



**MINISTRY OF TRANSPORT, INFRASTRUCTURE, HOUSING
AND URBAN DEVELOPMENT
STATE DEPARTMENT FOR TRANSPORT**

AIRCRAFT ACCIDENT INVESTIGATION

**PRELIMINARY ACCIDENT REPORT 5Y-CAC
05.06.2018**

**CESSNA CARAVAN 208B
THE ABERDARES RANGE, NJAMBINI**

PRELIMINARY REPORT

OPERATOR/OWNER : East African Safari Air Express LTD
AIRCRAFT TYPE : Cessna Caravan 208B
MANUFACTURER : Cessna Aircraft Corporation
YEAR OF MANUFACTURE : 1996
AIRCRAFT REGISTRATION : 5Y-CAC
AIRCRAFT SERIAL NUMBER : 208B-0525
DATE OF REGISTRATION : 7 August 2013
NUMBER AND TYPE OF ENGINE : One PWC PT6A-114A
DATE OF OCCURRENCE : 5 June 2018
TIME OF OCCURRENCE : 1402 hours
LOCATION OF OCCURRENCE : Njambini, Aberdare Ranges
TYPE OF FLIGHT : Commercial
NUMBER OF PERSONS ON BOARD : Ten (10)
INJURIES : 10 Fatal
NATURE OF DAMAGE : Destroyed
CATEGORY OF OCCURRENCE : Accident
PILOT IN COMMAND : YK-6250-CL
PIC FLYING EXPERIENCE : 2352.9 hours as at 11/05/2017
FIRST OFFICER : YK-9423-CL
FO FLYING EXPERIENCE : 301 hours as at 19/09/2017

All times given in this report is Coordinated Universal Time (UTC). East African Local Time is UTC plus 3 hours

OBJECTIVE

This report contains factual information which has been determined up to the time of publication. The information in this report is published to inform the aviation industry and the public of the general circumstances of the accident.

This investigation has been carried out in accordance with *The Kenya Civil Aviation (Aircraft Accident and Incident Investigation) Regulations, 2018 and Annex 13 to the ICAO Convention on International Civil Aviation.*

The sole objective of the investigation of an accident or incident under these Regulations shall be the prevention of accidents and incidents. It shall not be the purpose of such an investigation to apportion blame or liability.

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ABBREVIATIONS

AAID	-	Air Accident Investigation Department
AD	-	Aerodrome
AGL	-	Above Ground Level
AIP	-	Aeronautical Information Publication
AMSL	-	Above Mean Sea Level
ARP	-	Aerodrome Reference Point
ATC	-	Air Traffic Services
ATPL	-	Airline Transport Pilot License
CFIT	-	Controlled Flight Into Terrain
CPL	-	Commercial Pilot License
CVR	-	Cockpit Voice Recorder
ELT	-	Emergency Locator Transmitter
FDR	-	Flight Data Recorder
GFS	-	Ground Flight Safety
GPWS	-	Ground Proximity Warning System
HKJK	-	Jomo Kenyatta International Airport
HKKT	-	Kitale Airport
HKNW	-	Wilson Airport
ICAO	-	International Civil Aviation Organization
IFR	-	Instrument Flight Rules
KAA	-	Kenya Airports Authority
KAF	-	Kenya Air force
KAPU	-	Kenya Airport Police Unit
KCAA	-	Kenya Civil Aviation Authority
LG	-	Landing Gear
MLG	-	Main Landing Gear
NLG	-	Nose Leading Gear
QNH	-	Altimeter setting related to sea level
RFFS	-	Rescue and Fire Fighting Services
RMI	-	Radio Magnetic Indicator
SALS	-	Simple Approach Landing Systems
TAWS	-	Terrain Awareness Warning System
USA	-	United States of America
VFR	-	Visual Flight Rules
WGS	-	World Geodetic System (1984)

SYNOPSIS

The report describes the 5 June 2018 aircraft accident involving a Caravan Cessna 208 registration 5Y-CAC operated by the East African Safari Air Express LTD when it collided with the Aberdare ranges. The aircraft was destroyed on impact and all the ten persons onboard suffered fatal injuries.

The Aircraft Accident Investigation Department, AAID received information from the search and rescue coordination centre regarding the disappearance of 5Y-CAC from the radar on 5 June 2018 at 1430. The aircraft took off from Kitale airstrip at 1305 with ten onboard destined to Nairobi, requested to route via Golf Victor, before revising to route via AVENA, when it collided with the Aberdare ranges. Moments after it vanished from the radar, search and rescue mission was activated.

