSPJ	GO AHEAD
15:31:10	ATC	SPJ, GO AROUND AND JOIN THE LEFT DOWNWIND RWY 06
15:31:16	ZSSPJ	COPIED THAT, WE'LL GO AROUND AND REPORT THE LEFT DOWNWIND 06, SPJ
15:31:22	ATC	LEX WONDERBOOM

Time	Source	Text of transmission
15:31:24	ZSLEX	COPIED, EMERGENCY IN PROGRESS, MAINTAINING A NEUTRAL CIRCUIT FOR NOW FINAL RWY 29
15:31:29	ATC	LEX FOLLOW THE 172 AHEAD GOING AROUND AND REPORT LEFT DOWNWIND RWY 06
15:31:34	ZSLEX	COPIED, FOLLOW YOUR TRAFFIC AND CALL YOU FINAL, CORRECTION LEFT DOWNWIND 06, LEX
15:31:42	ZSRVZ	RVZ IS CONTINUING .....
15:31:45	ATC	RVX AFFIRM 1244
15:31:48	?????	*MIC IS KEYED*
15:31:52	ZSSBN	WONDERBOOM SBN
15:31:57	ATC	LHY STANDBY, EMERGENCY IN PROGRESS SIR
15:32:00	ZSLHY	STANDINGBY LHY
15:32:06	ATC	PZJ UH WONDERBOOM
15:32:08	ZSPZJ	PZJ
15:32:09	ATC	WHAT'S YOUR POSITION NOW, CONFIRM YOU ARE ON A .....CIRCUIT?
15:32:12	ZSPZJ	JA, UH WE WANT TO DO A CIRCUIT, READY TO CROSS 29
15:32:16	ATC	PZJ, CROSS TO THE EAST, RWY 06 IN USE NOW, REPORT READY FOR THE CIRCUIT
15:32:22	ZSPZJ	CROSS EAST OF 06, REPORT NEXT FOR CIRCUIT
15:32:30	ZSSBN	WONDERBOOM SBN
15:32:03	ATC	SBN GO AHEAD
15:32:04	ZSSBN	REQUEST TO CROSS TO THE APRON
15:32:06	ATC	SBN CROSS 06 FOR THE APRON
15:32:09	ZSSBN	UH, CROSS UH 24 FOR THE APRON SIR?
15:33:11	ZSRSE	WONDERBOOM TOWER GOOD DAY, RSE A R44
15:33:14	ATC	RSE STANDBY SIR ON FREQUENCY, I'LL CALL YOU BACK, WE HAVE AN EMERGENCY IN PROGRESS
15:33:20	ZSRSE	COPIED THAT
15:33:21	ATC	LHY STANDBY FOR THE START I AM ONLY GOING TO CONTACT RADAR NOW SIR, I'LL GET BACK TO YOU
15:33:28	ZSLHY	NOT A PROBLEM, I'LL STANDBY FOR THE START-UP, LHY
15:33:47	ATC	SPJ REPORT FINAL APPROACH 06 NO.1
15:33:51	ZSSPJ	REPORT FINAL APPROACH 06, NO.1, SPJ
15:33:54	ATC	LEX REPORT FINAL APPROACH 06, NO.2 FOR FULL STOP PLEASE
15:33:58	ZSLEX	REPORT FINAL APPROACH 06 FOR A FULL STOP, LEX
15:34:18	ATC	LHY START APPROVED, REPORT FOR TAXI, 06 IN USE NOW SIR, YOUR NUMBER ON BOARD PLEASE
15:34:24	ZSLHY	COPIED START-UP APPROVED, REPORT READY FOR TAXI LHY.....INAUDIBLE
15:34:29	ATC	RSE WONDERBOOM GO AHEAD
15:34:32	?????	*MIC IS KEYED*
15:34:33	ATC	RSE WONDERBOOM, GO AHEAD
15:34:43	ZSRSE	RSE, R44 SIR, REQUEST LIFT OFF FROM THE FUEL BAY FOR A FLIGHT TO HARTEBEESPOORT DAM FULL STOP
15:34:50	ATC	RSE, QNH IS 1015, LIFT AT OWN DISCRETION, TAXI AROUND THE TOWER VIA THRESHOLD 11 NOT 4600', REPORT ROSLYN OUTBOUND, SURFACE WIND 270 DEGREES 5 KTS
15:35:05	ZSRSE	QNH 1015, SIR WOULD IT BE POSSIBLE TO ROUTE VIA 06?
