



AIRCRAFT ACCIDENT REPORT

BHNL/2009/11/12/F

Accident Investigation Bureau

**Final Report on the Serious Incident involving two
Bristow Helicopters (Nig.) Ltd aircraft, Bell 412
helicopters with Registration numbers 5N-BGS, and
5N-BDD, at the Addax Base Helipad, Calabar, Cross
River State, Nigeria on 12th November, 2009.**



5N-BGS/5N-BDD

This report was produced by the Accident Investigation Bureau, Murtala Muhammed International Airport, Ikeja, Lagos.

The report is based upon the investigation carried out by the Accident Investigation Bureau, in accordance with Annex 13 to the Convention on International Civil Aviation, Nigerian Civil Aviation Act 2006, and Civil Aviation (Investigation of Air Accidents and Incidents) Regulations.

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.

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

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

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5N-BGS/5N-BDD

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GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

AIB	Accident Investigation Bureau
APDNL	Addax Petroleum Development Nigeria Limited
ATPL	Air Transport Pilot's Licence
BHNL	Bristow Helicopters Nigeria Limited
BSO	Base Supply Officer
CERPAC	Combined Expatriate Resident Permit and Aliens Card Company Bristow Group and/ or its Subsidiaries and Joint Ventures (as appropriate)
CVR	Cockpit Voice Recorder
CRM	Crew Resource Management
FATO	Final Approach and Take-off Area
FDR	Flight Data Recorder
FOD	Foreign Object Damage
ft	Feet - (unit of measurement) length
GMSC	General Manager Supply Chain
HCB	Head Calabar Base
HR	Human Resources
ICAO	International Civil Aviation Organisation
IMM	Impact Mitigation Monitoring



5N-BGS/5N-BDD

LAE	Licensed Aircraft Engineer
LLC	Limited Liability Company
MHz	Mega Hertz - (unit of measurement) frequency
ml	Millilitre - (unit of measurement) liquid (volume)
mm	Millimetre - (unit of measurement) distance
MSN	Manufacturer's Serial Number
NASA	National Aerospace & Aeronautics Administration
NCAA	Nigerian Civil Aviation Authority
NCAR	Nigerian Civil Aviation Regulation
NDB	Non-Directional Beacon
NIS	Nigeria Immigration Service
NTSB	National Transportation Safety Board
nm	Nautical Miles - (unit of measurement) distance
OOP	Out of phase Inspection
OPC	Operational Proficiency Check
PF	Pilot Flying
PIC	Pilot-In-Charge
PM	Pilot Monitoring
Q&S	Quality and Safety
Tech log	Technical Logbook



5N-BGS/5N-BDD

TLOF	Touchdown and Lift off Area
USA	United States of America
UTC	Universal Time Co-ordinate





5N-BGS/5N-BDD

Aircraft Accident Report No.:

BHNL/2009/11/12/F

Registered Owners:

Bristow Helicopters (Nig.) Ltd.

Operators:

Bristow Helicopters (Nig.) Ltd.

Aircraft Type and Models:

Bell 412 SP

Manufacturers:

Bell Textron Canada

Dates of Manufacture:

1989

1981

Registration Number:

5N-BGS

5N-BDD

Serial Numbers:

33186

33046

Location:

Addax Base Helipad, Calabar
N 04° 18'55", E 008° 22'02.5"

Date and Time:

12th November 2009 at 1015hrs

All times in this report are local time (equivalent to UTC+1) unless otherwise stated.



5N-BGS/5N-BDD

SYNOPSIS

The Accident Investigation Bureau (AIB) was notified by the Nigerian Civil Aviation Authority (NCAA) of the occurrence and investigators were dispatched to the site the same day.

On the 12th November, 2009 at 0805hrs a Bell 412 Helicopter, 5N-BGS departed for the first operation of the day from Addax Base helipad, Calabar to Margaret Ekpo International Airport, Calabar to pick up passengers for an offshore operation, and on completion of the flight returned to Addax Base Helipad at 0935hrs.

The PF lifted the helicopter to double the hover height, moved rearwards, descended back to hover height, initiated a left turn to face the opposite direction. During the turn the tail rotor struck the main rotor of a parked helicopter. 5N-BGS went into a spin, the PF closed the throttles to idle, controlled it to the deck and shutdown the engines.

There was no fatality and no fire outbreak.

The investigation identified the following causal and contributory factors:

Causal Factor

The lack of situational awareness by the crew by being preoccupied with avoiding the obstacles in front and did not take cognisance of the parked aircraft 5N-BDD as an obstacle.

