AIRCRAFT ACCIDENT REPORT

NCAT/2022/12/31/F

Nigerian Safety Investigation Bureau

Final Report on the Serious Incident involving Beech Baron 58 aircraft operated by Nigerian College of Aviation Technology (NCAT), Zaria with nationality and registration marks 5N-CAG which occurred on runway 05 at General Hassan Usman Katsina international Airport, Kaduna Nigeria on 31 December, 2022.

This report was produced by the Nigerian Safety Investigation Bureau, (NSIB), Nnamdi Azikiwe International Airport, Abuja.

The report is based upon the investigation carried out by Nigerian Safety Investigation Bureau, in accordance with Annex 13 to the Convention on International Civil Aviation, Nigerian Safety Investigation Bureau (Establishment) Act, 2022, and Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2023.

In accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of aircraft accident/serious incident investigations to apportion blame or liability.

Readers are advised that Nigerian Safety Investigation Bureau investigates for the sole purpose of enhancing aviation safety. Consequently, Nigerian Safety Investigation Bureau reports are confined to matters of safety significance and should not be used for any other purpose.

As the Bureau believes that safety information is of great value if it is passed on for the use of others, readers are encouraged to copy or reprint for further distribution, acknowledging the Nigerian Safety Investigation Bureau as the source.

Recommendations in this report are addressed to the Regulatory Authority of the State (NCAA) and relevant stakeholders. It is for the authority to ensure enforcement.

Printed in Nigeria for the Nigerian Safety Investigation Bureau (NSIB)

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GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

ARFFS	Aerodrome Rescue and Fire Fighting Service
ATO	Approved Training Organization
ATPL	Airline Transport Pilot Licence
ATPL	Airline Transport Pilot Licence
DNKA	General Hassan Usman Katsina International Airport
DNKN	Mallam Aminu Kano International Airport
FAAN	Federal Airports Authority of Nigeria
FI	Flight Instructor
ICAO	International Civil Aviation, Nigerian Safety
MCC	Multi Crew Coordination
NAMA	Nigerian Airspace Management Agency
NCAA	The Nigerian Civil Aviation Authority
NCAT	Nigerian College of Aviation Technology
Nig. CARs	Nigeria Civil Aviation Regulations
NSIB	Nigerian Safety Investigation Bureau
PF	Pilot Flying
PM	Pilot Monitoring
SB's	Service Bulletins
SP	Student Pilot
VMC	Visual Meteorological Conditions

Report number:	NCAT/2022/12/31/F
Operator:	Nigerian College of Aviation Technology, Zaria
Aircraft type and model:	Beech Baron 58
Manufacturer:	Hawker Beechcraft LTD, Wichita, Kansas, USA
Year of manufacture:	1995
Serial number:	TH-1756
Nationality and registration marks:	5N-CAG
Location:	Runway 05 General Hassan Usman Katsina International Airport, Kaduna
Date and Time:	31 December, 2022 at about 10:16 h (*All times in this report are local time, equivalent to UTC+1 unless otherwise stated*)

SYNOPSIS

Nigerian Airspace Management Agency (NAMA) notified Nigerian Safety Investigation Bureau (NSIB) of the occurrence on 31 December, 2022. Investigators were dispatched to the site same day and post occurrence assessment commenced under the provisions of the Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2023 and ICAO Annex 13.

On 31 December, 2022 a Beech Baron 58 aircraft operated by Nigerian College of Aviation Technology (NCAT) Zaria with nationality and registration marks 5N-CAG, was schedule for Airline Transport Pilot Licence (ATPL) training on instrument approach procedures in General Hassan Usman Katsina International Airport (DNKA) Kaduna. Four persons were onboard including the Flight Instructor (FI), the Student Pilot (SP) and two additional

student pilots seated at the rear with fuel endurance of 6 hours. The SP was the Pilot Flying (PF) on the left seat and the FI was the Pilot Monitoring (PM) on the right seat.

At 10:15 h, 5N-CAG requested for take-off which was granted. The flight crew further stated that after line-up for take-off the throttle was advanced, confirmed centre line and then full power, wind was 23 kt. Immediately after lift-off, the cockpit door on the right side opened. The SP continued with the take-off while the FI attempted to close the door. As the FI tried to close the door, the SP reduced the throttle lever to 300 RPM. With the door still open, the crew decided to land the aircraft straight ahead on the remaining runway. The FI took over control of the aircraft, closed the throttle levers and confirmed with the SP whether the landing gears were down. The SP replied that the landing gear was down with three greens.

The flight crew stated that, on landing the left main wheel touched the runway first followed by the right main wheel. The aircraft veered to the right and FI applied left rudder to keep the aircraft on the runway. The right main landing gear sheared off and the right wing impacted the runway as the aircraft veered to the right of the runway.

All the occupants disembarked unhurt.

The incident occurred at 10:16 h, day time in Instrument Meteorological Conditions.

Causal factor

The decision to land the aircraft within the remaining runway available during the initial climb instead of continuing with the flight using the appropriate procedure to land normally.

Contributory factors

1. The opening of the cockpit door during the initial climb.
2. Failure to execute the door unlatch checklist emergency procedures.

Four (4) safety recommendation were made in this report

1.0 FACTUAL INFORMATION

1.1 History of the flight

On 31 December, 2022 a Beech Baron 58 aircraft operated by Nigerian College of Aviation Technology (NCAT) Zaria with nationality and registration marks 5N-CAG, was schedule for Airline Transport Pilot Licence (ATPL) training on instrument approach procedures in General Hassan Usman Katsina International Airport (DNKA) Kaduna. Four persons were onboard including the Flight Instructor (FI), the Student Pilot (SP) and two additional student pilots seated at the rear with fuel endurance of 6 hours. The SP was the Pilot Flying (PF) on the left seat and the FI was the Pilot Monitoring (PM) on the right seat.

The ATPL training was initially scheduled to be conducted at Mallam Aminu Kano International Airport (DNKN) Kano with Diamond 42 (5N-CZA and 5N-BZE) where jet A1 fuel was readily available. The Service Bulletins (SB's) with reference number MSB 42-143/1 and MSB 42NG-086/1 requiring inspection of a hole position and condition in the rudder steering bracket rendered the DA-42 aircraft unserviceable. NCAT decided to continue the training at DNKA with a Beech Baron 58 (5N-CAG) that uses AVGAS which was available in Kaduna.

At 09:20 h, the FI briefed the SP on the training and the SP carried out preflight inspection in accordance with the Baron 58 (B 58) NORMAL PROCEDURES Checklist.

At 09:56 h, 5N-CAG requested for engine start-up for a non-precision VOR/DME instrument approach exercise for Runway 05 from Tower which was granted.

At 10:00 h, 5N-CAG requested for taxi and it was granted. According to the SP, during taxi the throttle levers were stiff and the engine RPM were not synchronized. The FI confirmed the indication as normal when asked.

