AIRCRAFT ACCIDENT REPORT

BH/2013/02/27/F

Accident Investigation Bureau

Report on the Serious Incident involving Bristow Helicopters Ltd Sikorsky S-92 with Registration 5N-BOA at MMA Lagos, Nigeria On 27th February, 2013

Published by Accident Investigation Bureau, of Nigeria

This Report is produced by the Accident Investigation Bureau (AIB), Murtala Muhammed International Airport, Ikeja, Lagos.

The Report is based upon the investigation carried out by 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.
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 the use of others, readers are encouraged to copy or reprint for further distribution, acknowledging Accident Investigation Bureau, Nigeria as the source.

Recommendations in this report are addressed to the regulatory Authorities of the state (NCAA). It is for this authority to ensure enforcement.

Printed in Nigeria for the Accident Investigation Bureau (AIB)

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GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

ABC Powder	Type of Fire Extinguisher
AIB	Accident Investigation Bureau
AIP	Aeronautical Information Publication
AMO	Approved Maintenance Organization
AOC	Air Operator Certificate
ASB	Alert Service Bulletin
ATC	Air Traffic Controller
BATS	BGI Aviation Technical Services
BHNL	Bristow Helicopter Nigeria Limited
BGI	Bristow Group International
CAA	Civil Aviation Authority (UK)
CO_2	Carbon Dioxide Type of Fire Extinguisher
GRA	Government Reserve Area
JAR FCL ATPL	European type Airline Transport Pilot Licence
NAMA	Nigeria Airspace Management Agency
NCAA	Nigerian Civil Aviation Authority
Nig.CAR	Nigerian Civil Aviation Regulation
NIMET	Nigerian Meteorological Agency
NM	Nautical Miles
PMI	Principal Maintenance Inspector (NCAA)
QA/EFS	Bristow Quality Assurance/Engineering Fleet Support

QNH	Altimeter Setting That Causes Altimeter To Indicate Altitude Above Sea Level
SOP	Standard Operating Procedure
TD	Technical Directive
UTC	Universal Time Coordinated

LIST OF FIGURES

Aircraft Accident Report No:	BH/2013/02/27/F
Registered Owner and Operator:	Bristow Helicopters Ltd.
Aircraft Type and Model:	Sikorsky S-92
Registration:	5N-BOA
Location:	Murtala Muhammed Airport, Lagos
Date and Time:	27th of February, 2013 at about 0715hrs *(All times in this report are local time, equivalent to UTC+1, unless otherwise stated)*

SYNOPSIS

Accident Investigation Bureau (AIB) was notified of the Incident at about 0815hrs on 27th of February, 2013 and Investigators were dispatched immediately to the Incident site and thus investigation into the incident began same day. All relevant authorities were notified.

At about 0715hrs, 5N-BOA, S-92 Helicopter with eight passengers onboard was about to request for taxi clearance, when the crew perceived a burning smell in the cockpit. A ground personnel on the ramp was also seen waving his hands in an urgent manner, indicative of a problem. The co-pilot saw a bit of smoke from his top left window, even though there was no indication of engine or any other fire in the cockpit, but the crew agreed that there was fire. The crew carried out an emergency engine shutdown and

waited for the rotor to come to a stop before evacuating the passengers. The standby fire extinguisher was used to put off the fire by ground personnel, the fire only lasted few seconds. Both crew members deplaned without any injuries to them or to the passengers.

The Investigation identified the following causal and contributory factor:

Causal Factor

115v cable loom chafed and arced with hydraulic pipeline, puncturing it and causing a high pressure leak which ignited on contact with hot surface of the Right Hand heat exchanger, resulting in fire on the Upper Deck.

Contributory Factors

1 The effectivity of the aircraft was excluded in the Alert Service Bulletin ASB No. 92-20-002A issued by the manufacturer.

2 The Technical Directive TD-S92A-29-99 did not include Check/Inspection of the right hand side of the Upper Deck.

Two safety recommendations were made.

1.0 FACTUAL INFORMATION

1.1 History of Flight

The first pre-flight of the day was carried out, passengers were briefed and boarded. Engine start-up was requested and granted. Both engines were started.

At about 0715hrs, 5N-BOA, S-92 Helicopter with eight passengers onboard was about to request for taxi clearance, when the crew perceived a burning smell in the cockpit. A ground personnel on the ramp was also seen waving his hands in an urgent manner, indicative of a problem. The co-pilot saw a bit of smoke from his top left window, even though there was no indication of engine or any other fire in the cockpit, the crew agreed that there was fire. The crew carried out an emergency engine shutdown and waited for the rotor to come to a stop before evacuating the passengers. The standby fire extinguisher was used to put off the fire by ground personnel, the fire only lasted few seconds.

Neither the smoke nor the fire got into the cabin or cockpit. Both crew members deplaned without any injuries to them or to the passengers. The helicopter was later moved into the hanger to assess the extent of the fire damage.