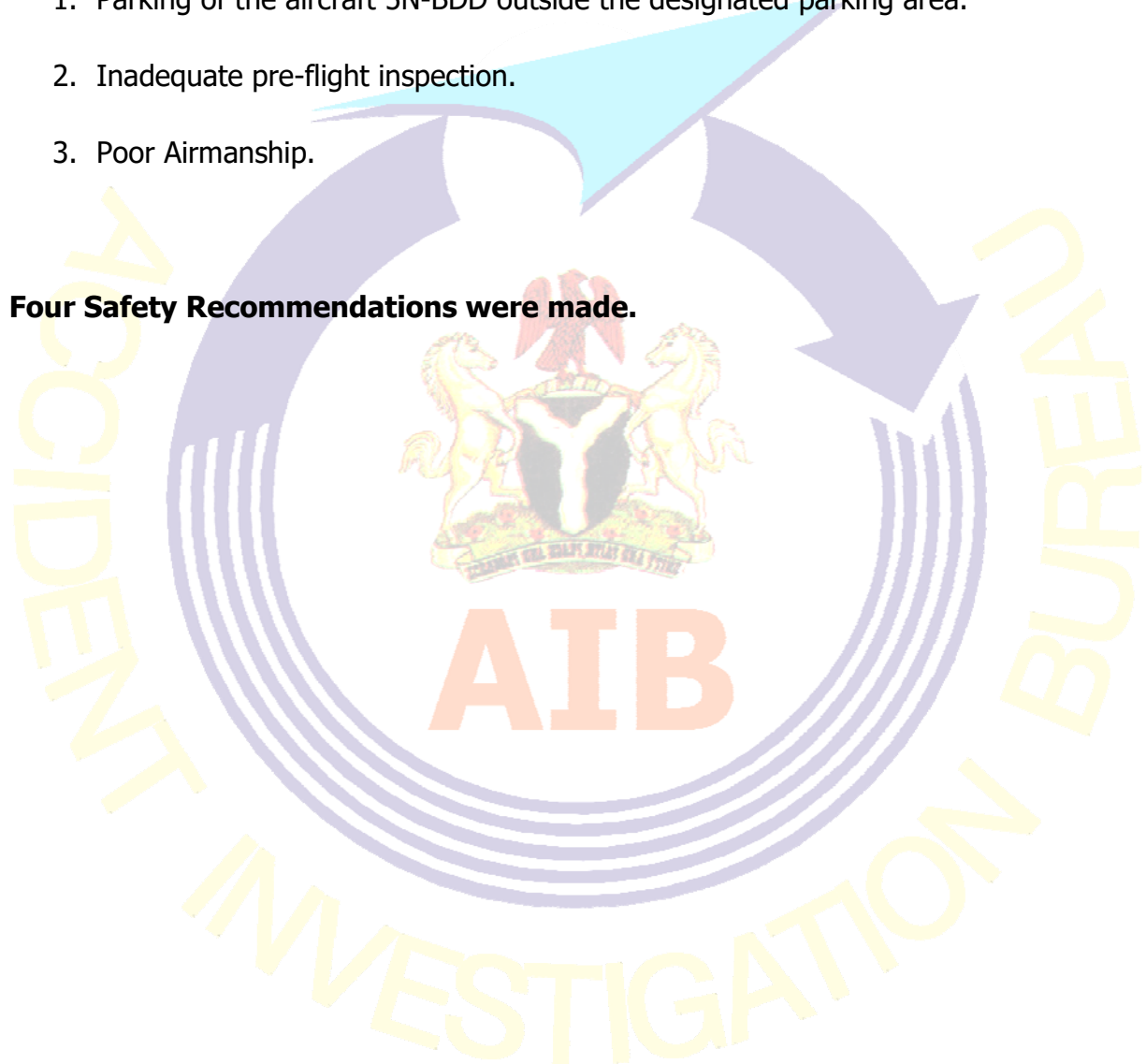


5N-BGS/5N-BDD

Contributory Factor

1. Parking of the aircraft 5N-BDD outside the designated parking area.
2. Inadequate pre-flight inspection.
3. Poor Airmanship.

Four Safety Recommendations were made.





5N-BGS/5N-BDD

1.0 FACTUAL INFORMATION

1.1 History of the Flight

On the 12th November, 2009 at 0805hrs a Bell 412 Helicopter, 5N-BGS departed for the first operation of the day from Addax Base helipad, Calabar to Margaret Ekpo International Airport, Calabar, to pick up passengers for an offshore operation, and on completion of the flight returned to Addax Base helipad, Calabar, at 0935hrs.

At 0945hrs, a maintenance engineer conducted a turnaround inspection on 5N-BGS and refuelled the helicopter in readiness for the next flight.

At 1005hrs, the crew prepared the aircraft for the second flight. The First Officer who was the Pilot Monitoring (PM) completed the pre-flight inspection. 5N-BGS was parked facing the hangar. The Captain, who was the Pilot Flying (PF), gave the take-off briefing that he would carry-out the lift to the hover and position the aircraft over the spot closest to the land, facing in the safe take-off direction, north along the ocean. Once in position the controls would be handed over to the PM. The PM reported calling Calabar Control Tower and requesting 500ft to Margaret Ekpo International Airport, Calabar, giving the location of the aircraft, persons on board and endurance.

At about 1015hrs 5N-BGS was cleared by ATC and the PF, who was also the Pilot-in-Charge, made a normal starting operating procedure, took-off to hover height, while the PM monitored the instruments and looked out from the left. It was reported that the PF lifted the aircraft to "double hover height", so that the tail-rotor was well clear of the ground while moving backwards. The PF reported moving rearwards, seeing the edge of the spot in the chin window and knew he was clear of obstruction of the fuel installation and fence which were situated in front of the aircraft, then descended to a



5N-BGS/5N-BDD

normal hover height and made a left turn in the hover. After turning through approximately 300, the tail rotor struck the main rotor blade of the parked helicopter, 5N-BDD. 5N-BGS went into a spin, the PF closed the throttles to idle, controlled it to the deck and shutdown the engines.

After engine shutdown, the PM called Calabar ATC to cancel the take-off request.

The helicopter 5N-BDD also operated by Bristow Helicopters Nigeria Limited (BHNL) came from Port Harcourt for maintenance and was awaiting a test flight; this helicopter was parked facing the rear of 5N-BGS outside the landing circle of the helipad, at the Addax Petroleum Development Nigeria Limited (APDNL) base facing the ocean.

The crew disembarked the aircraft unaided with no injuries.

The occurrence happened in daylight.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	1
Minor/None	Nil	Nil	Nil



5N-BGS/5N-BDD

1.3 Damage to Aircraft

5N-BGS and 5N-BDD were both substantially damaged.



Figure 1: The relative positions of 5N-BGS and 5N-BDD after the incident



5N-BGS/5N-BDD

1.4 Other Damage

Nil.