The flight crew stated that, at the holding point before take-off the checklist was completed and all parameters were found in the green.

At 10:15 h, 5N-CAG requested for take-off runway 05 which was granted. The crew confirmed that they were on runway centerline and advanced the throttles for take-off. immediately after lift-off, the cockpit door on the right side opened. The SP continued with the take-off while the FI attempted to close the door. As the FI tried to close the door, the SP reduced the throttle lever to 300 RPM. With the door still open, the flight crew decided to land the aircraft straight ahead on the remaining runway. The FI took control of the aircraft, closed the throttle levers and confirmed with the SP whether the landing gears were down. The SP replied landing gears down with three greens.

On landing, the left main wheel touched the runway first followed by the right main wheel. The aircraft veered to the right and FI applied left rudder to keep the aircraft on the runway. The torque link sheared off and inner cylinder of the right main landing gear pulls out and separated from the outer cylinder. The right wing impacted the runway. The aircraft veered to the right and finally stop at the edge of runway 05 with the right wing dripping fuel.

The flight crew notified Tower of the occurrence and requested the assistance of the Emergency services followed by the complete shutdown of the aircraft. At 10:19 h the Aerodrome Rescue and Fire Fighting Service (ARFFS) arrived the scene of the occurrence. All the occupants disembarked unhurt.

The incident occurred at 10:16 h, day time in Visual Meteorological Conditions (VMC).

1.2 Injuries to persons

Injuries	Crew	Passengers	Others	Total in the aircraft
Fatal	Nil	Nil	Nil	Nil
Serious	Nil	Nil	Nil	Nil
Minor	Nil	Nil	Nil	Nil
None	2	2	Nil	4
Total	2	2	Nil	4

1.3 Damage to aircraft

The aircraft was substantially damaged.

1.4 Other damage

Nil

1.5 Personnel information

1.5.1 Flight Instructor

Nationality:	Nigerian
Age:	54
Licence type:	Airline Transport Pilot Licence (Aeroplane)
Licence:	Valid till 9 May, 2023
Aircraft ratings:	Part 1: Beech Baron-58, Tampico Club TB-9 and Daher-Socata TBM 850
Medical certificate:	Valid till 9 May, 2023
Total flying time:	5000 h
Total on type:	400 h
Total on type (PIC):	370 h
Last 90 days:	50 h
Last 28 days:	0 h
Last 7 days:	0 h
Last 24 hours:	0 h

1.5.2 Student Pilot

Nationality:	Nigerian
Age:	31
License type:	Commercial Pilot Licence (Aeroplane)
Licence	Valid till 7 March 2023
Aircraft ratings:	Part 2: Embraer-135/145 Beach Baron-58, Tampico Club TB-9
Medical certificate:	Valid till 7 March 2023
Total flying time:	1972 h
Total on type (PIC):	344 h
Last 90 days:	170 h
Last 28 days:	40 h
Last 7 days:	0 h
Last 24 hours:	0 h

1.5.3 Engineer

Nationality:	Nigerian
Age:	53
License type:	Aircraft maintenance engineer
Licence	Valid till 13 June, 2027
Aircraft ratings:	Beech Baron-58, Daher-Socata TBM 850, Tampico Club TB-9, Trinidad GT TB-20, Diamond DA 42, Diamond DA 40

1.6 Aircraft information

1.6.1 General information

Type:	Beech Baron 58
Manufacturer:	Hawker Beechcraft LTD, Wichita, Kansas, USA
Year of manufacture:	1995
Serial number:	TH-1756
Certificate of airworthiness:	Valid till 25 April, 2023
Certificate of insurance:	Valid till 3 January, 2023
Certificate of registration:	Issued on 30 April, 2007
Total airframe time:	2014:41 h
Total Landing Cycles:	3209

1.6.2 Engines

Engine	**Number 1**	**Number 2**
Manufacturer	Continental Motors, INC USA	Continental Motors, INC USA
Type/Model	Continental IO-550-C1F	Continental IO-550-C1F
Serial number	1038268	1037709
Time since new	315:55 h	315:55 h

1.6.3 Propellers

Propeller	**Number 1**	**Number 2**
Manufacturer	McCauley USA	McCauley USA
Type/Model	3AF32C512-C	3AF32C512-C
Serial number	181086	951223
Time since new	315:55 h	315:55 h
Number of blades	3	3

Fuel Used: AVGAS

Figure 1: Beech baron 58 (5N-CAG) before the occurrence

1.6.4 Maintenance

The last annual inspection was carried out on the aircraft on 28 December, 2022 in accordance with the B 58 maintenance schedule. Engine ground run was carried out and all parameters were checked and found ok.

The Bureau was informed of previous instances of the door opening in flight. The aircraft technical logbook was inspected for a period of four months and there was no entry regarding cockpit door opening in flight.

During the site inspection, the Bureau observed that with the cockpit door closed and locked from the inside, indicating LOCKED, the door handles outside did not latch.