1.2 Injuries to Persons

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	Nil
MINOR/NONE	2	8	Nil

1.3 Damage to Aircraft:

The damage was around the forward area of the rotor, the cowlings, the right heat exchanger and all the wiring in that area, hydraulic fluid lines and other pipelines were burnt. All the components located in the top cowling area forward of the main rotor gearbox were damaged by the fire. See Figures 1 and 2 below:

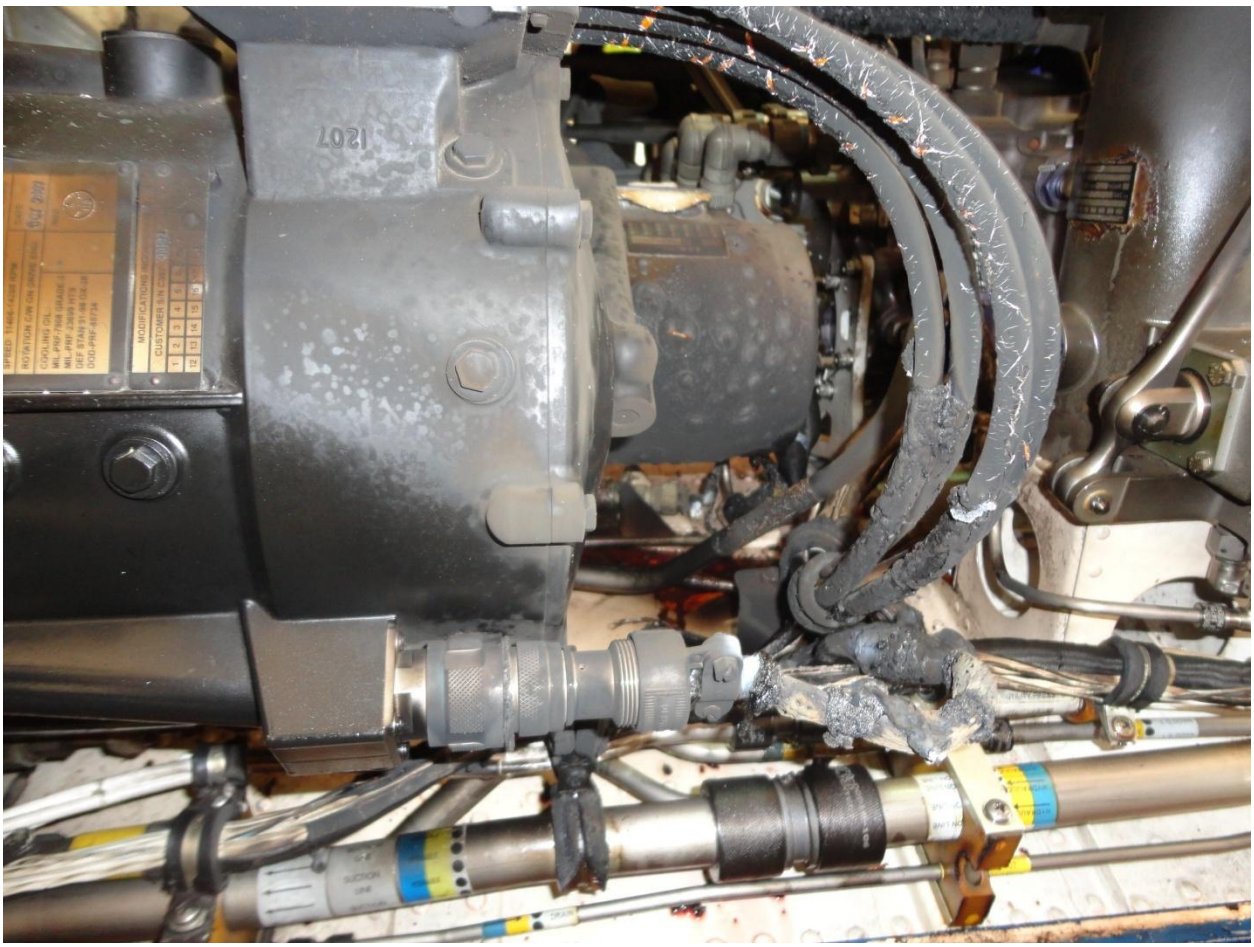


Figure 1: The burnt section of the upper deck

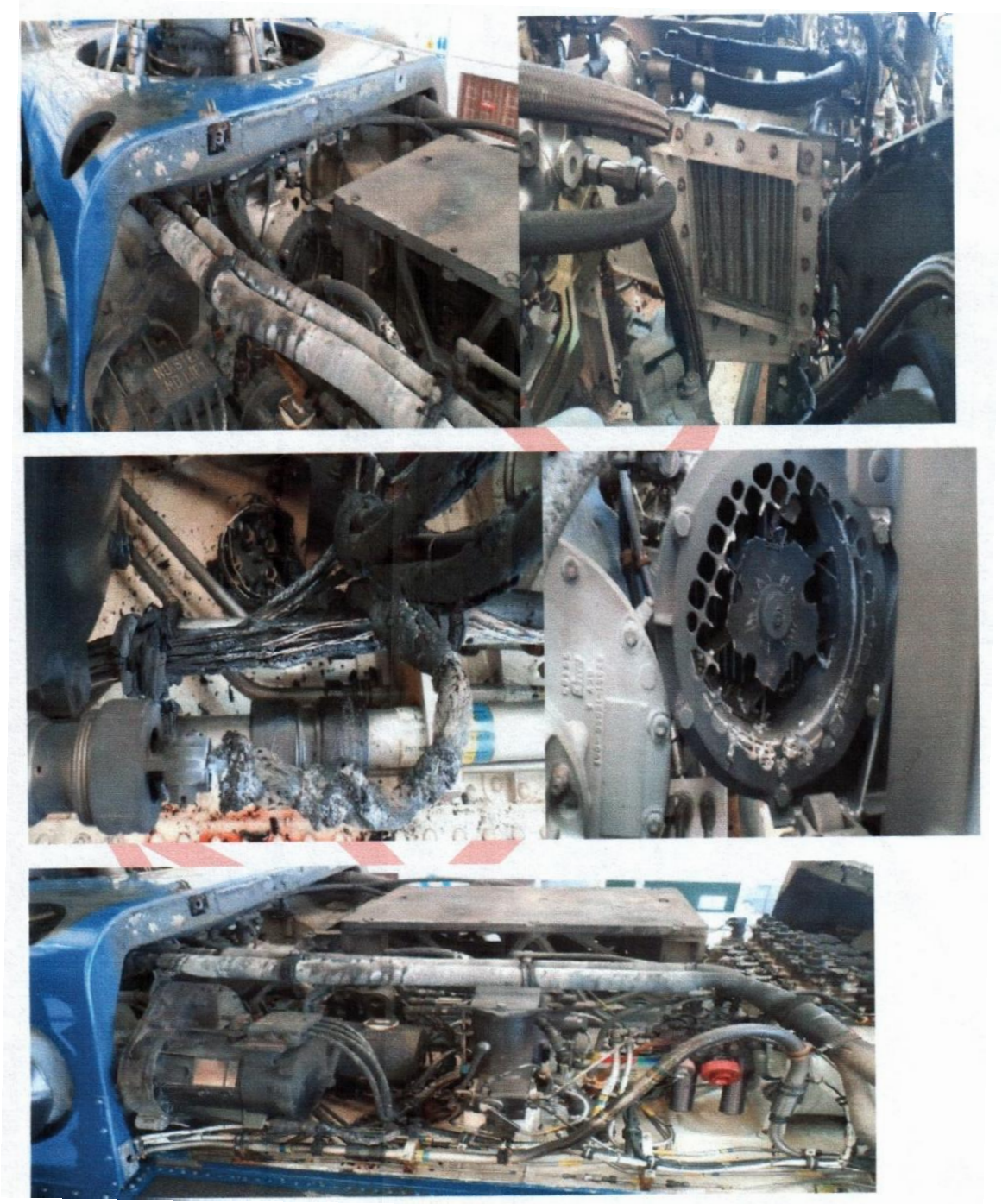


Figure 2: Different damaged areas of the upper deck caused by the fire outbreak

1.4 Other Damage:

There was no other damage.

1.5 Personnel Information

1.5.1 Pilot Flying

Nationality:	Spaniard
Gender:	Male
Age:	40 yrs
Licence No.:	JAR FCL ATPL (H) 403603D
Aircraft Ratings:	S-92
Instrument Rating Validity:	12th May, 2013
Proficiency Check:	12th May, 2013
Medical Certificate:	16th May, 2013
Total Flying Experience:	5260hrs
On Type	1680hrs
Last 90 days	150hrs
Last 28 days	70hrs
Last 24 hrs	01hrs