As per the International Civil Aviation Organization, ICAO requirement, AAID notified the National Transport Safety Board of the United States America; the manufacturer of the C208 aircraft, the Transport Safety Board of Canada; the powerplant manufacturer and Fiji; the State whose citizens suffered fatal injuries. The International Civil Aviation Organization was notified as per ICAO annex 13 requirement.

The aircraft wreckage was located at 0645hours on 7 June 2018 and the bodies of the victims extricated from the debris and recovered the same day.

Investigation of the accident involving 5Y-CAC is ongoing to determine the facts, conditions and circumstances of the accident in order to establish the probable cause; however, initial findings revealed that the aircraft collided with the Aberdare ranges under instrument meteorological conditions in a straight and level flight, consistent with controlled flight into terrain, CFIT.

Preliminary investigation recommends to KCAA and Air Operators Certificate holders that operate under IFR or night VFR to ensure that all flight crews to be provided with CFIT avoidance training and Upset Recovery Procedure Training, UPRT annually.

FACTUAL INFORMATION

1.1 History of the Flight

After take-off from Kitale (HKKT), a track to Jomo Kenyatta International Airport (HKJK) was established with slight variations in groundspeed and track. The aircraft Flight Level was sustained at 110, with some occasional variations. Aircraft height above ground level (agl) varied between 1102 feet and 4187 feet. One minute before its impact with the cliff, the aircraft was at 11100 feet asl, or 3000 feet agl, 159 knots ground speed, and tracking radial 338 NV. Immediately before impact, the elevation of the highest ground level was 12876 feet, the aircraft altitude 11200 feet asl, the ground speed was 156 knots, and track was radial 339 NV.

Information retrieved from the Radar transcript recorded various parameters of the aircraft from 13:05 up to 1402, the time the aircraft impacted the cliff. The radar system transmits information including aircraft position in relation to NV VOR, Flight Level or altitude, groundspeed, vertical speed and heading.

1.2 Injuries to Persons

Table 1: Injury chart

Injuries	Crew	Passenger	Others	Total
Fatal	2	8	0	10
Serious	0	0	0	0
Minor/none	0	0	0	0
Total	2	8	0	10

1.3 Damage to Aircraft



Figure 1: The wreckage of the damaged aircraft

1.3.1 Other damage



Figure 2: The effect of the fuel spillage from the accident aircraft on the vegetation

1.4 Personnel Information:

1.4.1 Captain

Records indicate that the pilot in command was born in the year 1988 and held a Commercial pilot license; CPL issued on 09/10/2010 by the KCAA and employed by the company in the year 2014. The CPL expiry date indicated 15/05/2019. The endorsements under group `A` on the CPL are BE55, C208, C172, PA28 and BE200. Beech 1900 endorsed under group `B` The instrument rating renewal check out was done and endorsed on the license on 11/04/2018. The last license renewal records from KCAA indicate that the pilot had accumulated 2352.9 flight hours as at 11/05/2018.

1.5.2 First Officer

The first officer was born in the year 1992 and held a Commercial pilot license; CPL issued on 28/09/2016 by the KCAA and employed by the company in the year 2017. The CPL expiry date indicated 26/09/2018. The endorsements under group `A` on the CPL are C150, PA34 and C208. The initial instrument rating practical test conducted and endorsed on the license on 13/02/2017. The last license renewal records from KCAA indicate that the pilot had accumulated 301.4 flight hours as at 14/09/2017.

1.6 Aircraft Information

1.6.1 General

Records obtained from KCAA indicate that the aircraft type Cessna 208B serial number 208B-0525 is owned by 720 Investment Ltd and Leased to the East African Safari Air Ltd as per KCAA Certificate of Registration number 2350-B. The aircraft held a Certificate of Airworthiness number 2776 under Commercial Air Transport Category with an expiry date of 17 August 2018. According to the records, 5Y-CAC was fitted with weather radar Bendix/Kind Art 2000, radio altimeter Bendix/king KRA 10A and GPWS (EGPWS) Sandel ST 3400.

1.7 Meteorological Information

The Graphical Area of the Satellite image for 1700 local time indicated that the Aberdare region was under the influence of a trough of warm air aloft. The system featured overcast low-level clouds.