Figure 2: The unlatched starboard door handle

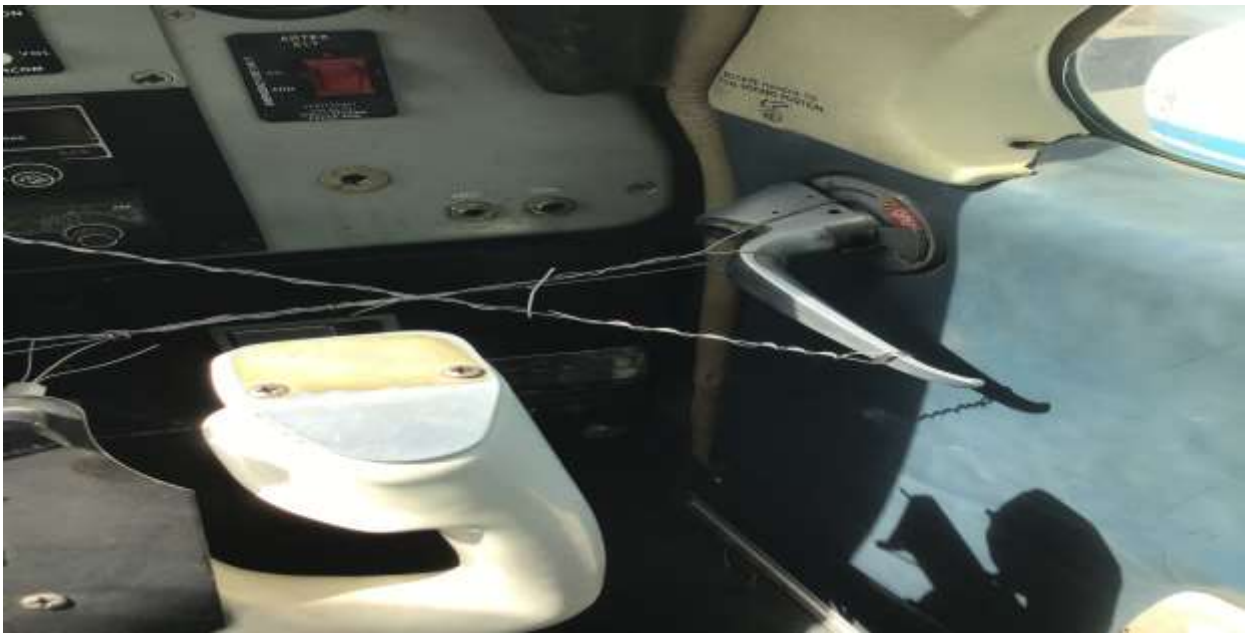

Figure 3: The starboard door locked from inside the cockpit

1.6.5 Excerpts from Aircraft Maintenance Manual (Beech Baron 58)

1.6.5.1 Landing Gear General Description and Operation

Landing Gear System

The landing gear system is operated through adjustable linkage connected to an electro mechanical actuator assembly mounted behind the forward spar carrier-thru. The actuator assembly is driven by an 14 or 28 volt electric motor controlled by the landing gear position switch mounted near the lower center of the instrument panel, the limit switches are mounted adjacent on the left hand side of the actuator assembly. The dynamic brake relay is mounted to the right side of the gear actuator. There are two ground safety switches one located on each main landing gear strut assembly. The landing gear motor, dynamic brake relay, limit switches and actuator assembly are accessible by removing the front seats & spar cover. The landing gear may be operated electrically UP or DOWN and also may be lowered manually. By tripping the landing gear motor circuit breaker and extending the hand crank located on the actuator assembly then turning clockwise (average 50 turns to full down and locked), this should be done in an emergency only. The landing gear circuit consists of the landing gear position switch, UP and DOWN limit switches, two ground safety switches, resettable circuit breaker, drive motor and a dynamic brake relay. When the landing gear switch is placed in the UP position and the aircraft is airborne.

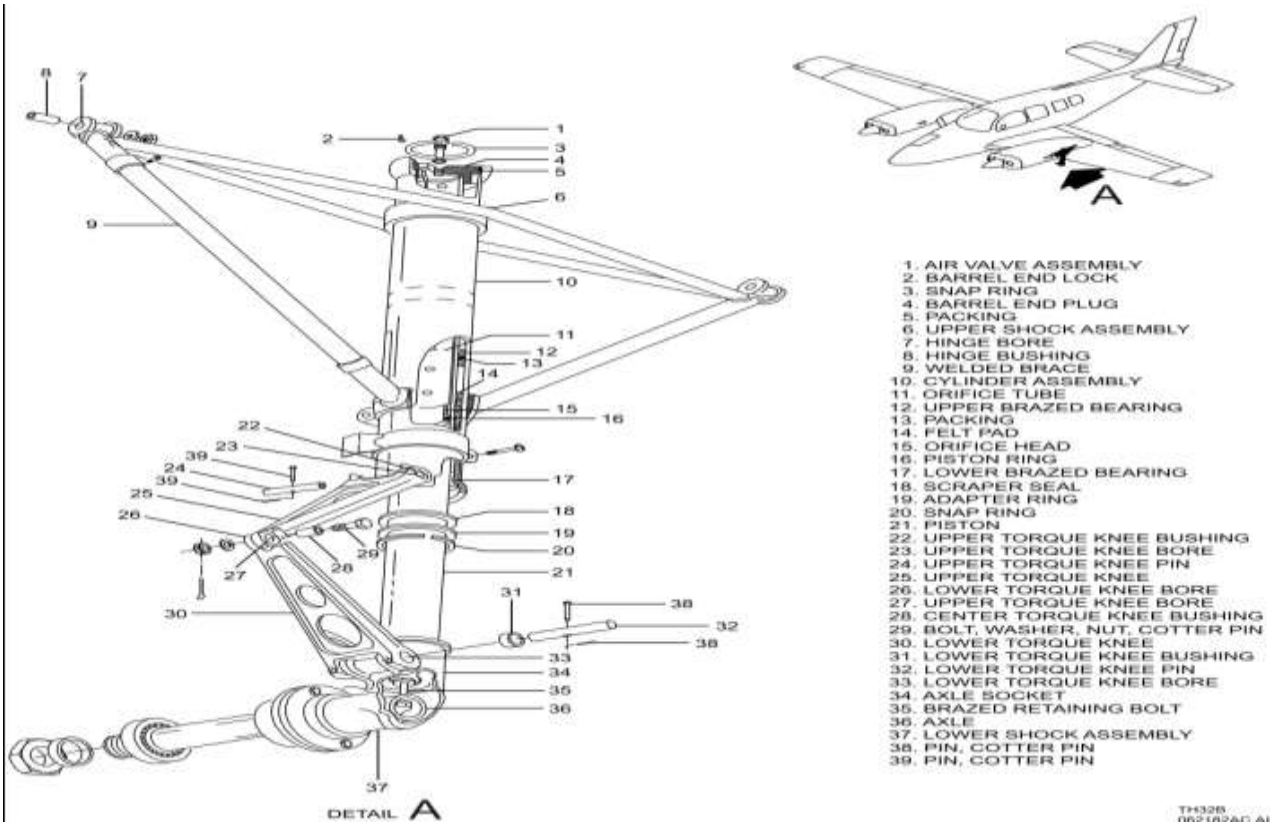

Figure 4: Main Landing Gear Assembly

1.6.5.2 Excerpts from Aircraft Maintenance Manual (Beech Baron 58)

Doors General Description and Operation

The cabin door is located on the right hand side of the fuselage just aft of the trailing edge of the wing. The door is opened by pushing in the latch button which releases the locking mechanism and allows the door to open. The door may be locked by the key

furnished with the airplane.

