**PRELIMINARY REPORT ON A SERIOUS INCIDENT INVOLVING A LEONARDO S.p.A AW139 AIRCRAFT WITH NATIONALITY AND REGISTRATION MARKS 5N-BSG OPERATED BY CAVERTON HELICOPTERS LIMITED, ENROUTE BONGA FPSO ON 20TH JANUARY 2024**

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|---|---|
| **Registered owner:** | TVPX Aircraft Solutions Inc. |
| **Registered operator:** | Caverton Helicopters Limited |
| **Aircraft type and model:** | AW139 |
| **Manufacturer:** | Leonardo S.p.A, Italy |
| **Year of manufacture:** | 2014 |
| **Nationality and registration marks:** | 5N-BSG |
| **Serial number:** | 41360 |
| **Location:** | Enroute Bonga FPSO, Radial 152°, 80 NM (Coordinates 5°17.87' N, 4°8.43' E, 11.95 NM WSW ERHA[1]) |
| **Date and time:** | 20 January 2024 at about 08:40 h<br>All times in this report are local time (UTC +1) unless otherwise stated |

## INTRODUCTION

The operator notified the Nigerian Safety Investigation Bureau (NSIB) of this occurrence on 20 January 2024. Investigators were dispatched, and arrived at the operator's base, where the aircraft had been secured, the same day.

NSIB commenced investigation into the circumstances of the occurrence under the provisions of Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2023 and Annex 13 of International Civil Aviation Organization (ICAO).

[1] ERHA FPSO is an offshore drilling platform

This preliminary report provides details of initial facts, discussions and findings surrounding the occurrence; it includes information gathered from witness statements, evidence harvesting, and a preliminary inspection of the aircraft.

**The investigation is ongoing.**

## 1.0 FACTUAL INFORMATION

### 1.1 History of the flight

On 20 January 2024, at 07:53 h, an AW139 helicopter with nationality and registration marks 5N-BSG operated by Caverton Helicopters Limited departed Murtala Muhammed Airport, Lagos (DNMM) for Bonga Floating Production Storage and Offloading (FPSO) (routing DNMM - Bonga FPSO – DS10 – DNMM) as a charter flight, 360A, on an Instrument Flight Rules (IFR) flight plan. On board were 12 persons including 2 crew; with 3 hours endurance.

The Captain was the Pilot Flying (PF) while the First Officer was the Pilot Monitoring (PM).

Before take-off, both Auto Pilots (AP) were switched ON, on ground in accordance with the Pre-Take Off checklist procedure. After take-off, the aircraft climbed to 1,500 ft initially, and requested 2,500 ft from Lagos Air Traffic Control (ATC).

At 08:19 h, the crew reported reaching ETVOV, a waypoint on a radial 151$^{o}$ and 69 NM from LAG, maintaining 2,500 ft on QNH. During cruise at 2,500 ft, AP 2 fault warning came up on Crew Alerting System (CAS) message. Crew attempted unsuccessfully to clear it by disengaging and re-engaging the Auto Pilot. The FDR captured five disengagements and re-engagements of AP 2 in a 2-minute period. The crew then reset the Gangbar (Master Gen. 1 & 2) to clear the fault, without success.

The crew further reported that AP 1 fault warning came up, and aircraft nose dropped. The Captain took manual control of the flight while the First Officer continued attempts to re-engage the Automatic Flight Control System (AFCS).

According to FDR data, simultaneous with the attempts to re-engage the AFCS, the aircraft climbed to about 3,500 ft within a period of 1 min and 40 s, followed by a rapid descent to 330 ft in 45 s. FDR shows that the aircraft commenced another climb to 2,500 ft in the next 2 mins within which period, several pitch and roll control inputs were recorded; pitch angle varied between 28$^{o}$ pitch up and 12$^{o}$ pitch down before a maximum

25° pitch down motion was recorded, simultaneous with the maximum recorded roll angle of 37° to the right.

Over the next 44 s, the PF attempted to correct the right roll unto datum and continued into a left roll to a maximum angle of 15° before recovering to level flight 9 min later, following a series of roll attitude corrections.

The crew reported that to re-establish control of the aircraft, the Pilot 'guarded the controls' while the First Officer monitored the instruments and made call-outs of attitude and position.

Attempts to re-engage the Auto Pilot were eventually successful when AP 1 came engaged, followed by AP 2, 4 s later. The aircraft then settled on level flight path at about 800 ft. The crew climbed to, and stabilized the aircraft at 1,000 ft AGL, and made an Air Return. The FDR indicated that the aircraft was flown with both Auto Pilot engaged from this point till the end of the flight.

