



KINGDOM OF SWAZILAND

MINISTRY OF PUBLIC WORKS & TRANSPORT
DIRECTORATE OF CIVIL AVIATION

FINAL REPORT AIRCRAFT ACCIDENT

BEECH B58 BARON
ZS-KAH s/n TH-830
28 September, 1995
Mount Ntondozi
Swaziland

FINAL REPORT
ACCIDENT INVESTIGATION ZS-KAH
CONTENTS

	Preface	1
1	Factual information	
	1.1 History of flight	2
	1.2 injuries to persons	3
	1.3 Damage to aircraft	3
	1.4 Other damage	3
	1.5 Personnel information	4
	1.6 Aircraft information	5
	1.6.1 Airframe	5
	1.6.2. Engines	5
	1.6.3 Equipment	5
	1.7 Meteorological information	6
	1.8 Aids to navigation	7
	1.9 Communication	7
	1.10 Aerodrome information	7
	1.11 Flight recorders	8
	1.12 Wreckage and impact information	8
	1.13 Medical and pathological information	8
	1.14 Fire	9
	1.15 Survival aspects	9
	1.16 Test and investigation	9
	1.17 Additional information	9
	1.18 New investigative techniques	9
2	Analysis	
	2.1 Fitness of crew	10
	2.2 Fitness of the air traffic controller	10
	2.3 Airworthiness status of ZS-KAH	10
3	Conclusions	11
4	Recommendations	12

PREFACE

On the 28th of September 1995 at 05:51 UTC (07:51 local time), a Beechcraft B58 Baron, registered in the Republic of South Africa with registration letters ZS-KAH, crashed during an approach manoeuvre near the " MW" NDB on the final approach path of runway 07 of Matsapha International Airport in the Kingdom of Swaziland.

The Ministry of Transport and Communications appointed Capt. George Ph. Dierijck, as the Inspector of Accident Investigation, and as such to conduct the investigation into the aforementioned aircraft accident.

The accident investigation was conducted in accordance with the Swaziland Aviation Act 1968 as amended, the Swaziland Aviation regulations 1969 as amended and in accordance with I.C.A.O. Annex 13.

Investigations, Evaluations and Recommendations were made in order to determine the cause of this fatal accident and enlightening evidence on the accident was acquired during the course of the accident investigation.

The result of the accident investigation transcribed herein are in the prescribed format in accordance with I.C.A.O. Manual 6920/AN/855/4 and I.C.A.O. Annex 13.

All times in this report are Coordinated Universal Time (U.T.C). Local time in the Kingdom of Swaziland is UTC + 2 hours.

1. FACTUAL INFORMATION

1.1 History of flight

On the 28th of September, 1995, a Beechcraft B58 Baron registered in the republic of South Africa as ZS-KAH and operated by National Airway Corporation based at Lanseria Airport, departed from Grand Central Airport at 04:39 with one passenger with final destination Matsapha International Airport in the Kingdom of Swaziland. The pilot in command of the aircraft was Capt. A. Fouche holder of a South African ALTP number TA02458.

Earlier that morning the pilot left Lanseria Airport and ferried the aircraft to Grand Central Airport in order to pick up his passenger. The flight left Lanseria with full fuel and according to Grand Central Tower, the take off was uneventful and the aircraft cruised at FL 110 towards the Matsapha TMA. At 07:28 the pilot established first radio contact with Matsapha Approach control on frequency 124.90 and forwarded his estimate for EVAMA being 05:39. Approach control instructed ZS-KAH to maintain FL 110 and submitted the 05:00 METAR (120 degrees 7 knots, 5,000 meters in fog, BKN 010, BKN 025 temperature 19, dewpoint 18, QNH 1022. At 05:29:14 the pilot confirmed the transmission and informed Matsapha Approach that he will call "top of descent".

At 05:34:48 the pilot requested for the descend and was subsequently cleared to the "MW" NDB at 6,000 feet, the approach controller corrected the altitude immediately to 7,100, QNH 1022 and no delay for ILS Approach runway 07. The pilot confirmed the QNH 1022, Runway 07 and asked "say again the level cleared to". Approach Control repeated "MW 7,100", again confirmed by the pilot as "MW seven????hundred". At 05:35:40 the pilot requested "and confirm MW is operational" Approach control replied with "Affirmative".