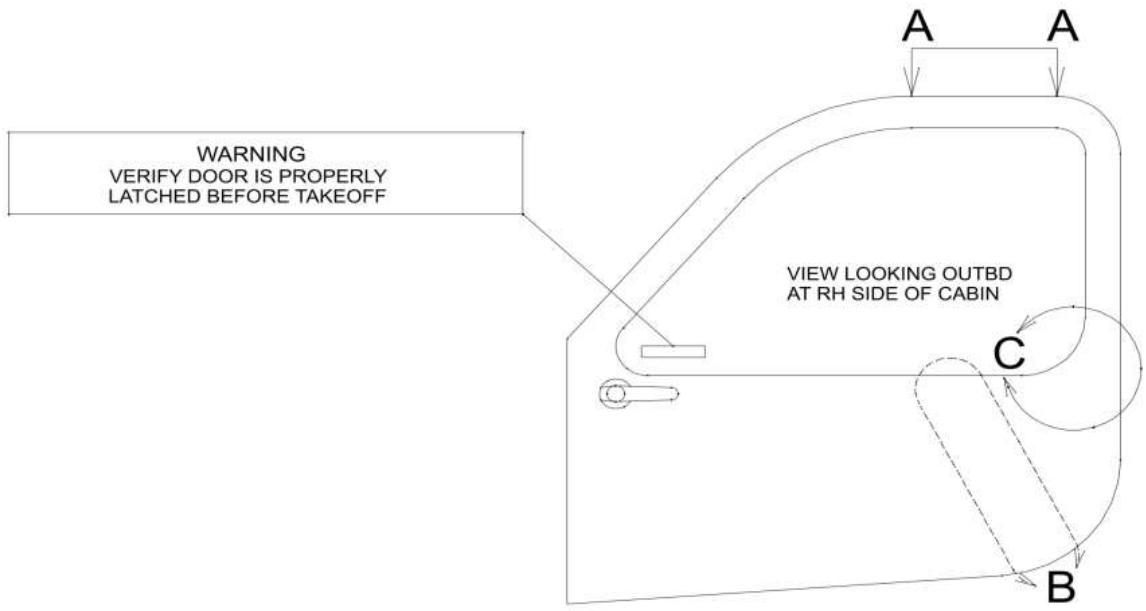

Figure 5: Cabin door latching point

1.6.5.3 Excerpts from Aircraft Maintenance Manual (Beech Baron 58)

Doors - Passenger/Crew - Adjustment/Test

(1) Latching Adjustment If any of the following conditions exist, check and adjust the cabin door latching mechanism:

- *The door is difficult to close.*
- *There is excessive wind noise around the door*
- *The door is not airtight or watertight.*
- *The door is opening in flight.*
- *The door has recently been removed or repaired.*

(a) Make sure the door's internal latch mechanism is not binding and/or preventing proper door closing as follows:

1. *With the door in the open position, operate the latching mechanism several times to ensure that the internal mechanism is operating smoothly and properly.*

2. *With the door still in the open position, rotate the inside door handle counterclockwise as far as possible. Mark the inside handle escutcheon plate at the edge of the blade protruding from the inner forward end of the handle.*
3. *Place the latch in the open position and then close and latch the door. Check to see that the handle rotates to the position that was marked in the previous step. If the handle does not line up with the mark, open the door and remove the door upholstery. Inspect the latching mechanism to determine the reason for the interference and make the necessary adjustments. Note: The areas of possible interference are where the lower pin, the upper latch hook, and the aft latch bolt engage in the door frame.*

1.7 Meteorological information

DNKA	**0800z**
Wind:	070/19 kt
Visibility:	2000 m
Weather:	Haze
Cloud:	NSC
Temp/Dew:	18/-01 ^{o}C
QNH:	1020
DNKA	**0900z**
Wind:	050/15 kt
Visibility:	2000 m
Weather:	Haze
Cloud:	NSC
Temp/Dew:	20/-01 ^{o}C
QNH:	1021

1.8 Aids to navigation

The status of the navigational aids at General Hassan Usman Katsina international Airport Kaduna on the day of the occurrence were as follows:

"KDA" VOR/DME 115.3 MHz	-	'Serviceable'
Met Information System/L.L.W.A.S	-	'Serviceable'
WIND DIRECTION/SPEED INDICATORS	-	'Serviceable'

1.9 Communication

Effective communication between the aircraft and air traffic control existed up to the point of take-off. After the landing, 5N-CAG declared an emergency and requested for a fire truck. The ATC enquired for the nature of the emergency but the crew did not response. When ATC called again for the nature of the emergency, the crew responded that the right main landing gear was damaged.

The Tower audio recording system was unserviceable at the time of the occurrence.

The status of communication aids at General Hassan Usman Katsina international Airport Kaduna on the day of the occurrence were as follows:

MOSE/INTERCOM PHONE/ITEL/HUAWEI/HUAWEI NEW	-	'Serviceable'
ALDIS LAMP/ATC CLOCK/BINOCULARS	-	'Serviceable'
VHF 118.8 MHz Tower Main Frequency	-	'Serviceable'
VHF 118.5 MHz, 121.7 MHz, 122.3 MHz, 124.3MHz	-	'Serviceable'

1.10 Aerodrome information

General Hassan Usman Katsina international Airport (DNKA) Kaduna is located 29 km North-West of Kaduna with coordinates 10°41'39.4"N 7°19'06.0"E and has an elevation of 632 m. The aerodrome has a runway of an asphalt/concrete surface with orientation of 05/23. The length and width of the runway are 3000 m and 60 m respectively.

The control tower at (DNKA) was temporarily located at the Aerodrome Rescue and Fire Fighting services (ARFFS) watch room at the time of the occurrence. The watch room provides limited viewing of the extreme end of runway 05.

Figure 6: ARFFS Watch room/ATC Tower

Figure 7: ATC tower under construction

On the safety investigators' arrival at the scene of the occurrence, it was discovered that the aircraft had been moved away from its final position to another location 713 m along the runway after the occurrence.

The distance from the threshold of runway 05 to the point where the right main landing gear sheared off is 847 m.

The distance from the point where the right main landing gear sheared off to the aircraft's final position is 203 m.

Figure 8: Area view of General Hassan Usman Katsina international Airport Kaduna showing distance the aircraft was moved

The DATCO on duty reported that he did not grant permission to remove the aircraft from the incident site. There was no evidence that the Bureau permitted the removal.

1.11 Flight recorders

The aircraft was not equipped with a Flight Data Recorder (FDR) or Cockpit Voice Recorder (CVR), as the regulations required Neither of this.

1.12 Wreckage and impact information

During take-off and after lift-up the right hand cockpit door opened. The FI closed engine power and landed the aircraft. This resulted in the hard impact of the right main landing gear on the runway surface and the right main landing gear sheared off.

The damages sustained by the aircraft include;

- The right main landing gear torque link sheared-off

- The right main landing gear inner cylinder separated from the outer cylinder
- The right wing lower section of the tank tore-off
- Two of the propeller blades of the right engine bend outward and the other bends rearward
- The aircraft's right door step broke-off

Figure 9: The aircraft after the occurrence

Figure 10: The aircraft after the occurrence

Figure 11: The sheared right main landing gear

Figure 12: The remaining part of the landing gear attach to the aircraft

Figure 13: The remaining part of the landing gear attach to the aircraft after it was moved

Figure 14: Bent propeller blade at the tip

Figure 15: The broken right door step

Figure 16: The ruptured right tank from the bottom

Figure 17: The ruptured right tank from the bottom

1.13 Medical and pathological information

Post-incident medical examination (including physical, mental, psychology and full toxicology) was conducted on the crew at Mends Specialist Hospital and Aviation Medical Centre in Kaduna on the 31 December 2022 at about 14:00 h. The medical examination is attached.

1.14 Fire

There was no fire.

1.15 Survival aspect

During landing, the right main landing gear sheared off due to the impact with the runway surface. As a result, the left wing tank was drag over the runway surface and torn underneath. At 10:19 h, Aerodrome Rescue and Fire Fighting Service (ARFFS) arrived at the scene and discovered fuel spillage from right wing tank and hydraulic fluid from the detached right main wheel. ARFFS uses one charged length of hose to flush out the fuel spill and maintained a standby at the scene.