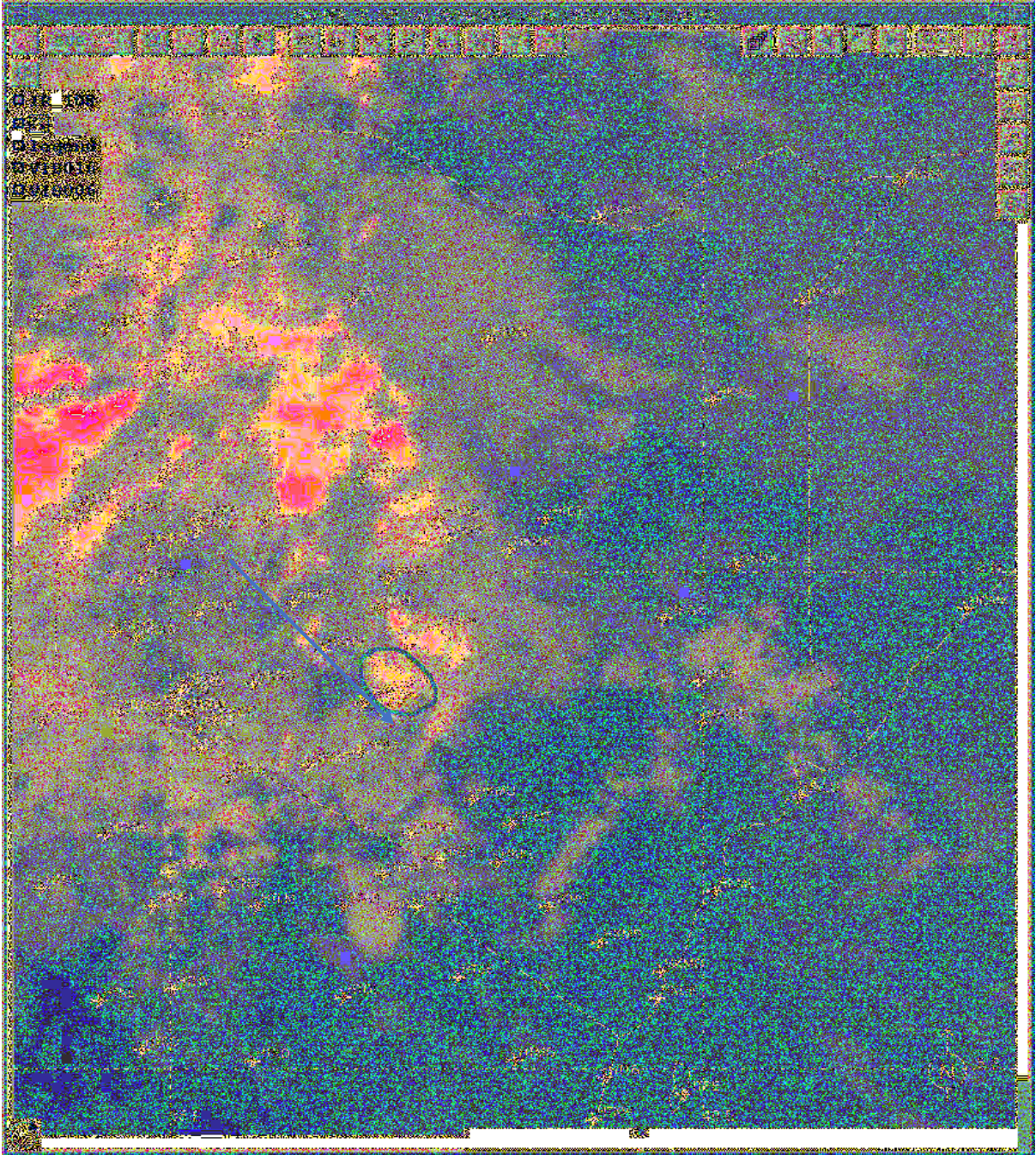


Figure 3: Satellite Image at 05/06/2018: 1700 local time (courtesy of Meteorological Department of Kenya)

Description:

Orange/ brown/ red background: Convective (Thunder) clouds.

White background: Low-level clouds.

Black background: Area with no clouds.

1.7.1 JKIA:

The terminal forecast for JKIA, was valid for the period 0500 until 1600 on 05 June 2018. This is to be established if it was available to the pilot before departure. For the period of the flight, the weather was forecast to be wind 030T at 08 knots; visibility more than 10km; sky condition few Cumulonimbus cloud at 2400 feet agl, broken at 9000 feet agl., the predicted condition remained essentially the same up to 1630.

1.7.2 HKKT:

The aviation routine weather report (METAR) for HKKT reported calm wind; visibility more than 10km in light rain; sky condition 1500 feet agl broken, 8000 feet agl overcast; temperature 16°C, dew point 16°C.