The following transmission was made by the pilot at time 05:47:18 "Matsapha KAH overhead MW and turning outbound".

Approach control replied "Roger for ILS approach and report again MW inbound" followed at 05:47:30 by "Roger cleared for the ILS and MW inbound next, KAH". At 05:50:20 the pilot made the following transmission "KAH inbound established on the ILS", immediately followed by a transmission from Approach Control "Roger report OM", confirmed by the pilot "OM next".

On the ATC tape are two very short "clicks" at time 05:51:40, these clicks are suspected to be the time of the impact and caused by the microphone key switch.

The Transition level was not given to the aircraft by Matsapha Approach during the initial contact.

Air Traffic Control initiated at 06:29 the search phase and transmitted the required information to all adjacent Air Traffic Control Centres followed by the Alert Phase at 06:47.

The aircraft was located at 08:29 by an Army search aircraft as soon as the intense fog cleared at Mount Ntandozi. The aircraft had struck the peak of mount Ntandozi on a magnetic heading of 082°, 8.9 n.m. short of the touch-down of Matsapha runway 07, coordinates 26° 37.47 S - 031° 09.88 E, at an elevation of 4,300 feet (MSL), and was completely destroyed by the impact and subsequent fire.

The flight path of the aircraft before it struck the mountain was straight for the NDB "MW" only 200 metres away and approximately 75 feet below the NDB location.

The HSI when recovered from the wreckage showed a Glide Slope warning flag and a fly "up" Glide Slope needle. The altimeter was recovered from the wreckage and the subscale showed the correct altimeter setting (QNH) of 1022 hPa.

Both the pilot and the passenger on board perished as a result of the impact, explosion and subsequent fire. It was daylight at the time of the accident, with thick fog in the area of impact. The few witnesses to the crash stated that the aircraft had passed over the area at a very low height above the ground and that they heard an explosion a few minutes later.

1.2 Injuries to persons

INJURIES	CREW	PASSENGERS	OTHERS
Fatal	1	1	-
Serious	-	-	-
Minor / None	-	-	-

1.3 Damage to aircraft

The aircraft was completely destroyed. All parts and components were damaged as a result of the impact with the rocks and the subsequent explosion and fire.

1.4 Other damage

An area of 900 square meters of mountain vegetation was destroyed as a result of the fire and spillage of fuel and oil.

1.5

Personnel information

Pilot in Command

Name	Fouche, A.
Nationality	South African
Age	56
Licences	<p>He obtained a South African ALTP, number TA02458 on the 11th of February, 1974,</p> <p>Class: Single and Multi engine land.</p> <p>Type: Single and Multi engine piston engine aeroplanes having a maximum certificated mass of 5,700 kg or less as endorsed in pilots logbook.</p> <p>Other: Instructor Grade I valid till 14th September, 1996 Instrument rating valid till 5th February, 1996 Licence valid 5th September, 1996</p>
Medical certificate	<p>Incorporated in the ALTP valid till 5th September, 1996.</p> <p>Endorsement: The holder must wear corrective lenses or glasses</p>
Last check - aircraft type	<p>Instrument rating renewal on the 6th Feb. 1995. As flight instructor on the 15th Sept. 1993.</p>
Equipment flown as P-I-C	<p>See attached listing. From the listing, provided by the South African Civil Aviation Authority, it could not be established that the pilot was type-rated on the aircraft.</p>
Total time as P-I-C	Could not be established since logbooks could not be made available.
Total time in type	Could not be established since logbooks could not be made available.
Flight time last 90, 30 and 4 days	Could not be established since logbooks could not be made available.