The incident was survivable because structural integrity of the cabin was not compromised and there was no fire. The FI and the SP exited the aircraft through the cockpit door while the two occupants exited the aircraft through the cabin door. The seats and seat belt harness were intact. There was no evacuation.

1.16 Test and research

Not applicable.

1.17 Organizational and management information

1.17.1 Nigeria Civil Aviation Authority (NCAA)

The Nigerian Civil Aviation Authority (NCAA) is the apex body responsible for the regulations and oversight of the activities of civil aviation in Nigeria. NCAA issues

authorizations, licenses, approvals, permits and certificates to personnel, airline operators, air navigation services providers, aerodrome operators, and other service providers in the aviation sector. It exercises its privileges, among other means, by carrying out inspections and audits based on the instrumentality of the Civil Aviation Act of 2006 and the Nigeria Civil Aviation Regulations (Nig. CARs).

1.17.1.1 Excerpt from Nigeria Civil Aviation Regulations (Nig.Cars) 2015

3.2.1.14 PERSONNEL – GENERAL REQUIREMENTS

(a) The ATO shall nominate a person responsible for ensuring that it is in compliance with the requirements for an approved organisation.

(b) The ATO shall employ the necessary personnel to plan, perform, and supervise the training to be conducted.

(c) The competence of instructional personnel shall be in accordance with procedures to a level acceptable to the Authority.

(d) The ATO shall ensure that all instructional personnel receive initial and recurrent training appropriate to their assigned duties and responsibilities.

(e) The training programme established by the ATO shall include training in knowledge and skills related to human performance.

(f) The training programme for ATO personnel shall be contained in the ATO Procedures Manual.

8*.5.1.9. COMPLIANCE WITH CHECKLISTS.*

(a) The PIC shall ensure that the flight crew follows the approved checklist procedures when operating the aircraft

8.5.1.19. REPORTING MECHANICAL IRREGULARITIES.

(a) The PIC shall ensure that all mechanical irregularities occurring during flight time are—

(b) For general aviation operations, entered in the aircraft logbook and disposed of in accordance with the MEL or other approved or prescribed procedure.

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12.6. OBLIGATIONS OF THE AERODROME OPERATOR

12.6.27. REMOVAL OF DISABLED AIRCRAFT

The aerodrome operator shall:

(b) designate an experienced and competent officer representing the Aerodrome operator to co-ordinate and liaise with ATS, the Accident Investigation Bureau, the Authority, the Aircraft operator, Customs and Immigration Departments if the aircraft is involved in international operation, and note that the aircraft is the property of the Aircraft operator and his or her insurers and that the task of moving the aircraft is the responsibility of the Aircraft operator or owner;

(c) provide the capability of removing the disabled aircraft by following his or her plan for supplying of equipment, for dealing with nominated agents acting on behalf of each operator at the Aerodrome and local contractors capable of facilitating the aircraft removal operations;

(d) make available a mobile office for the aircraft removal operation with communication links with ATS;

(e) secure the scene of the incident or accident with security personnel;

(f) keep records of all events, and photographs of the scene.

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14.1. PROVISION OF AIR TRAFFIC SERVICES `

14.1.1 The Authority shall determine the portions of the Nigerian airspace and the aerodromes which shall be provided with air traffic services to:

(a) prevent collisions between aircraft;

(b) prevent collisions between aircraft on the maneuvering area of the aerodrome concerned and obstructions on such area;

(c) expedite and maintain an orderly flow of air traffic;

(d) provide advice and information useful for the safe and efficient conduct of flights; and

(e) provide aeronautical search and rescue and related support services.

1.17.2 The Nigerian College of Aviation Technology (NCAT), Zaria

The Nigerian College of Aviation Technology, Zaria, (formerly known as Nigerian Civil Aviation Training Center) was set up by Act. No 31 of 1964 (as amended), with Approved Training Organization (ATO) number NCAA/ATO/AA/001. NCAT conducts:

1. Civil Aviation courses for use in flight training or airport operations & management as may be prescribed from time to time.
2. Training of approved persons in the installation, maintenance and operation, as the case may be, of technical equipment, the use of which is calculated or likely to increase the margin of operational safety of civil aircrafts.
3. Training on equipments and necessary facilities for technical research or normal use.

The college has 26 aircraft in its fleet including eight TB 9, five TB 20, three Baron 58, one TBM 850 seven DA40NG and two DA42NG.

The ATPL training was initially scheduled to be conducted at Mallam Aminu Kano International Airport (DNKN) with Diamond 42 (5N-CZA and 5N-BZE) where jet A1 fuel was readily available. The service bulletins (SB's) with reference number MSB 42-143/1 and MSB 42NG-086/1 requiring inspection of a hole position and condition in the rudder steering bracket rendered the DA-42 aircraft unserviceable. NCAT decided to continue the training in General Hassan Usman Katsina international Airport (DNKA) Kaduna with a Beech Baron 58 (5N-CAG) that uses AVGAS which was available in Kaduna.

Evidence available to the Bureau indicates that;

- The flight maintenance engineers were trained last on B58 in 2017.
- Flight Instructors refresher course, Multi Crew Coordination (MCC) refresher were not consistent with safety regulations and best practices.
- Refresher courses for Flight maintenance engineers was not consistent with safety regulations and best practices.

1.17.2.1 Excerpt from NCAT Flying School Procedures Manual Chapter 4: Staff Recruitment, Training and Evaluation

4.4 REFRESHER TRAINING

4.4.1 FLYING AND SIMULATOR INSTRUCTORS

Every year, each Flying Instructor shall undergo Flying Instructor refresher course at any NCAA approved facility.

1.17.2.2 Excerpt from NCAT Maintenance Management Exposition Part 3

3.4.0 CERTIFYING STAFF QUALIFICATION AND TRAINING PROCEDURES

A personnel named certifying staff usually holding a Nigerian licence and is authorized by NCAT to sign the certificate of release to service.

The certifying staff may only certify components or/ and aircraft for which they are authorized by their licence. The licence must be valid while signing.

Certifying staff will undergo recurrent training every second year. This training is arranged by the Quality Assurance Manager.

For details of certifying staff, refer to Part 1 of this Exposition.

1.17.2.3 Excerpt from NCAT Safety Management Systems Manual (SMS)

Chapter Three: Safety Risk Management

Introduction

Safety Risk Management is a formal process that is used to identify hazards associated with our operations, the analysis and assessment of the risks associated with exposure to those hazards, and the implementation of controls, when necessary, to prevent future accidents and incidents.

Our safety risk management process is both reactive and proactive. The process can also be used to prioritize the resulting process improvements to ensure the best allocation of our resources.