1.5 Personnel Information

1.5.1 Pilot Flying (PF)

Nationality:	British
Gender:	Male
Age:	61 years
Licence No.:	CPL, ATPL 4538(H)
Licence Validity:	28 th February, 2010
Aircraft Ratings:	Bell 212 Dauphin SA 365, Bell 412
Instrument Rating Validity:	1 st August, 2010
Proficiency/ Recurrent Checks:	1 st February, 2010
Medical Class/Validity:	Class 1/28 th February, 2010
Total Flying Experience:	12569hrs
On Type:	525hrs



5N-BGS/5N-BDD

Last 90 days: 41:25hrs

Last 28 days: 27:40hrs

Last 24 hours: 5:50hrs

The PF had CRM training between 15th and 16th of June 2009.

1.5.2 First Officer (PM)

Nationality: Nigerian

Age: 30years

Gender: Male

Licence No.: CPL (H) 5247

Licence Validity: 31st March, 2010

Aircraft Rating: Bell 412

Instrument Rating Validity: 13th June, 2010

Proficiency/Recurrent Checks: 13th December, 2009

Medical Class/Validity: Class 1/ 30th September, 2010

Total Flying Experience: 453hrs

On Type: 142hrs



5N-BGS/5N-BDD

Last 90 days: 116hrs

Last 28 days: 60hrs

Last 24 hours: 06hrs

The PM had CRM training between 20th and 21st of June 2009.

1.6 Aircraft Information

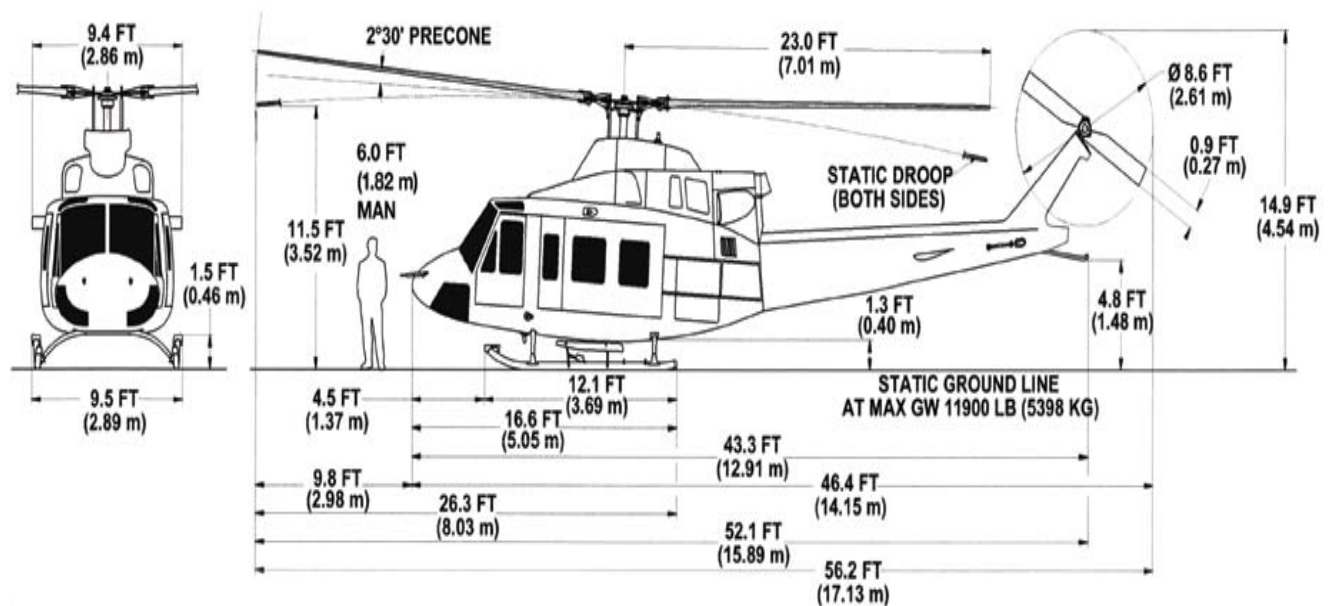


Figure 2: Aircraft Dimensions

1.6.1 General Information

Aircraft Type: Bell 412



5N-BGS/5N-BDD

Serial Number:	33186
Registration Number:	5N BGS
Operator:	Bristow Helicopters Nig. Ltd
Manufacturer:	Bell Textron Canada
Year of Manufacture:	1989
Total Airframe Time:	10656:25hrs
Certificate of Insurance Validity:	1 st April, 2010
Certificate of Airworthiness:	29 th July, 2010
Category:	Transport (passenger)
Certificate of Registration:	26 th April, 2007

1.6.2 Engines

	No. 1	No. 2
Manufacturer:	Pratt & Whitney	Pratt & Whitney
Type:	PT6T-3B	PT6T-3B
Serial No.:	62395	60696
TSN:	15869:48hrs	28359:25hrs
CSN:	7193	8029



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Combined Gearbox Type: CP-GB-TC 0132

Serial Number: TC 0132

TSO: 1485:40hrs

1.6.3 Main Rotor

Number of Blades: 4
Diameter: 46ft
Chord (equivalent): 1ft. 2in.
Disc Area: 1620sq. ft.
Aerofoil Section: 8% at tip, 23% at root
Tip Speed: 780ft/sec
RPM: 324

1.6.3.1 Tail Rotor

Number of Blades: 2
Diameter: 8ft. 7in.
Chord: 11.5in.
Disc Area: 57.8sq.ft.



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Tip Speed:	745ft/sec.
RPM:	1660

1.6.4 Maintenance of 5N BGS

Examination of 5N-BGS maintenance records confirmed that it was in compliance with all the Mandatory Service Bulletins and Airworthiness Directives in force at the time of the occurrence.

There was Tail Rotor Blade replacement on 24th October, 2009 at 10603:55hrs in accordance with Bell Helicopter 412 Maintenance Manual Chapter 64 due to damage.