1.6 Aircraft information

1.6.1 Airframe

Make	Beechcraft
Model	BE-58 Baron
Serial number	TH 830
Registration	ZS-KAH (Republic of South Africa)
Date of Manufacture	1977
Certificate of Registration	Registered 14 June, 1977
Certificate of Airworthiness	Number
Date of last inspection	13 December, 1994
Total time	3,159.5
Type of last maintenance	M.P.I at NAC Lanseria (AMO 157)

The aircraft was owned by: Group Five Air (Pty) Ltd.
P.O. Box 3401
Vanderbijlpark, 1900
Republic of South Africa

Operated on their behalf by: N.A.C.
Lanseria Airport

1.6.2 Engines

	No.1	No.2
Make	Teledyne Continental	Teledyne Continental
Model	IO-520-C	IO-520-C
Serial number	561544	561553
Date of last service	13 December, 1994	13 December, 1994
Total time	3,159.5	3,159.5
Time since overhaul	1,292.7	1,292.7
Type of last maintenance	M.P.I	M.P.I

1.6.3 Equipment

The aircraft was properly equipped for the intended flight.

1.7 Meteorological Information

The meteorological conditions at Matsapha Airport on the day of the accident, according to METAR's, were as follows:

METAR 05:00

Wind	110° at 07 Knots
Visibility	5,000 meters
Clouds	Broken at 1,000 feet Broken at 2,500 feet
Temperature (° C)	19°
Dew point (° C)	18°
QNH (hPa)	1021

METAR 06:00

Wind	120° at 06 Knots
Visibility	9,000 meters
Clouds	Scattered at 1,500 feet Broken at 2,000 feet Broken at 3,000 feet
Temperature (° C)	19°
Dew point (° C)	16°
QNH (hPa)	1022

METAR 07:00

Wind	090° at 05 Knots
Visibility	9,000 meters
Clouds	Scattered at 1,500 feet Broken at 2,500 feet
Temperature (° C)	20°
Dew point (° C)	18°
QNH (hPa)	1022

According to statements obtained from eye-witnesses in the accident vicinity, at the time of the accident, the crash site, Mount Ntondozi, was surrounded by heavy fog which reduced the visibility to a minimum.

The weather report submitted by the South African Weather Bureau is attached to this report.

1.8 Aids to navigation

Matsapha airport, near the city of Manzini, is equipped with VOR/DME "VMS", NDB "MS", NDB "MW", outer marker locator "OM", ILS/DME "IMS". Due to lack of maintenance the VOR/DME "VMS" has been out of service for more than 1 year, while the NDB "MW" was down graded, the outer marker unserviceable and the ILS unreliable as ident could not be picked up.

Immediately after the accident, it was established by another incoming aircraft, that the ILS glide slope was not functioning. The ILS monitoring system installed in the tower did not indicate the glide slope failure.

1.9 Communication

Both Matsapha Approach Control and the aircraft were equipped with VHF radio communication equipment; voice recordings indicate that communications were normal at all times and took place on frequency 124.90 Mhz.

Matsapha ATC provided a tape from the Voice Logging Recorder with time injection. The source of the time injection is provided locally and it was determined that a + 7 minute and 30 seconds time difference existed. The tape was replayed and the time signal corrected for the error.

1.10 Aerodrome information

The Matsapha International Airport, near the city of Manzini, has 1 single runway (07 - 25), with the following characteristics:

Orientation	070° - 250°
Location (ARP)	26° 31.7' S - 031° 18.5' E
Elevation (runway 07) (airport)	2,027 feet 2,075 feet
Runway length	2,600 metres
Runway width	45 metres
Operating hours	05:00 - 20:30
Owner	Government of Swaziland Ministry of Transport & Communications Directorate of Civil Aviation (DCA)
Operating permit	Not been issued by DCA
Runway surface	Asphalt

1.11 Flight recorders

Flight recorders are not required for this category of aircraft and were not installed.

1.12 Wreckage and impact information

According to the field inspection carried out at the accident site, the marks left by the impact showed that the aircraft hit the flank of the mountain with a 25° right bank angle and slightly nose up.

The inspection also determined that the aircraft struck the mountain with the right wing first. As a result, the fuselage turned right and the left engine and both propellers were propelled in an elliptical path by inertia, which threw these parts of the aircraft towards the higher part of the mountain to a distance of approximately 75 meters.