Hazard Identification

The purpose of hazard identification is to allow for a safety analysis of the risks associated with exposure to the hazard and the subsequent elimination of the hazard or the reduction of its risks to an acceptable level. While the identification of every conceivable hazard is impossible, all employees must exercise due diligence to identify hazards related to their operations. These hazards can be actual or foreseeable. All hazards identified and communicated to the Head Safety Unit (Safety Manager) will be assigned a unique tracking number and be introduced into the Safety Risk Management process described in this chapter.

The College utilizes reactive, proactive and predictive methods of hazard identification.

*Our traditional **reactive methods** of hazard identification will analyze hazards that have been identified or have already contributed to a mishap. These reactive processes include the conduct of investigations into accidents, incidents, occurrences, employee reports, and regulatory violations.*

*The College also utilizes **proactive methods** of hazard identification. Proactive methods attempt to identify and analyze hazards before they have resulted in an incident or accident. Our proactive methodologies are discussed below:*

- *During the implementation of our SMS, all existing procedures and operations will be analyzed to identify inherent risks.*
- *All significant changes to our operations will be analyzed prior to implementation to foresee new hazards and to revise the proposal to eliminate the hazards or to control the risks to an acceptable level. This process is described in section 3.2.2 of this manual.*

*Our organization also utilizes **predictive methods** of hazard identification. Predictive method continuously looks at Operational data real-time as it happens to identify hazards in order to take corrective measures to prevent occurrences or incidents. Our predictive methodologies include:*

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Mandatory Reporting Programs

By the regulations, we are required to participate in several mandatory reporting programs. These programs will continue, but will now become incorporated into our SMS.

This means that all reports will still be made to the NCAA per standard procedures, but copies of the report will also be supplied to the Head, Safety Unit for inclusion into the Safety Risk Management process as appropriate.

Our College is affected by mandatory reporting programs that require notification on aircraft accidents, incidents, occurrences, malfunctions, and defect reports. These reports and notifications must now be reported to the Head, Safety Unit as well for incorporation into our safety risk management process.

Voluntary Reporting Program

Employees who work daily in the operational areas of the company are in the best position to be aware of hazards and incidents. Thus, all personnel are strongly

encouraged to report all current or potential hazards, as well as actual incidents where our procedures did not adequately ensure the proper level of safety. Also, reports should be made when procedures were not followed for either inadvertent or intentional reasons.

Reports may be made verbally to any member of the Safety Unit, but it is preferred that the report is made in writing to the Head, Safety Unit using Form NCATSMS 003 Hazard Identification Report Form.

1.17.3 Extract from Raytheon Aircraft Beech Baron 58

Before Take-Off Checklist

BEFORE TAKEOFF

1. Parking Brake. . . . . SET
2. Seat Belts and Shoulder Harnesses . . . . . CHECK
3. Fuel Boost Pumps . . . . . OFF
   (if ambient temperature is 32°C or above, use LOW pressure boost)
4. All Instruments . . . . . CHECKED
5. Fuel Indicators . . . . . CHECK QUANTITY INDICATED

6. Mixture:

(TH-1472 Thru TH-1840, Not In Compliance With Raytheon Aircraft S.B. 28-3052):

- FULL RICH

(TH-1841 and After, and Prior Airplanes In Compliance With Raytheon Aircraft S.B. 28-3052):

- ADJUST AS REQUIRED BY FIELD ELEVATION WHEN SETTING FULL POWER FOR TAKEOFF

7. Fuel Selectors . . . . . CHECK ON
(feel for detents & visually check)
8. Starter Energized Annunciator . . . . . CHECK
(Should be illuminated during start and extinguished after start. If annunciator is inoperative, check loadmeters for proper indication)
9. Throttles . . . . . 2200 RPM

CAUTION

When checking the minimum governing RPM, do not move the propeller controls past the detent. To do so will allow the propellers to feather, imposing high stresses on the blade shanks and engines.

10. Propeller Controls . . . . . RETARD TO THE DETENT
(Verify RPM decreases to approx. 2000 RPM)
11. Throttles . . . . . 1700 RPM
12. Magnetos. . . . . CHECK
(variance between individual magnetos should not exceed 50 rpm, max drop 150 rpm)
13. Throttles . . . . . 1500 RPM
14. Propellers . . . . . FEATHERING CHECK
(do not allow an rpm drop of more than 300 RPM)

15. Throttles . . . . . .IDLE (note RPM)
16. Throttles . . . . . 900 to 1000 RPM
17. Trim. . . . . AS REQUIRED FOR TAKE-OFF
18. Flaps . . . . . CHECK AND SET FOR TAKE-OFF
19. Flight Controls. . . . . CHECK
    (for proper direction and freedom of movement)
20. Ice Protection Systems . . . . . AS REQUIRED
21. Windows . . . . . .LOCKED
22. Doors . . . . . .LOCKED
    (On serials TH-1543, TH-1545 and After,
    Check Cabin Door Lock Indicator - CLOSED)
23. Parking Brake . . . . . .OFF

TAKEOFF

CAUTION

Do not operate above 1200 rpm until oil temperature reaches 24°C or above and oil pressure is in the green.

1. Power . . . . . SET BEFORE BRAKE RELEASE
   a. Throttles . . . . . FULL FORWARD
   b. Propellers. . . . . HIGH RPM
   c. Mixture:

1.17.3.1 Extract from Raytheon Aircraft Beech Baron 58

Unlatched Door in Flight

Section III
Emergency Procedures

Raytheon Aircraft
Beech Baron 58

UNLATCHED DOOR IN FLIGHT

If the cabin door is not properly latched, it may open in flight. The door may trail open approximately 3 inches, but the flight characteristics of the airplane will not be affected, except the rate of climb will be reduced.

1. Maintain control of the airplane.
2. Do not attempt to close the door until after landing.
3. All occupants fasten seatbelts.
4. Land as soon as practical using Normal Procedures.

If occupant can assist from right seat:

5. Hold door during and after landing to prevent it from swinging open.

3-22 June, 2003

1.17.3.2 Extract from Raytheon Aircraft Beech Baron 58

Before landing Checklist

Raytheon Aircraft
Beech Baron 58

Section IV
Normal Procedures

BEFORE LANDING

1. Seat Belts and Shoulder Harnesses . . . . . FASTENED
2. Seat Backs . . . . . POSITION FOR LANDING
3. Fuel Selector Valves . . . . . CHECK ON
   (feel for detent & visually check)
4. Fuel Boost Pumps . . . . . OFF OR LOW AS PER
   AMBIENT TEMPERATURE
5. Cowl Flaps . . . . . AS REQUIRED
6. Mixture Controls:

(TH-1472 thru TH-1840, Not In Compliance With Raytheon Aircraft S.B. 28-3052):

- FULL RICH

(TH-1841 and After, and Prior Airplanes In Compliance With Raytheon Aircraft S.B. 28-3052):

- AS REQUIRED BY FIELD ELEVATION

7. Flaps (152 kts max.). . . . . APPROACH (15°)
8. Landing Gear (152 kts max.) . . . . . DOWN
9. Flaps (122 kts max.). . . . . FULL DOWN (30°)
10. Airspeed . . . . . ESTABLISH NORMAL
    LANDING APPROACH SPEED
11. Propellers . . . . . HIGH RPM

June, 2003

4-23

1.17.4 Excerpt from Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2019

19.—(1) Where an accident or a serious incident occurs in Nigeria, the Bureau shall take all reasonable measures to protect the evidence and to maintain safe custody of the aircraft and its contents for such a period as may be necessary for the purposes of an investigation. Protection of evidence shall include the preservation, by photographic or other means of any evidence which might be removed, effaced, lost or destroyed. Safe custody shall include protection against further damage, access by unauthorized persons, pilfering and deterioration.