Main Drive Shaft replacement was carried out in accordance with Bell Helicopter 412 Maintenance Manual Chapter 63 due to 600hrs/12 months inspections, grease throw check was carried out; and aft cross tube, left hand rubber bumper replaced on 31st October, 2009 at 10624:15hrs.

No. 1 Starter Generator was replaced on 11th November 2009 at 10654:55hrs and generator balance carried out satisfactorily.

The last turnaround inspection carried out on the aircraft was on 12th November, 2009 at 0945hrs after the first flight of the morning and before the occurrence. The next minor inspection check A/25/50 would be due at 10672:45 airframe hours. The last out-of-phase hourly and calendar inspection completed on the aircraft was a check A/25/50/100/150/check 'B' P1 /'C' P3+R3 on the 31st of October, 2009 at 10624:15hrs.



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1.6.5 Weight and Balance

Weight and Balance was carried out on the aircraft by Arrow Aviation Repair Station Louisiana 70518, USA on the 24th of June 2008 at 9046:20hrs airframe total time; Old Empty Weight - 7666.7lbs and Empty Weight C.G - 141.9

1.6.5.1 Weight and Balance Change

A Notice of Weight and Balance change was issued on the aircraft on the 18th of July, 2008 Empty Weight Configuration - 7779.1 and Empty Weight C.G. 141.05. Also, on 12th September, 2009 New Empty Weight Configuration - 7721.0 and Empty Weight C.G 141.41 were obtained as a result of installation of life rafts, survival packs, crew and passenger's life jackets by BHNL Operations.

1.6.6 Type of Fuel Used

Jet A1

1.7 Meteorological Information

The Nigerian Meteorological Agency (NIMET) Calabar gave the following Terminal Landing report:

Time:	1000 UTC
Wind:	Calm
Visibility:	10km



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Weather: N/A
Cloud: Overcast 1500ft
Temperature: 30°C
QNH: 1011hPa

1.8 Aids to Navigation

The available Navigational Aid is a Non Directional Beacon (NDB) – 430 kHz. This is provided by Addax Petroleum Development Nigeria Limited (APDNL). It was serviceable at the time of the occurrence.

1.9 Communications

There was effective two-way communication between the crew and Air Traffic Control (ATC) at Margaret Ekpo International Airport, Calabar.

The Addax Base Radio Room was manned by a radio operator, and fixed radios installed in vehicles, as well as portable radios for the base and offshore. A VHF Marine radio frequency 148.90 KHz is used for ground and air/ground communications.

The crew did not report the occurrence to the ATC.



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1.10 Aerodrome Information

1.10.1 Addax Base Helipad

Addax Base in Calabar is owned by Nigerian Ports Authority. It is leased and operated by Addax Petroleum Development Nigeria Limited (APDNL).

APDNL is an oil and gas exploration company. The Addax Base in Calabar has an in-built Helipad for helicopter operations; the Helipad has areas for lift, approach and touchdown manoeuvres.

The Helipad was designed in an L-shape with two landing spots to accommodate two helicopters to avoid downwind operations and keep cross-wind operations to a minimum. The approach surfaces to the two landing spots are separated by 150°.

The location of the Helipad is such that the required clear approach and take-off sector is available, making best use of the prevailing winds, and the Final Approach and Take-off Areas (FATO) is not affected by structure-induced turbulence or high temperatures, and turbulence from the exhausts of gas turbines.

1.10.2 Helipad Dimension and Related Information

The following data were measured and described, as appropriate, for each facility provided on the helipad:

Helipad type – principally a Helipad for operational use only.



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Touchdown and lift-off area - dimensions to the nearest metre or foot, slope, surface



Figure 3: Addax Base Helipad, Calabar
type, bearing strength in tons as 9.5 tons;

- a) Nature of final approach and take-off area – coated steel*
- b) Safety Area – 50m by 50m;*
- c) Helicopter ground taxiway is not applicable, air taxiway and air transit route – cleared from the sea on helicopter approach;*
- d) Apron – adequate*
- e) Clearway – is purely from field but adequate.*
- f) Visual aids for approach procedures, markings and lighting of FATO, TLOF, taxiways and aprons not applicable to the CALABAR HELIPAD*

g) The Navigational aid available is NDB on 430 kHz.

LATITUDE: N04⁰ 8' 6.7"

LONGITUDE: E008⁰ 19' 45"

j) Nature of FATO - Coated steel

1) Navigational Aids: NDB – 430kHz

m) Helipad Dimension: 150 x 90m

n) Runway Orientation: N/A

o) Significant obstacles in the vicinity of the Helipad: Nil

p) Distance from city: within the Port at Calabar.

s were not retrieved.

1.12 Wreckage and Impact Information



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The aircraft wreckage distribution was localised and limited to the Helipad deck; the impacted and detached tail rotor was found on the floor of the helipad. The fuselage sections of both aircraft were intact. 5N-BGS sustained damage on the following: Two Tail Rotor blades, Tail Rotor 90⁰ Gearbox, 42⁰ Gearbox, Tail Rotor Drive Shaft, Combine Gearbox, Forward Cross Tube, Aft Cross Tube, Tail Rotor Drive Cover, 2 Nos. of Main Rotor Blades and Tail Rotor Hub and others.

The parked aircraft, 5N-BDD sustained substantial damage to one of the Main Rotor Blade.



Figure 4: The damaged Main Rotor Blade of 5N-BDD



5N-BGS/5N-BDD



Figure 5: The close-up view of the damage on 5N-BDD Main Rotor



5N-BGS/5N-BDD



Figure 6: The detached tail rotor blade of 5N-BGS on the Helipad after the impact



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1.13 Medical and Pathological Information

Body fluid specimens were collected from the crew after the incident and taken to a medical facility in Calabar on 12th November, 2009 for initial drug screening and testing for drug metabolism, alcohol or other abused substances. The results were negative for these substances.

1.14 Fire

There was no post impact fire.