1.8 Aids to Navigation

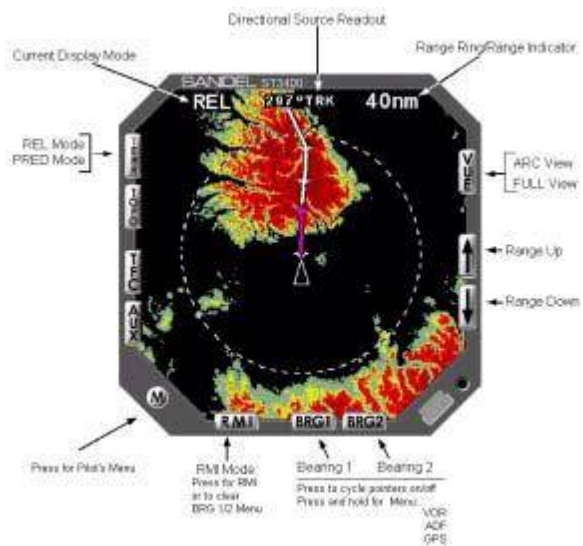
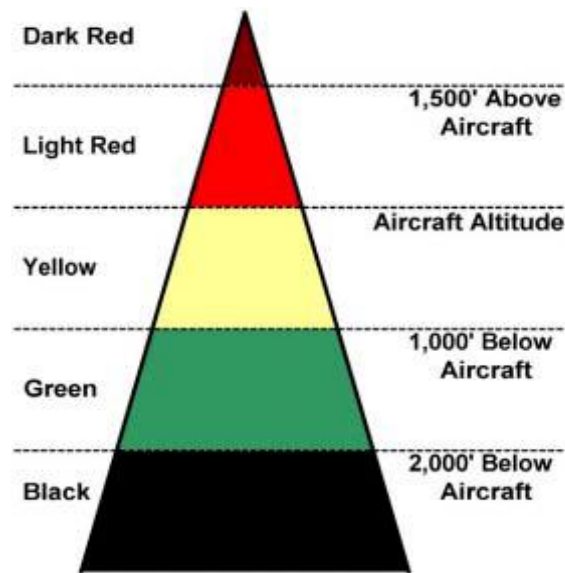
The aircraft was flying under IFR, therefore pertinent navigational were in use both onboard the aircraft and other ground navigational aids.

1.8.1 SANDEL, ST3400 TAWS/RMI

The aircraft was equipped with SANDEL, ST3400 TAWSS/RMI with traffic capability. The ST3400 is a multi-function display with a self-contained TAWS (Terrain Awareness Warning System) system. It includes a TAWS computer, graphics symbol generator and an integrated full-color screen, built within a standard 3-inch instrument chassis. It includes bearing pointer features to directly replace an existing mechanical RMI (Radio Magnetic Indicator), and has the optional capability of acting as a Primary or secondary Traffic indicator, showing traffic either in standard TCAS format or overlaid on terrain when connected to an external traffic detection system.

Terrain protection is enabled during all airborne phases of flight - Departure, Enroute, Terminal, and Approach and in any selected display mode.

The ST3400 is a situational awareness tool and an alerting and warning device, not intended to be used for primary navigation of the aircraft. During normal flight operations, the system remains essentially silent. It uses GPS, radar altitude, barometric altitude, and other relevant data in combination with its internal database information to provide the pilot with a full-time terrain display. The look ahead function compares the aircraft flight path to terrain and obstacle database information and distance to known runways. Understanding Alerts, Warnings and Cautions If any terrain alert occurs, the TAWS Alert text is shown at the bottom of the screen and an audible alert message will occur on the cockpit audio system. The REL (RELative Altitude) terrain display screen is automatically selected at an appropriate range to put the alerting terrain onscreen. This action occurs on any alert, including GPWS. If the pilot has previously selected TAWS INH, GPWS alerts are still enabled but no terrain will be shown. Pilots should train to react properly to all alerts, cautions and warnings, just as one would train to react to an aircraft stall, engine failure or any other potential or actual emergency situation. The ST3400 includes a built-in caution and warning system providing annunciation and aural alerts. Provision is made for all the traditional/standard Ground Proximity Warning System (GPWS) alerts, new enhanced terrain alerts, and various advisories. All of the alerts are automatically displayed. The unit supports optional external caution and warning annunciators.



During enroute flight (not on approach to a runway or airport) the nominal color coding is:
 Dark Red: Greater than 1500' **above** the aircraft
 Light Red: Within 100' of the aircraft to 1500' **above** the aircraft
 Yellow: Between 1000' and 100' separation below the aircraft
 Green: Between 2000' and 1000' separation below the aircraft
 Black: Greater than 2000' separation below the aircraft

Figure 3: Representation of color coding and multi-function display of Sandel.