2.—(a) No person other than the Commissioner, the investigator-in-charge or an authorized person shall have access to the aircraft involved in the accident or serious incident, the contents thereof, or the site of the accident or serious incident; and

(b) No person shall move or interfere with the aircraft, its contents or the site of the accident or serious incident except under the authority of the commissioner or the investigator-in-charge.

5. Where the Commissioner or investigator-in-charge is of the opinion that the aircraft involved in the accident or serious incident is likely to be in danger or obstruction to the public, air navigation or other transport, he may order the owner, operator or hirer of such aircraft to remove the aircraft to such place as the Commissioner or investigator-in-charge shall indicate.

1.18 Additional information

1.18.1 Stall

When a plane flies, the air around the wings is at different pressures. The air passing over the wing has a lower pressure than the air passing under the wing, generating lift and 'pushing' the aircraft upwards.

However, when an aircraft increases its 'angle of attack,' known as the angle at which the wings face oncoming air, a separate flow of air is created behind the wings where

the two air pressures mix. At a certain point, the separated flow reaches a critical mass that stops lift generation.

Without lift, the aircraft will start to fall no matter how powerful the engines are or how fast it flies. The point where an aircraft wing reaches stalling conditions by raising the nose of the plane is called the critical angle of attack. It is generally over 15 degrees, hence why you rarely see aircraft take off or land at a steep angle.

While every stall situation is different, the general advice for pilots to recover from a stall is to lower the nose of the aircraft (and thus decrease the angle of attack) and increase speed.

Source Simple flying.com

1.18.2 Hard landing

A hard landing occurs when an aircraft or spacecraft hits the ground with a greater vertical speed and force than in a normal landing. A hard landing is never intended and if an aircraft has had a hard landing, it must be inspected for damage before its next flight. Depending on aircraft type and/or environmental conditions.

Source Wikimedia

2.0 ANALYSIS

2.1 General

The aircraft had a valid Certificate of Airworthiness. The flight crew was licensed and qualified to conduct the flight.

According to the SP, the throttle levers were stiff during taxi and the engine RPM was not synchronized. The post occurrence investigation shows that the throttle lever can be adjusted to be soft or stiff depending on the flight crew's requirement and the engine synchronization can be achieved with manual adjustment.

A review of the technical logbook over 4 months indicated that no maintenance was carried out on the main landing gear.

The Flight Instructor's refresher course, Multi Crew Coordination (MCC) refresher was not consistent with the NCAT Flying School Procedure Manual Chapter 4 subsection 4.4.1 and it contravenes section and subsection 3.2.1.14 (d) (1) Nig. CARs 2015 respectively.

Also, The Flight Maintenance Engineer's refresher course, was not consistent with the NCAT Maintenance Management Exposition Part 3 Subsection 3.4.0 and it contravenes section and subsection 3.2.1.14 (d) (1) Nig. CARs 2015 respectively.

This analysis focused on the conduct of the flight, door opening in flight, preservation of evidence and Location of the ATC unit in the Fire watch room in Kaduna Airport.

2.2 Conduct of the flight

The flight crew was cleared for take-off. immediately after lift-off, the cockpit door on the right side opened. The Student Pilot (SP) continued with the take-off while the Flight Instructor (FI) attempted to close the door but was unsuccessful. With the door still open, the crew decided to land the aircraft straight ahead on the remaining runway.

The decision to close the door in flight and land the aircraft straight ahead is not in compliance with section iii of Emergency procedure, UNLATCHED DOOR IN FLIGHT (Raytheon Aircraft Beech Baron 58). It contravenes section 8.5.1.9 (a) of Nig.CARs 2015.

The FI should have instructed the SP to continue with the flight using the appropriate procedure until landing as stated below.

- Maintain control of the airplane.
- Do not attempt to close the door until after landing.
- All occupants fasten seatbelts.
- Land as soon as practical using normal procedures.

With the throttle levers retarded to closed position during the initial climb, the forward speed of the aircraft decreased. Considering the remaining landing distance available, the FI initiated the landing manoeuvre to ensure the aircraft landed within the available distance. The left main wheel touched the runway first followed by the right main wheel. The aircraft then veered to the right and FI applied left rudder to keep the aircraft on the runway. The damage sustained by the aircraft was consistent with that sustained during a hard landing and side load during the landing roll.

2.3 Door opening in flight

During post occurrence interview, the Flight Instructor stated that there had been previous instances of the door opening in flight. The aircraft technical logbook was inspected for a period of 4 months and there were no snags reported with regards to the door opening in flight. In the Aircraft Maintenance Manual, conditions exist that the door might open in flight, if the door handle is not properly latched. Non the less, it should be reported, this would have allowed the Aircraft Maintenance Engineers to rectify it in accordance with the Aircraft Maintenance Schedule and contravenes section 8.5.1.19 of Nig.CARs 2015.

Any malfunction in the aircraft operation is a potential hazard and it should be reported to allow for a safety analysis of the risks associated with exposure to the hazard and the subsequent elimination of the hazard or the reduction of such risks to an acceptable level.

The decision not to report or snag the aircraft when the cockpit door opening in flight is not in line with the NCAT Safety Management Systems Manual chapter III Safety Risk Management.

During the site inspection, the Bureau observed that with the cockpit door closed and locked from the inside, indicating LOCKED, the door handles outside did not latch. The Beech baron 58 was not designed with a light or aural sound to indicate when the door is closed or open and latched from the cockpit. This would have alerted the flight crew that the door was not closed and locked before the flight.

2.4 Preservation of evidence

On arrival of the safety investigators to the scene of the occurrence, it was discovered that the aircraft was moved from its final position to another location 713 m along the runway after the occurrence. The Bureau is responsibility for determine the cause and circumstances surrounding the occurrence. This can be successfully achieved with proper preservation of evidence. This is very important as it enables the investigators to gather relevant and crucial evidence that can aid in the investigating the occurrence. Recall that, the propeller blades' tips struck the runway surface. The investigation could not identify where the blades struck the runway because the incident site was compromised. The investigations revealed that; the aircraft stop at the edge of the runway with the left wing deep into the runway after the occurrence. Hence, the runway was closed at 10:14 h and the relevant stakeholders were informed.