1.15 Survival Aspects

The crash was survivable since there was a liveable volume available to the crew as the cockpit section was intact. The crew exited the aircraft with no injuries. The seat-belt attachments were intact.

1.16 Test and Research

Nil.



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1.17 Organizational and Management Information

1.17.1 Bristow Helicopters Nigeria Limited

Bristow Helicopters Nigeria Limited is an NCAA Air Operator's Certificate holder competent to conduct safe and secure transport (passenger) operation in compliance with the Operations Specifications accompanying the AOC valid till January 2011.

It also holds an Approved Maintenance Organisation (AMO) Certificate valid till 15th April, 2010.

BHNL provides helicopter operational support to the drilling and production facilities operated by ADDAX Petroleum.

1.17.2 Addax Petroleum Development Nigeria Limited

The following are extracts from the ADDAX Petroleum Development Nigeria Limited (Calabar Base Helipad Manual).

APDNL is the operator of Calabar Base Helipad, which was leased from the Nigerian Ports Authority.

Addax Petroleum Development Company Nigerian Limited (APDNL) is an oil and gas exploration company. The Base has an in-built Helipad for helicopter operations. APDNL obtained approval for the Helipad at Addax Petroleum/Shoreline base from the Town Planning Department, Government of Cross River State of Nigeria on the 30th April 2009.



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1.17.3 Calabar Base Structure

1.17.3.1 General Manager Supply Chain (GMSC) APDNL

The GMSC APDNL, is responsible for the policy and co-ordination of operations at Calabar Base Jetty to meet Statutory, Regulatory and Company Standards and Requirements.

1.17.3.2 Head, Calabar Base (HCB)

The Head, Calabar Base is responsible to the General Manager Supply Chain (GMSC) for the efficient functioning of the Base and the operational areas of the Helicopter Jetty. On a day-to-day basis the Head, Calabar Base has overall responsibility for the operation and management of the jetty.

Safety Accountabilities

- 1. The HCB is responsible to the GMSC for implementing and publicizing APDNL HSE Safety Management Policy and Safety Management Systems within the Base and for the Jetty operational areas.*
- 2. Ensuring the staff employed around the Base operate within the Company safety regulations.*
- 3. Ensure that personnel who operate on the Jetty are adequately briefed and trained to carry out their duties.*
- 4. Ensure that all drivers are adequately briefed and that vehicles are maintained to requisite standards.*



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5. Ensure that when work projects are being carried out, all current HSE regulations are being applied and observed.

6. Ensure that the Security task is carried out as per APDNL's regulations and instructions.

7. Ensure that Security staff are briefed as to their duties and responsibilities, particularly during the absence of the Security Supervisor.

1.17.3.3 Base Safety Officer – Calabar Base (BSO)

General Responsibilities

The BSO is responsible to the HCB for maintaining an efficient and effective Safety Policy.

Safety Accountability

- 1. Ensuring that all Fire Appliances (CRT, Extinguishers etc) are current and in good working condition before the start of each day's operation.*
- 2. Ensuring that staff employed in the operation are properly trained and competent to carry out their duties.*
- 3. Implement as appropriate any safety measure or remedial action resulting from an occurrence that has been agreed with the HCB.*
- 4. Review safety measures regularly.*
- 5. Is responsible to the HCB for jetty and manoeuvring area inspections.*
- 6. Ensuring that staff employed on extraneous duties are trained and competent to carry out these tasks.*
- 7. Conduct required Drills and Response time checks.*



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1.17.3.4 BHNL Pilot-in-Charge - Calabar Base

General Responsibilities

The Pilot in Charge is responsible to the HCB for safe air operations.

Safety Accountabilities

To be responsible to the HCB for the application of APDNL and BHNL HSE MANAGEMENT Policy and Procedure within the air and ground operations section.

To be responsible to the HCB for ensuring good Housekeeping practice in the jetty and hangar areas.

To be responsible to the HCB for ensuring the smooth running of 3^d party air operations within the Base.

To be responsible to the HCB for ensuring that whenever changes to operational strategy are planned, the safety implications are fully considered and regulatory approval is obtained as necessary.

To be responsible to the HCB for ensuring that all operational procedures are documented and applied in accordance with the relevant legislation and regulations.

To be responsible to the HCB for developing and maintaining all aspects of BHNL Ground Staff training and discipline.

The Pilot in Charge (PIC) is responsible for initiating NOTAMs on subjects such as unserviceability of parts of the movement area and jetty lighting, Nav. Aids or airside obstructions.



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1.17.3.5 Outbound Traffic – Air Traffic Control Service

Extract from Calabar Base Helipad manual section 7.2.3

1. Prior to departure, call the Helipad Radio on 130.00MHz stating call sign, request radio check and on reply from the Radio Room give the following information, destination, POB, Captain's name and any additional information. Read back the QFE/QNH given.

- 1. Proceed to holding point of active Helipad.*
- 2. At the holding point report ready for departure. Report airborne, report leaving the ATZ and report transfer frequency as instructed.*

1.17.3.6 Coordination

- 1. Co-ordination by CALABAR HELIBASE with all other facilities*
- 2. Selection of Direction of Take-off*
- 3. The PLATFORM has only one Helipad available for visual traffic subject to aircraft type.*
- 4. Direction of the take-off is governed by wind direction/distance to the bridge jangle of the sun etc., the Pilot will announce the heading to be used.*
- 5. Variable direction circuits may be used at times in accordance with air traffic control instructions in the interests of the noise abatement.*
- 6. Procedures for evaluating the suitability for use and availability of the take-off/landing is at pilot's discretion.*



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1.17.4 Bell 412 Emergency Operating Procedures

1.17.4.1 Procedure No. 8/2 Tail Rotor Drive Failure in the Hover

INDICATIONS: *Uncontrollable right yaw.*

IMMEDIATE ACTIONS

Throttles

Close fully

Cyclic

Minimise drift and yaw effect

Collective

Cushion touchdown – accepting yaw

SUBSEQUENT ACTIONS

Complete aircraft shutdown

1.17.4.2 Procedure No. 8/3 Tail Rotor Control Failure in the Hover

INDICATIONS: *Jammed pedal or lack of response to pedal application.*

IMMEDIATE ACTIONS

DO NOT CLOSE THROTTLES UNLESS SEVERE YAW TO THE RIGHT OCCURS

Collective

Lower slowly

Cyclic

Minimise drift and effect yaw

Land

Accepting yaw



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SUBSEQUENT ACTIONS

Complete aircraft shutdown

CONSIDERATIONS:

Application of power to correct left yaw is not recommended in view of possible subsequent difficulties.