About 52 min later, the aircraft commenced a descent to 500 ft within 90 s, at which altitude it flew for the next 5 min before commencing final descent to Lagos air field.

At 10:00 h, the aircraft landed at DNMM.

The passengers disembarked safely.

The serious incident occurred in daylight, and Instrument Meteorological Conditions (IMC) prevailed.

## 1.2 Injuries to persons

| Injuries | Crew | Passengers | Total in the aircraft | Others |
|---|---|---|---|---|
| **Fatal** | Nil | Nil | Nil | Nil |
| **Serious** | Nil | Nil | Nil | Nil |
| **Minor** | Nil | 3 | 3 | Nil |
| **None** | 2 | 7 | 9 | Nil |
| **Total** | 2 | 10 | 12 | Nil |

## 1.3 Damage to aircraft

The aircraft sustained minor damage.

## 1.4 Other damage

Nil.

## 1.5 Personnel information

### 1.5.1 Captain

| | |
|---|---|
| Nationality: | Nigerian |
| Age: | 47 years |
| Licence type: | Airline Transport Pilot Licence (Helicopter) |
| Licence: | Valid till 14th January 2025 |
| Aircraft ratings: | Helicopter - Single engine/Multi engine |

| | |
|---|---|
| | **Part 1:** AS350-B2, AW139 |
| Medical certificate: | Valid till 20th November 2024 |
| Simulator: | Valid till 23rd April 2024 |
| Instrument rating: | Valid till 23rd October 2024 |
| Proficiency check: | 23rd April 2024 |
| Total flying time: | 6,390:8 h |
| Total on type: | 6,011:1 h |
| Total on type (PIC): | 4,097:7 h |
| Last 90 days: | 38:30 h |
| Last 28 days: | 38:30 h |
| Last 7 days: | 16:40 h |
| Last 24 hours: | 6:10 h |

### 1.5.2 First Officer

| | |
|---|---|
| Nationality: | Nigerian |
| Age: | 39 years |
| Licence type: | Airline Transport Pilot Licence (Helicopter) |
| Licence: | Valid till 13th December 2028 |
| Aircraft ratings: | **Part 2:** AW139, Bell 412, R 44 |
| Medical certificate: | Valid till 15th January 2024 |
| Simulator: | Valid till 16th April 2024 |
| Instrument rating: | Valid till 16th October 2024 |
| Proficiency check: | 16th April 2024 |

| | |
|---|---|
| Total flying time: | 2,879 h |
| Total on type: | 2,379 h |
| Last 90 days: | 128 h |
| Last 28 days: | 18:55 h |
| Last 7 days: | 13:40 h |
| Last 24 hours: | 6:10 h |

### 1.5.3 Engineer

| | |
|---|---|
| Nationality: | Nigerian |
| Age: | 39 years |
| Licence type: | Aircraft Maintenance Engineer's Licence (Airframe and Powerplant) |
| Licence validity: | 13th January 2026 |
| Aircraft/Engine Ratings: | AW139/ PWC PT6C |

## 1.6 General information

### 1.6.1 Aircraft information

| | |
|---|---|
| Type: | AW139 |
| Manufacturer: | Leonardo S.p.A, Italy |
| Year of manufacture: | 2014 |
| Serial number: | 41360 |
| Registered operator: | Caverton Helicopters Limited |
| Nationality and registration marks: | 5N-BSG |

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|---|---|
| Certificate of Airworthiness: | Valid till 14th November 2024 |
| Certificate of Insurance: | Valid till 31st March 2024 |
| Certificate of Registration: | Issued 19th April 2019 |
| Noise certificate: | Issued 12th November 2014 |
| Airframe time: | 8,539:48 h |

The AW139 is a twin-engine, rotary wing aircraft powered by two PT6C-67C turbine engines, with cabin size adequate for between 11 and 15 passengers depending on configuration. 5N-BSG was configured for 12 passengers.

The landing gear is a nose tricycle, telescopic arm, fully retractable type with separated retracting actuator.

The main rotor is a five bladed, fully articulated rotor. The basic, non de-iced blade is a complete composite structure with a fibreglass epoxy spar. A parabolic tip is provided. The leading edge is protected by stainless steel erosion shield. The blade is protected against lightning damage by an appropriate lightning conductor strip connected from the tip to the root of the blade.

The tail rotor is a four-blade articulated rotor. The blades are of composite material construction, with leading edge protected by a metallic strip.