The central part of the fuselage and empennage were crushed at the point of impact and the remains severely burned. Some parts of the aircraft were spread over an area of approximately 200 metres caused by the impact. Identification of the wreckage established that both engines had practically disintegrated. Parts of the landing gear, flaps and aft fuselage were also identified.

The level of destruction produced by the impact precluded complete identification of the parts of the aircraft, as numerous fragments of the fuselage, wings and other components were scattered about indiscriminently. Attached to this report is a polar diagram of the distribution of the remains over an area of 900 square meters.

Condition of Instruments and controls on board the wreckage

During the examination of the wreckage it was established that the landing gear had been selected "down" and wing flaps selected to an extended position, however, the exact degree of flap extension could not be determined. Flight control cables were all found to be intact and therefore flight control problems could almost be eliminated. All instruments were seriously damaged by the impact and the subsequent fire.

1.13 Medical and pathological information

The information obtained in this area indicates that the physiological state of the crew member was normal before and during the flight. The ATC tape did not reveal any anomalies in speech.

The captain and his passenger perished as a consequence of the crash and the state of the remains of the only crew-member made it almost impossible to carry out the full autopsy; indirect evidence indicates, however that the crew-member had not ingested any alcohol or drugs that could have affected his capacity for the flight.

In sustainment of the above and in compliance with the current I.C.A.O. regulations the results of the last medical check-up conducted on the crew-member, were examined and showed that he had been declared fit to fly.

Documentation and the autopsy reports are attached to this report.

1.14 Fire

The majority of the wreckage was consumed destroyed by the resulting ground fire fed by fuel carried on board of the aircraft after impact. The center fuselage was still smouldering when the Rescue Team and the accident investigator arrived at 08:45.

1.15 Survival aspects

As shown in the post-mortem reports, both deaths were more or less instantaneous and were caused by severe multiple fractures and head injuries. Although it took approximately 3 hours before the wreckage was located and before the arrival of the Rescue Team on the scene of the accident, it can be objectively stated that this factor did not have any negative repercussion on the possibility of survival.

1.16 Test and investigation

The crash site was duly examined to determine the position and flight path of the aircraft at the moment of impact. During interviews with other (co)pilots, some of which had flown with Capt. Fouche to Matsapha a couple of days before the accident occurred, it was established that Capt. Fouche had invented and frequently used an alternative approach procedure in order to save time and eliminating a lengthy entry procedure over the "MW" NDB.

It was confirmed by a witness, that he heard the aircraft passing over Mount Ntondozi in a Southerly direction. This enhances the theory that the aircraft, when passing "MW" NDB, turned right on an outbound heading of 250° in order to intercept the ILS from the South. The procedure followed by the pilot is non-standard and has not been published as such.

1.17 Additional information

Immediately after it was established that the ILS Glide Path transmitter had failed and the fact that the ILS monitoring system in the tower was not working properly, a NOTAM was issued to that effect and the South African DCA was requested to conduct a flight calibration. The flight calibration was conducted on the 3rd of October, 1995 to determine the integrity of both the Localiser and Glide Path transmitters. It was determined that the second Localiser transmitter was defective and a NOTAM should have been issued as indicated in the Flight Calibration report.

The flight calibration report dated 6 October, 1995 is attached.

The investigation was seriously hampered by the fact that the Airport Communications engineer had impounded the wrong tape from the Voice Logging Recorder. The correct tape, containing all the information, could easily have been destroyed whenever it was used for re-recording.

1.18 New investigative techniques

Not used; proceedings were conducted with standard practices and in accordance with the relevant manuals.

2. ANALYSIS

From the above information, it was clearly established and confirmed by witnesses, that the joining procedure followed over the "MW" NDB was not the standard published procedure for ILS interception for Matsapha runway 07. The fact that the crew-member descended 1,000 feet below the published altitude, 4,300 instead of 5,300 feet remains unknown.

2.1 Fitness of crew

From information obtained , it can be confirmed that the only crew-member was physically and psychologically fit for the intended flight. Colleagues at Lanseria airport described him as very professional and a highly experienced instrument pilot and examiner.