An internal recorder automatically records a minimum of the last ten hours of flight data. Oldest data is automatically overwritten with most recent data. This data can be used to analyze recent alert activity.

1.9 Communication

The aircraft was on a two-way radio communication with ATS

1.10 Aerodrome Information

1.10.1 Kitale Airport, HKKT (Departure Aerodrome)

Kitale airport is without ATC, but managed and operated by the Kenya Airports Authority. It is located at Coordinates: N0°58.32' / E34°57.51' with an elevation is 6070.0 feet above mean sea level.

Dimensions:	4757 x 75 feet / 1450 x 23 meters	
Surface:	Hard	
	Runway 04	Runway 22
Coordinates:	N0°58.01' / E34°57.26'	N0°58.62' / E34°57.76'
Elevation:	6070	6070
Runway Heading:	040°	220°



Figure 4: Google map showing HKKT aerodrome

1.10.1.1 Jomo Kenyatta International Airport (Destination Aerodrome)

Jomo Kenyatta International Airport (HKJK) is the country's main international airport operated by Kenya Airports Authority located in Nairobi County. It has a bitumen runway surface length 4117m and width 45m located at WGS coordinates S 01°19'09.2'' E 036°55'39.9'' with an elevation of 5330ft agl. It has PAPI lights on both runway 06 and 24. Runway 06 has Precision Approach Landing Systems (PALS) and runway 24 has Simple Approach Landing Light Systems (SALS).

1.10.2.1 HKJK Clearance issued to 5Y-CAC

The forecast weather that prevailed for the entire day on 5 June 2018 was wind 030T at 08 knots. The runway in use at HKJK was 24. 5Y-CAC, inbound JKIA was cleared by Approach at 13:56 to route direct to AVENA at flight level 110, subject to own terrain clearance.

1.11 Flight Recorders

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder. Neither recorder was required by the Kenya Civil Aviation regulations.

1.12 Wreckage and Impact Information

1.12.1 Structural Damage

The wreckage was confined within the same area.



Figure 5: The wreckage of the damaged aircraft

1.12.2 Emergency locator transmitter

5Y-CAC was equipped with a Kannad 406 AF- COMPACT emergency locator transmitter (ELT), part number S1820506-01, serial number 15260294. During field examination of the wreckage,

the ELT was noted to be out of its mounting tray having been dislodged and ejected from mounted antenna and the remote cockpit switch. The remote control panel wires were broken near the plug on the ELT. The antenna had broken off by ground contact, and its cable was detached from the assembly. Due to loss of the antenna, no 406 MHz signal was recorded by the search and rescue Coordination Centre (JRCC), nor was a 121.5 MHz signal received by search and rescue aircraft.



Figure 6: The Kannad ELT



Figure 7: The damaged ELT in armed position

1.13 Medical and Pathological Information

Fluids were taken from the accident bodies for appropriate testing. The process is ongoing.

1.14 Fire

There was no pre or post impact fire.

1.15. Survival Aspects

1.15.1 Collision Impact

The radar parameters recorded on impact indicates that the aircraft might have collided with the obstacle at 156 Knots

1.15.2. Search and rescue

The last radio call heard from 5Y-CAC was at 13:57 on NV Radial 333 with DME of 53 (indicating a distance of 53 miles from NV Ground station) at FL111, Ground speed of 157 Knots and heading 128. The last known position appearing on the Radar database indicated that 5Y-CAC was on NV Radial 339 40 DME at FL112 Coordinates 004227S 0364201E. The company emergency response plan was activated at 1245. The ELT did not deploy as expected to facilitate search and rescue mission.

The forecast weather for the area indicated rain and low level clouds that hampered the search and rescue exercise.

1.15.3 Accident Site



Figure 8: A section of the Aberdare ranges where the accident took place

The Aberdare Range forms a section of the eastern rim of the Great Rift Valley running roughly north to south. On the west, the range falls off steeply into the Kinangop Plateau and then into the Great Rift Valley.

On the east, the range slopes more gently. The terrain consists of densely covered Bamboo forest with the highest point of the cliff with an elevation of 13,120 feet above mean sea level. The point of impact was at an elevation of 11200 feet asl, 38 feet below the top of the vertical cliff. The cockpit was crushed, and the forward passenger cabin was distorted, with the forward cabin bulkhead mostly dislodged from its attachments. The aircraft seemed to have impacted the obstacle in a straight and level configuration.

1.15.3. Emergency Response

The crash area was located two days after the accident. Even if the occupants would have survived the impact forces, chances of surviving were exacerbated by both the harsh weather conditions and the duration it took to access the crash site.

Martyn Lunani
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20 June 2018