### 1.6.2 Engines

| | No. 1 | No. 2 |
|---|---|---|
| **Engine model** | PT6C-67C | PT6C-67C |
| **Manufacturer** | Pratt & Whitney Canada Corp. | Pratt & Whitney Canada Corp. |
| **Year of manufacture** | 2013 | 2013 |
| **Serial number** | PCE-KB1467 | PCE-KB1463 |
| **Time Since New** | 8,072:17 h | 7,446:16 h |
| **Cycles Since New** | 5,206 | 5,699 |

**Fuel type used:** Jet A-1

### 1.6.3 Recent history of autopilot faults on 5N-BSG

The tech logs revealed that on 18 January 2024, 5N-BSG was snagged with a **2 AP FAIL** failure on the last flight of that day.

The following day, 19 January, the aircraft was evaluated, maintenance action carried out and the aircraft released to service. The Tech log records that at 15:30 h, the defect was rectified with reference to WP: LINE-020295-2024. During the first flight of the day, the operating crew reported an Auto Pilot disengagement which was successfully re-engaged and the flight continued to its destination, operating through the day without further event.

## 1.7 Meteorological information

**DNMM**

| | |
|---|---|
| **Time** | **0600Z** |
| **Wind** | 120/05 kt |
| **Visibility** | 1,500 m |
| **Weather** | BR (Mist) |
| **Cloud** | No Significant Cloud |
| **Temperature/Dewpoint** | 25°C/25°C |
| **QNH** | 1014 hPa |

## 1.8 Aids to navigation

Onboard Global Positioning System (GPS) and compass.

## 1.9 Communications

There was effective communication between the crew and Air Traffic Control.

## 1.10 Aerodrome information

### 1.10.1 DNMM

Murtala Muhammed International Airport has two bi-directional runways - RWY 18L/36R, 9,006 ft (2,745 m) width 149 ft (45 m) and 18R/36L, 12,795 ft (3,900 m) width 200 ft (90 m). It is located on an elevation of 135 ft with coordinates N06° 34’43.1298”, E03° 19’.12´. The runway surfaces are asphalt coated. The ICAO designated code is DNMM.

### 1.10.2 Bonga FPSO

Bonga FPSO (Floating, Production, Storage, Offloading vessel) is an offshore facility located at coordinates 4° 33.4′ N, 4° 36.9′ E, around 120 km off the coast of Nigeria in the Gulf of Guinea.

## 1.11 Flight recorders

The aircraft was fitted with a Multi-purpose Flight Recorder (MPFR) that has combined cockpit voice and flight data recording capability. The MPFR has the following particulars:

| | |
|---|---|
| **Part number** | D5165-142-090 |
| **Serial number** | A03277-005 |
| **Manufacturer** | Penny & Giles Aerospace Ltd., United Kingdom |

The recorders were successfully downloaded and analysed at the Nigerian Safety Investigation Bureau's Transportation Safety Laboratory in Abuja.