2.2 Fitness of the air traffic controller

It was established by the Accident Investigator that the air traffic controller manning the Approach control on frequency 124.90 Mhz. on the date and time of the occurrence was current but **not** licensed. An on-going dispute between Ministries prevented all air traffic controllers from having their medical certificates renewed as required by I.C.A.O. regulations outlined in Annex 1, Chapter 6.1.1 c for the issue of an ATC licence.

2.3 Airworthiness status of ZS-KAH

Information received regarding the aircraft indicated that the latter was airworthy on the day of the occurrence, ruling out the possibility of a technical failure. The aircraft has been maintained to the highest standards by NAC at their CAA approved (AMO 157) Lanseria Airport maintenance facility.

3. CONCLUSIONS

3.1 Results

- The crew-member was not type rated as required by the South African Civil Aviation Authority, however this could be an oversight of the CAA, when a new open licence system was introduced. It was established that Capt. Fouche had been flying Beech Baron's for many years;
- The ATC officer controlling the flight on the date and at the time of occurrence carried out all functions and actions throughout the flight phase consistent and in accordance with the relevant international standards, however he was **not** licensed. His psychophysical and technical fitness to handle the flight in question was normal;
- The powerplants were developing a high power setting, this conclusion is evidenced by the disintegration of both powerplants and propeller conditions;
- Weather conditions in the vicinity of the "MW" NDB were such that no ground visibility could have been obtained by the crew-member during the interception of the ILS;
- The aircraft was airworthy and all logbooks and technical administration, as far as examined, was found to be in compliance with the regulations;
- There is no evidence of technical problems concerning the airframe, powerplants and flight controls;
- The technical state of all ground navigational aids are in questionable condition resulting in a continuous high failure rate;
- The ILS glide slope was **not** functioning which was established by two other incoming aircraft;
- The ILS monitoring system installed in the tower did **not** indicate the glide slope failure;
- The Matsapha International Airport has **not** been licensed for many years as required by Part XXI of the Aviation Regulation 31, 1969 as amended.

3.2 Cause

3.2.1 Active

Personnel factors - Pilot in command - Procedures, regulations and instructions

The investigator believes that the probable cause of the accident was the crew-member's interpretation and execution of the ILS intercept over the "MW" NDB and subsequent descend below the published altitude (5,300') before passing overhead "MW" NDB.

Besides, the following factors may have contributed to the cause of the accident:

- Failure of the ILS Glide Slope transmitter during the interception of the final flight path;
- Possible misintrepetation of the altimeter by 1,000 feet
- Possible failure of the single altimeter on board of the aircraft;
- An attempt to become "VMC below" without the necessary precautions.

3.2.2 Passive

Personnel factors - Pilot in command - Procedures, regulations and instructions

- Pressed for time by his passenger to comply with his meeting schedule.

4. RECOMMENDATIONS

4.1 To the competent Civil Aviation Authority (DCA)

- It is strongly urged that proper inspection and control be exercised on navigation aids and relevant communication equipment;
- That the equipment failure rate be drastically reduced and preventative maintenance programmes be introduced and immediately implemented;
- That the airport be licensed in accordance with the pertaining regulations;
- That the Voice Logging Recorder is inspected at regular intervals and the time injection be regularly synchronised with an international time source;
- That a Search and Rescue agreement be made between DCA and the Umbutfu Swaziland Defence Force (USDF) for the utilisation of their aircraft without going to lengthy approval procedures;
- That Air Traffic Controllers undergo a medical examination and licenses be issued in accordance with I.C.A.O. Annex 1;
- That every possible initiative towards the improvement in handling situations of unusual operations and emergencies is emphasised during regular meetings of all levels of Air Traffic Control Personnel;
- That without further delay accident investigation equipment is purchased .

4.2 To the aircraft operator:

- All flight crews be briefed about the Matsapha procedures in particular when approaching from the North, and how to execute the "MW" NDB - ILS intercept.

4.3 To the South African Civil Aviation Authority

- Make a second altimeter mandatory for all operations engaged in commercial air transport and aircraft used for hire or reward in IFR operations.