1.17.5 Dispatch Procedure

The customer, ADDAX Petroleum, collates the number of passengers and destinations.

The ADDAX Flight Co-coordinator decides on the route.

The route is passed to the Chief Pilot who passes it on to the crew.

The crew calculates the fuel requirement and passes that to the engineers who are responsible for re-fuelling the aircraft.

Once the aircraft is re-fuelled the crew carries out their pre-flight inspection and pre-start checks before starting.

Once all pre-flight procedures are completed, the crew call Calabar ATC for clearance to lift from the jetty and proceed to the airport to pick up passengers.

1.17.6 Emergency Program

1.17.6.1 Jetty Emergency Procedure

In the event of an aircraft accident, incident or emergency, the HCB has overall responsibility for the co-ordination of the emergency procedures. Emergency action must be initiated by the first person having knowledge of the incident or accident.



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1.17.6.2 Training Program

All new air operations personnel are required to attend training prior to commencing work. Continuation Training is carried out by APDNL and BHNL staff to a planned programme titled "Continuation Training Programme".

1.17.7 The Federal Ministry of Environment

The Federal Ministry of Environment granted the Final Environmental Impact Assessment Approval via the letter Ref: FMENV/CONF/EIA/123:929/vol.1/153 dated 17th August, 2011. The approval covers only Calabar Port Expansion project, subject to the following conditions:

- *Repair of the Port facilities.*
- *Helicopter operations upgrade.*
- *Refurbishing of Millerio Wharf; Mciver jetty and reinforcement/ replacing the missing caisson.*
- *Expansion of the existing operation quays to accommodate three berthing facilities.*
- *Shore protection and extension to the lay down and apron areas.*
- *Reconstruction and addition to the heavy duty paving.*
- *Rehabilitation of offices, warehouse, living accommodation facilities.*

There shall be Impact Mitigation Monitoring (IMM) exercise by the ministry in collaboration with other relevant regulatory Authorities. This is facilitated by Addax.



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1.17.8 The Nigerian Civil Aviation Authority (NCAA)

The Nigerian Civil Aviation Authority is the Regulatory agency established by an act of the National Assembly to oversee the aviation industry in accordance with International Civil Aviation Convention of 1944 and its annexes. NCAA issued the Temporary Aerodrome Certificate with a letter ref. NCAA/AERO-OPS/008/Vol.II/195 dated 13th November, 2009 for the Calabar Helibase in pursuant to the power conferred on the Authority in S.30 (3) of the Civil Aviation Acts 2006, for the operations of CALABAR HELIBASE (040 8' 6.7"N 0080 19' 45"E) till 31st July, 2010.

1.18 Additional Information

1.18.1 Hovering In Ground Effect (HIGE)

Helicopter performance revolves around whether the helicopter can be hovered. A hover requires more power than any other flight regime. Hover is significantly influenced by density altitude.

Helicopter ground effect can be equated to a similar fixed wing phenomenon. Compared with performance required to hover out of ground effect (HOGE), hovering in ground effect (HIGE) has beneficial gain in lift production or in reducing power required to hover at the same weight when hovering approximately one rotor disc diameter or less above the surface. At that HIGE, induced downwash ceases its vertical velocity reducing the induced flow at the rotor disc. The angles of attack on the blade increase with a corresponding increase in lift. Ground effect also makes a larger portion of the blade produce lift by restricting the generation of blade tip vortices.

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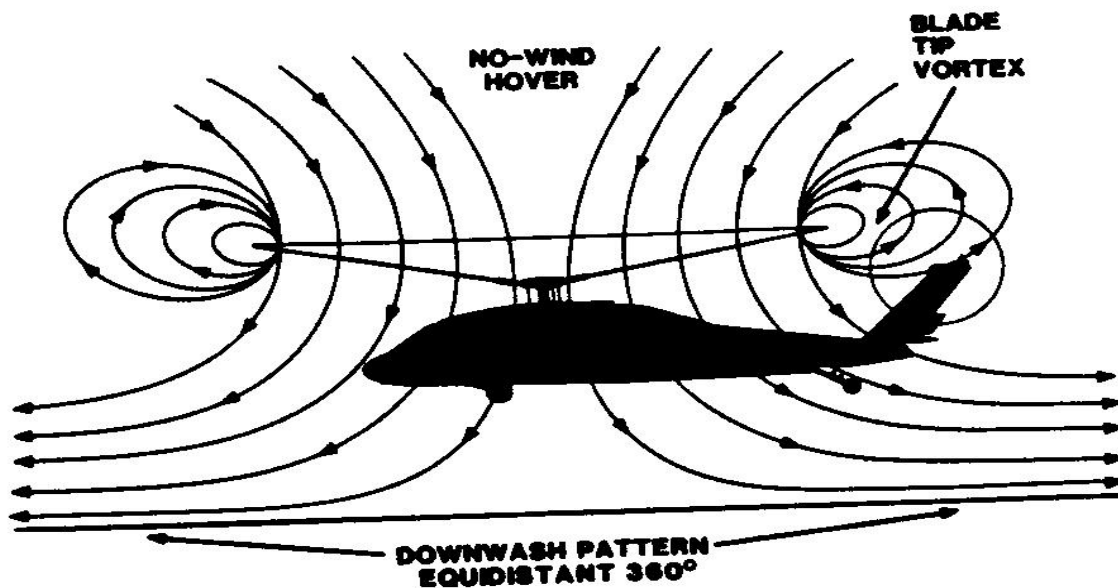