The aircraft was moved without obtaining permission from the bureau in contravention of Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2019 section 3 subsection (1) (2) paragraphs (a) and (b) respectively. Furthermore, Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2019 section 3 subsection 5 state that "Where the Commissioner or investigator-in-charge is of the opinion that the aircraft involved in the accident or serious incident is likely to be in danger or obstruction to the public, air navigation or other transport,

he may order the owner, operator or hirer of such aircraft to remove the aircraft to such place as the Commissioner or investigator-in-charge shall indicate". In light of the above, there was no request from the NCAT or FAAN to move the aircraft nor permission granted by the Bureau. If these had been done, the movement would have been properly documented, taking into account the nature and location of recovery. These also contravenes section 12.6.27. (b) of the Nig.CARs, 2015.

2.5 Location of the ATC unit in the Fire watch room at General Hassan Usman Katsina International Airport (DNKA) Kaduna

The control tower in DNKA is temporarily located at the ARFFS watch room at the time of occurrence. The watch room provides limited view of the end of runway 05. This contravenes section 14.1.1 (a), (b), (c) and (d) of the Nig. CARs 2015.

Control tower is responsible for aircraft on the maneuvering area, active runway, departing, landing and all aircraft airborne within the designated airspace. The current position of the tower does not permit the DATCO to perform his duty effectively. The DATCO should be able to scan the runway's full length and keep aircraft in sight aircraft during take-off roll, take-off, final approach, landing roll and when taxiing onto a runway or taxiing out. An aircraft should be watched closely by the tower so that proper clearances may be issued if the aircraft might need assistance. See figure below.

Figure 18: Area view of General Hassan Usman Katsina international Airport (DNKA) Kaduna showing the location of the Kaduna Tower and the ARFFS watch room

3.0 CONCLUSION

3.1 Findings

1. The flight crew were licensed and qualified to conduct the flight.
2. The aircraft had a valid Certificate of Airworthiness.
3. The flight was an Airline Transport Pilot License (ATPL) training on instrument approach procedures.
4. The SP was the Pilot Flying (PF) and the FI was the Pilot Monitoring (PM).
5. The ATPL training was initially scheduled to be conducted at Mallam Aminu Kano International Airport with Diamond 42 (5N-CZA and 5N-BZE).
6. The two DA-42 were unserviceable due to the Service Bulletin (SB) with reference number MSB 42-143/1 and MSB 42NG-086/1.
7. NCAT decided to continue the training at *General Hassan Usman Katsina international Airport* with Beech Baron 58 that uses AVGAS which was available in Kaduna.
8. immediately after lift-off, the cockpit door on the right side opened.
9. The SP continued with the take-off while the FI attempted to close the door.
10. The FI tried to close the door, the SP reduced the throttle lever to 300 RPM.
11. With the door still open, the crew landed the aircraft straight ahead on the remaining runway 1440 m from the of runway 05.
12. On the safety investigators' arrival to the scene of the occurrence, it was discovered that the aircraft was moved away from its final position to another location 713 m along the runway after the occurrence.
13. On landing, the left main wheel touched the runway first followed by the right main wheel.
14. The right main wheel sheared off from its attachment point.
15. The right wing impacted the runway and the aircraft veered to right of the runway.

16. The aircraft came to stop at the edge of the runway with the right wing dripping fuel.
17. The aircraft was moved to another location along the runway at about 713 m before the safety investigators arrived
18. The investigation identified that there were previous instances of the door opening in flight.
19. There were no technical logbook entries regarding the previous incidences of door opening in flight.
20. There was no maintenance carried out on the main landing gear in the last four months preceding the occurrence.
21. During the site inspection, the Bureau observed that with the cockpit door closed and locked from the inside, indicating LOCKED, the door handle outside did not latch.
22. The control tower in DNKA is temporarily located at the ARFFS watch room at the time of occurrence.
23. The watch room provides limited view of the maneuvering area, active runway, departing and landing aircraft at the beginning of runway 05 or end of runway 23.
24. The Duty Air Traffic Controller (DATCO) reported that permission to remove the aircraft from the incident site was not granted.
25. The Bureau did not grant permission for the aircraft to be removed from incident site.
26. NCAT Flight Instructors refresher course, Multi Crew Coordination (MCC) refresher were not consistent with in accordance with Nig. CARs.

3.2 Causal factor

The decision to land the aircraft within the remaining runway available during the initial climb instead of continuing with the flight using the appropriate procedure to land normally.

3.3 Contributory factors

1. The opening of the cockpit door during the initial climb.
2. Failure to execute the door unlatch checklist emergency procedures.

4.0 SAFETY RECOMMENDATION

4.1 Safety recommendations issued in the preliminary report

4.1.1 Immediate safety recommendation (3 March, 2023)

1. The Nigerian College of Aviation Technology (NCAT), Zaria should not tamper with evidence of an aircraft occurrence which could lead to loss of evidence and adhere strictly to the provisions of Part 3 section 19 (1), (2) (a and b) Civil Aviation (investigation of air accidents and incidents) regulations 2019.
2. The Nigerian College of Aviation Technology (NCAT), Zaria should ensure that its flight crew made entries in the Technical Logbook of the door opening in flight.
3. The Nigerian College of Aviation Technology (NCAT), Zaria should ensure that type rated engineer's on the college fleet undergo refresher trainings as required by relevant sections of Nig.CARs 2015.
4. The Nigerian Airspace Management Agency (NAMA) should ensure that the Tower audio recording system installed at Kaduna airport Tower is serviceable.

4.2 Safety recommendations issued in this report

4.2.1 Safety recommendation 2024-044

The Nigerian College of Aviation Technology (NCAT), Zaria should ensure that its flight crew strictly adhere to the use of Emergency/non-normal checklist during flight training.

4.2.2 Safety recommendation 2024-045

Nigeria Civil Aviation Authority should ensure that the Nigerian College of Aviation Technology (NCAT), Zaria strictly adhere to the Flight Instructor's refresher courses in accordance with the NCAT Flying School Procedure Manual Chapter 4 subsection 4.4.1 and section 3.2.1.14 (d) (1) of Nig. CARs 2015 and 2023 respectively.

4.2.3 Safety recommendation 2024-046

Nigeria Civil Aviation Authority should ensure that the Nigerian College of Aviation Technology (NCAT), Zaria strictly adhere to the Flight Maintenance Engineer's refresher

course, in accordance with the NCAT Maintenance Management Exposition Part 3 Subsection 3.4.0 and section 3.2.1.14 (d) (1) Nig. CARs 2015 and 2023 respectively.

4.2.4 Safety recommendation 2024-047

Nigeria Civil Aviation Authority should ensure that the Federal Airports Authority of Nigeria (FAAN) complete the construction of the Control Tower at General Hassan Usman Katsina international Airport Kaduna to permit seamless operation in accordance with section 14.1.19 (a), (b), (c) and (d) of the Nig. CARs 2015 and now 14.1.26.2 of the Nig. CARs 2023.