15:35:09	ATC	NEGATIVE SIR, 06 IS THE ACTIVE NOW, EMERGENCY IN PROGRESS, ROUTE VIA THRESHOLD 11 PLEASE
15:35:15	ZSRSE	WE'LL ROUTE VIA THRESHOLD 11 AND UHM, REMAIN BELOW 4600', RSE
15:35:21	ATC	RSE, NUMBER ON BOARD
15:35:23	ZSRSE	IT'S 1 PLUS 1 AND 3 HOURS ENDURANCE SIR
15:35:37	ZSPZJ	WONDERBOOM PZJ, CIRCUIT COMPLETE

Time	Source	Text of transmission
15:35:40	ZTC	PZJ COPIED, CROSS RWY 06 NOW, REPORT SAFE ON THE GROUND, YOUR SURFACE WIND 270 DEGREES 5 KTS
15:35:49	ZSPZJ	CROSS RWY 06, REPORT SAFE, PZJ
15:35:54	ATC	LEX CONTINUE APPROACH, HELICOPTER CROSSING RIGHT TO LEFT
15:35:57	ZSLEX	COPIED, WILCO LEX
15:36:12	ATC	LEX, RWY 29 CLEARED TOUCH AND....CORRECTION CLEARED TO LAND, SURFACE WIND IS 270 DEGREES AT 5 KTS
15:36:19	ZSLEX	LEX
15:36:59	ZSRSE	RSE, SIR DO YOU WANT ME TO CROSS ON THE NORTHERN SIDE OF THE UHM TOWER?
15:37:09	ATC	LAST CALL SAY AGAIN
15:37:18	ZSPZJ	PZJ CHEERS
15:37:20	ATC	PZJ CHEERS
15:37:28	ZSRSE	RSE CLEARED TO CROSS 11?
15:37:31	ATC	RSE AFFIRM, ROUTE VIA THRESHOLD 11 NOT ABOVE 4600' REPORT AT ROSLYN
15:37:36	ZSRSE	REPORT AT ROSLYN, NOT BELOW...BELOW 4600 RSE
15:38:49	ZSKSO	WONDERBOOM TOWER.....KSO
15:38:52	ATC	KSO GO AHEAD
15:38:53	ZSKSO	KSO REQUEST TAXI CLEARANCE FOR A FLIGHT TO RUSTENBERG
15:38:58	ATC	KSO, NUMBER ON BOARD AND YOUR AIRCRAFT TYPE
15:39:01	ZSKSO	UH 1 ON BOARD AND C182
15:39:05	ATC	KSO TAXI HOLDING POINT RWY 06, QNH 1015
15:39:09	ZSKSO	1015, HOLDING POINT 06, KSO
15:39:14	ZSLHY	LHY WONDERBOOM, READY FOR TAXI AND STANDINGBY TO COPY ATC
15:39:20	ATC	LHY TAXI TO HOLDING POINT RWY 06, UH.....INAUDIBLE.....AFTER DEPARTURE TURN LEFT HBV, CLIMB TO 8000' AFTER 7500' CONTACT RADAR FREQUENCY 123,7, SQUAWK 6765
15:39:38	ZSLHY	UH, CLEARED BY RADAR AFTER DEPARTURE 06, TURN LEFT TO HBV CLIMBING 8000', PASSING 7500' CONTACT RADAR 123,7 AND SQUAWKING 6765 LHY
15:39:55	ATC	LHY READBACK IS CORRECT, REPORT READY
15:39:58	ZSLHY	UH, READY FOR THE DEPARTURE, THANKS LHY
15:40:03	ZSRSE	RSE IS AT ROSLYN AND CHANGING FREQUENCY 125,8
15:40:08	ATC	RSE CHEERS
15:40:10	ZSRSE	THANK YOU SIR
15:40:11	ATC	LHY CONFIRM HOW MANY ON BAORD
15:40:14	ZSLHY	JUST 1 CREW LHY