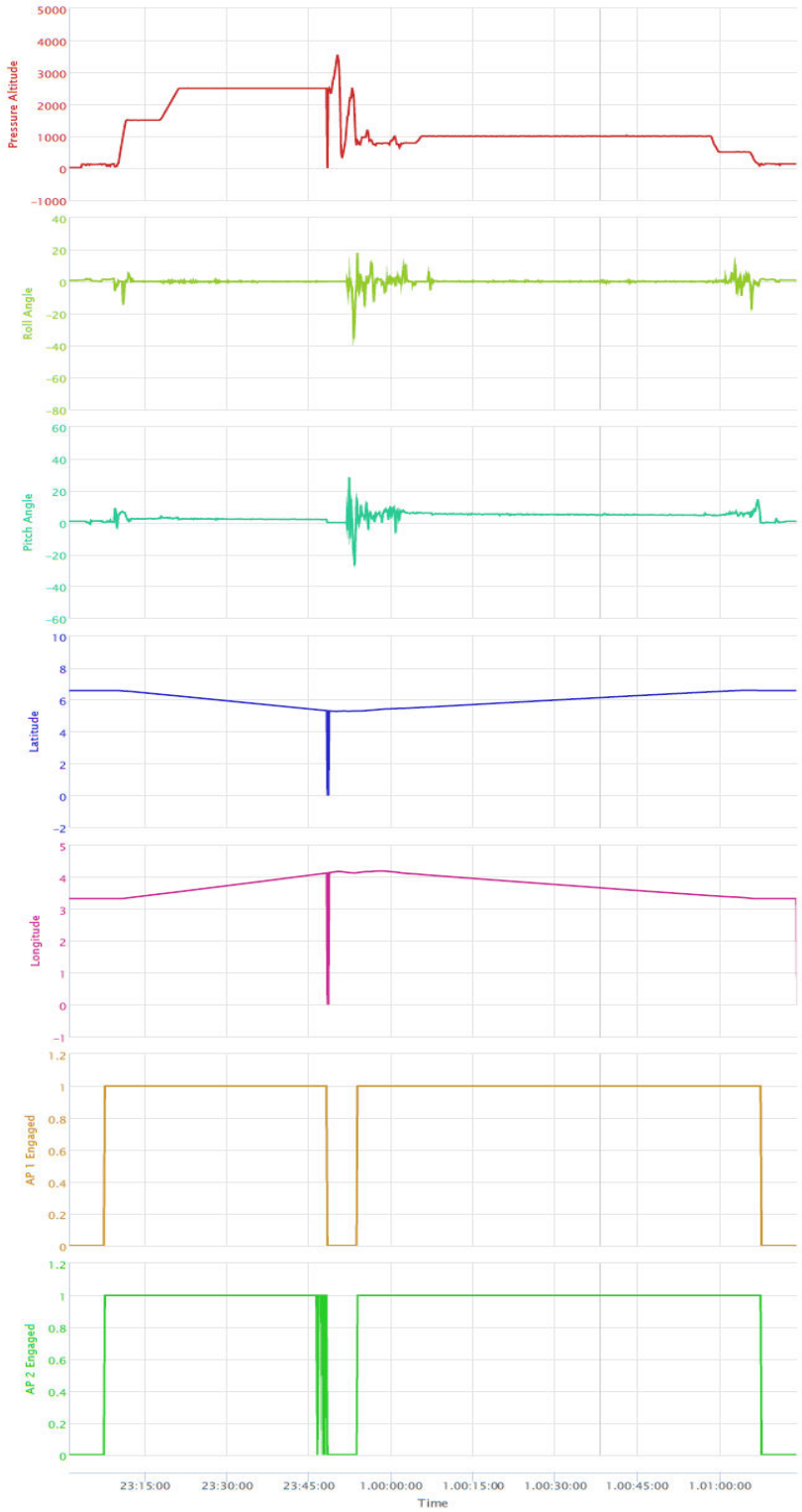
### 1.11.1 Cockpit Voice Recorder (CVR)

Four channels (cv1, cv2, cv3 and hqc), each containing over 2 hours of audio including the Cockpit Area Microphone and flight crew headsets were download. The fourth channel contained no audio.

The recordings begin shortly after the aircraft had been recovered from the 'unusual attitude' and captures crew conversation and ambient noise during the return to Lagos, the landing and about 47 minutes of post-landing audio. The audio recordings of the event were overwritten.

### 1.11.2 Flight Data Recorder (FDR)

Some flight data recorder parameters were analysed as contained in the plots below.



## 1.12 Wreckage and impact information

The following damages were observed during post occurrence inspection of the aircraft:

1. Two cabin windows were blown out in flight, and missing on ground.
2. Debris from a broken third window was found in the cabin.
3. A main rotor blade had a broken glass shrapnel stuck to the blade root.
4. The main rotor lightning conductor was broken.
5. A cabin light lens and transparent light cover were broken.

## 1.13 Medical and pathological information

Toxicology tests were conducted on the crew and the result was negative.

## 1.14 Fire

There was no fire.

## 1.15 Survival aspect

The occurrence was survivable in that the passenger restraint system (seat belts and shoulder harnesses) were intact and there was liveable volume for the occupants.

## 1.16 Test and research

Nil.

## 1.17 Organisational and management information

Caverton Helicopters Limited is a charter, shuttle and maintenance company established in September 2002, operating in the offshore helicopter service sector. Based in Lagos, the operator also has operational bases in Port Harcourt (NAF Base), Warri and Cameroon.

It operates a fleet of Leonardo AW139 and Sikorsky S-76D helicopters, and a Viking Air (DHC) 6-400 "Twin Otter".