Figure 7: Effect of the Wind on Helicopter

Effect of the wind

When the wind is on the nose of a helicopter in a hover or at a low speed less than 30 knots, the fuselage and vertical stabilizer tend to weather-vane and hold the nose of the helicopter into the wind. If the wind is from a side, the helicopter tends to weather-cock in that direction. The requirement for tail rotor thrust varies depending on which side the wind strikes the helicopter. BELL 412 helicopters has CCW rotating main rotor, wind from the left side reduces tail rotor efficiency and creates a tendency to yaw to the right.



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There are three groups of relative wind and the associated effects, thus:

- a) Winds from 120° to 240° relative, helicopter attempts to weather vane its nose into the relative wind.
- b) Winds from 210° to 330° relative cause a tail rotor vortex ring state to develop. The air flow will be non-uniform and unsteady into the tail rotor creating thrust variations.
- c) Winds from 285° to 315° relative cause the main rotor vortex to be blown into the tail rotor by the relative wind creating extreme turbulence.

If considerable anti-torque pedal is required and maintained during a phase of flight such as hovering HOGE with an external load, there may not be enough anti-torque pedals left to counteract an unanticipated yaw.

The BELL 412 EMERGENCY OPERATING PROCEDURES recommends lowering of the collective to minimize yaw and initiate landing, to reduce torque and to control LTE.

1.19 Useful or Effective Investigation Techniques

Nil.



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2.0 ANALYSIS

2.1 General

There was no evidence of any defect or malfunction in the aircraft that could have contributed to the occurrence.

The flight crew were properly licenced, medically fit and adequately rested to conduct the flight.

There was no reported adverse weather prior to the flight.

A Helicopter, 5N BDD was parked inappropriately outside the second landing circle of the helipad.

2.2 Conduct of the Flight

The PF lifted the aircraft to "double hover height", so that the tail rotor was well clear of the ground while moving backwards. The PF reported moving rearwards, seeing the edge of the spot in the chin window and assumed that the tail of the aircraft would be clear of the obstruction of the fuel installation and fence which were situated in front of the aircraft probably not considering 5N-BDD which was parked to the right. Then descended to a normal hover height and made a left turn in the hover. After turning through approximately 30°, the tail rotor struck the main rotor blade of the parked helicopter, 5N-BDD. 5N-BGS went into a spin, the PF closed the throttle to idle, controlled it to the deck and shut down the engines.

The investigation revealed that this occurrence would have been avoided if only the PF maintained the double hover height before turning left. Alternatively, after moving



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rearward and descending to normal hover height, the PF would have performed sideways hover to the left to clear the platform. The investigation also revealed that 5N-BDD was not parked exactly within the landing circle therefore that should have been a concern to the crew to take appropriate measures/manoeuvres to avert the occurrence.





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3.0 CONCLUSIONS

3.1 Findings

The investigation revealed the following:

1. 5N-BGS was airworthy at the time of the occurrence.
2. The crew were certified to conduct the flight.
3. The parked helicopter 5N-BDD, which had its main rotor damaged, came from Port Harcourt to Addax base for maintenance.
4. 5N-BDD was parked on the Addax Helipad awaiting test flight.
5. 5N-BDD was parked outside the specified landing circle at the helipad.
6. The impact of the tail rotor of 5N-BGS severely damaged one of the main rotor blades of 5N-BDD.
7. 5N-BGS was on its way to Calabar airport to pick APDNL passengers to an offshore location.
8. The tail rotor of 5N-BGS was sheared off from its attachment point.
9. Addax base platform belongs to Nigerian Ports Authority leased by Shoreline Logistics.
10. The crew failed to report the occurrence to the ATC.



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11. There was no evidence of a marshaller present on the Helipad at the time of the incident.

12. The Calabar Base Helipad Manual was approved by NCAA.

13. There was no evidence that the PM debriefed the PF after completing the pre-flight inspection.

3.2 Causal Factor

The lack of situational awareness by the crew by being preoccupied with avoiding the obstacles in front and did not take cognisance of the parked aircraft 5N-BDD as an obstacle.

3.3 Contributory Factor

1. Parking of the aircraft 5N-BDD outside the designated parking area.
2. Inadequate pre-flight inspection.
3. Poor Airmanship.



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4.0 SAFETY RECOMMENDATIONS

4.1 Safety Recommendation 2017-024

NCAA should ensure that Calabar Base Helipad Manual of APDNL be reviewed to comply with the Nig.CARs.

4.2 Safety Recommendation 2017-025

APDNL should ensure that Helicopters are properly parked in designated locations.

4.3 Safety Recommendation 2017-026

APDNL should ensure that Helicopter Landing Officers (HLOs) are always present during aircraft operations.

4.4 Safety Recommendation 2017-027

NCAA should ensure that helicopter flight operations at the Helipad are done in accordance with Nig. CARs.



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RESPONSES TO SAFETY RECOMMENDATIONS

NCAA Response on AIB Safety Recommendations

NCAA responded to Safety Recommendation 4.1 (2017-024) as follows:

"Addax Petroleum Development Nigeria Limited (APDNL) has closed its operations at the Calabar Base and had transferred same to Port Harcourt. With the closure of the Calabar Helipad Base, all safety risks associated with flight operations have been eliminated. However, the Port Harcourt base has been certified and its Helipad Manual approved by the Authority in accordance with Part 12 of the Nig. CARs."