### 1.17.1 Excerpt from Caverton Helicopters Operations Manual Part A

*11.1.7. Base post-accident procedures*

*The Chief Pilot / Flight safety supervisor or Base flight safety officer shall ensure that all recorded data (e.g. CVR / FDR) is preserved (engineering and quality department must be informed at all time). This will initially require the aircraft electrical system to be isolated and if possible the CVR/CVFDR circuit breakers to be pulled and isolated to prevent the recording equipment being powered and data erased. At an appropriate time CVR/CVFDR equipment should be removed from the aircraft and quarantined.*

## INITIAL FINDINGS

1. The crew are type-rated on the AW139 aircraft.
2. The Captain was licensed and qualified to conduct the flight.
3. The First Officer's medical certificate validity expired on 15th January 2024.
4. The Captain was the Pilot Flying while the First Officer was the Pilot Monitoring.
5. The aircraft had a valid Certificate of Airworthiness.
6. The aircraft had a valid insurance certificate.
7. The flight was operated on an Instrument Flight Rules (IFR) flight plan.
8. The serious incident occurred in Instrument Meteorological Conditions (IMC).
9. The crew experienced failure of the Auto Pilot systems (AP 1 and AP 2) and the aircraft entered 'unusual attitude'.
10. The FDR captured multiple unusual attitudes within a 5-min period.
11. In an attempt to re-engage the AFCS, the crew reset the Gang-bar (Master Gen 1 and 2).
12. The aircraft stabilised at 800 ft AGL, and the crew climbed to 1,000 ft AGL.
13. The crew made an Air Return to Lagos after regaining control of the aircraft.
14. FDR data shows that both Auto Pilots were engaged during the Air Return.
15. The aircraft landed safely at DNMM at 10:00 h.
16. The CVR recordings of the event were overwritten.

## IMMEDIATE SAFETY RECOMMENDATIONS

1. NCAA should enforce Air Operators Letter (AOL) reference NCAA/FSG/AOL/19/003 and NCAA/DGCA/AOL/11/16/365 on the Over-Writing of Cockpit Voice Recorders.

2. Caverton Helicopters Limited should adhere strictly to the provisions of Nig. CARs 2023 Part 7.8.1.3 (b) and Nig. CARs 2023 Part 8.14.10.3(a) on the Continuous Overwriting of Cockpit Voice Recorders, as well as the provisions of Company Operations Manual (OM Part A) Chapter 11 (11.1.7) on Base post-accident procedures.

3. Caverton Helicopters Limited should implement an effective monitoring procedure for crew licence validity.

## FURTHER INVESTIGATIVE ACTIONS

1. Further analysis of the FDR data to corroboration with Central Maintenance Computer (CMC) findings.
2. Flight simulations to ascertain the effect of the Gang-bar (Master Gen. 1 & 2) reset in the attempt to re-engage the AFCS.
3. Evaluation of maintenance history of Auto Pilot failure events.
4. Evaluation of operator's compliance with applicable Service Bulletins.


**Figure 1: The aircraft parked in the hangar after the occurrence**

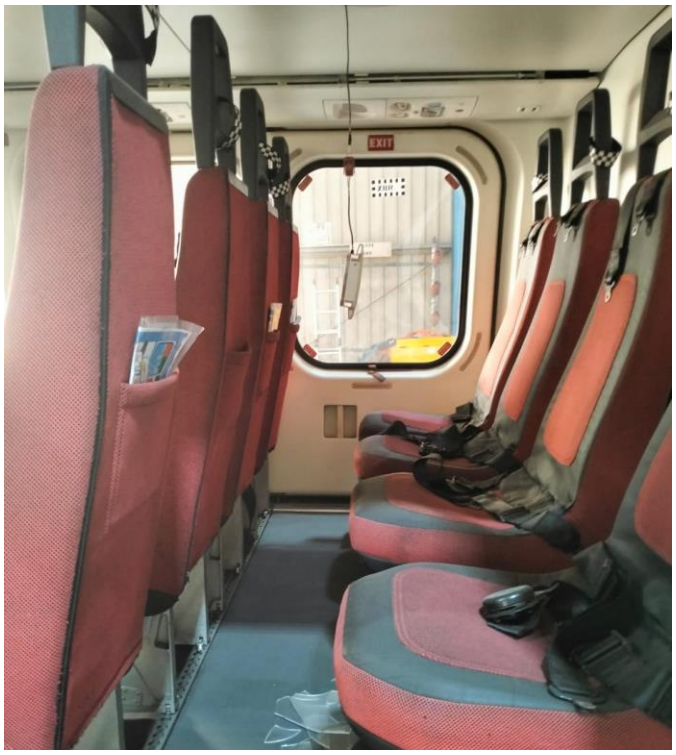



**Figure 2: Views of the cabin post occurrence showing some damage**