NCAA responded to Safety Recommendation 4.4 (2017-027) as follows:

"The NCAA has certified the Port-Harcourt Helipad Base in accordance with the Nig. CARs Part 12 and also conducts continuous surveillance of operational activities to ensure that APDNL continues to maintain the standards of the certification. Where during inspections, findings have been raised, the NCAA has ensured that APDNL develops and implements corrective action plans to address the noted deficiencies."



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APPENDICES

Appendix A:



Figure 8: The stump of sheared Tail Rotor blade of 5N-BGS on the Helipad



5N-BGS/5N-BDD

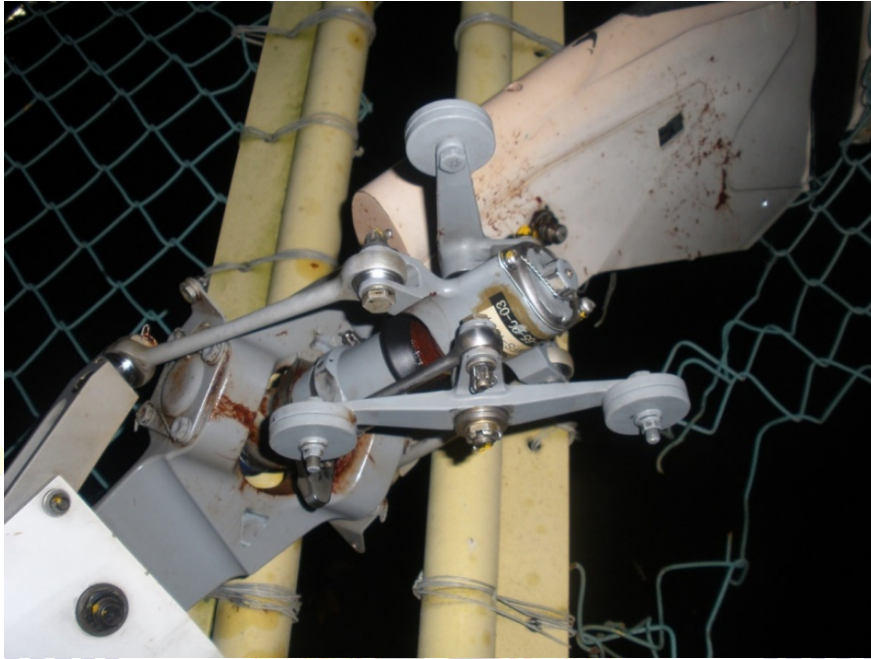


Figure 9: The sheared off Tail Rotor Assembly of 5N-BGS on the helipad

AIB



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Figure 10: The detached and broken Tail Rotor blade assembly of 5N-BGS on the Helipad

AIB



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Figure 11: The damage on one of the Main Rotor blade of 5N-BDD on the parking circle



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Figure 12: 5N-BDD positioned almost outside the parking circle on the Helipad



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AppendixB: Calabar Helicopter Jetty Plan.

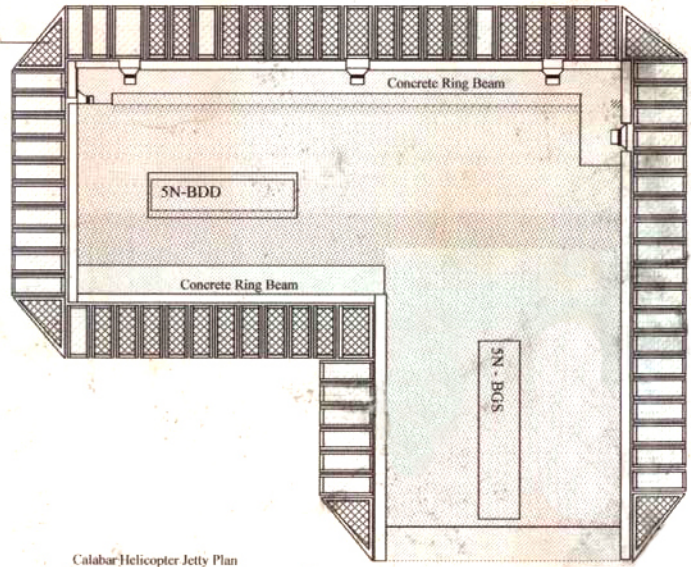
CALABAR BASE OPERATIONS MANUAL
Section 4 - Appendix 2

Document No. APDNL:

Appendix Two

JETTY DATA

Dimensions	90 x 150 m (13500 m ²)
Jetty Lighting:	
Floodlighting	No
Edge Lights	Yellow
Apron Marking:	
Passenger Path Lines	white
Helicopter Touchdown Pads	2 pads





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AppendixC: Bell Emergency Operating Procedures

BELL 412 EMERGENCY OPERATING PROCEDURES

PROCEDURE N° 8/2 TAIL ROTOR DRIVE FAILURE IN THE HOVER

INDICATIONS: Uncontrollable right yaw.

IMMEDIATE ACTIONS

Collective	Lower to minimise yaw and initiate landing
Throttles	Close fully
Cyclic	Minimise drift and yaw effect
Collective	Cushion touchdown - accepting yaw

SUBSEQUENT ACTIONS

Complete aircraft shutdown

PROCEDURE N° 8/3 TAIL ROTOR CONTROL FAILURE IN THE HOVER

INDICATIONS: Jammed pedals or lack of response to pedal application.

IMMEDIATE ACTIONS

DO NOT CLOSE THROTTLES UNLESS SEVERE YAW TO THE RIGHT OCCURS

Collective	Lower slowly
Cyclic	Minimise drift and effect yaw
Land	Accepting yaw

SUBSEQUENT ACTIONS

Complete aircraft shutdown

CONSIDERATIONS:

Application of power to correct left yaw is not recommended in view of possible subsequent difficulties.

TAIL ROTOR DRIVE FAILURE/TAIL ROTOR CONTROL FAILURE IN THE HOVER

Q12 Q. Q12



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