The captain a Spaniard, has a JAR licence JAR FCL ATPL (H) number 403603D, initially issued in the United Kingdom by Civil Aviation Authority (CAA). He has a total of 1680hrs on type and experienced on the S-92. The Licence was validated by Nigerian Civil Aviation Authority (NCAA) on the 14th November, 2012 and therefore qualified to fly the S-92 Helicopter.

1.5.2 Pilot Monitoring

Nationality:	Nigerian
Gender:	Male
Age:	28 yrs
Licence No.:	Commercial 5552(H)
Aircraft Ratings:	S-76; S-92
Instrument Rating validity:	20th October, 2013
Proficiency Check:	18th April, 2013
Medical Certificate:	22nd January, 2014
Total Flying Experience:	2060hrs
On Type	142hrs
Last 90 days	73hrs
Last 28 days	39hrs
Last 24 hrs	Nil

The Co-pilot, a Nigerian with a Licence CPL 5552(H) issued by NCAA, is rated and qualified to fly the S-92 Helicopter. The Co-pilot is relatively new on the S-92 with total hours on type at 142hrs.

1.6 Aircraft Information

1.6.1 General Information

Type	S-92
Serial No.	920075
Manufacturer	SIKORSKY
Year of Manufacture	December 2007

Airframe time	3157:41 hrs
Cycles	4125 as at 22nd January, 2013

See Figure 3 for the picture showing the aircraft on ground.

1.6.2 Power Plant

Engine Model:	**General Electric GE-CT7-8A**
No. 1 TSO	
Serial No:	**GE-E947391**
Hours	4055:41
Cycles	2271
No. 2 TSO	
Serial No:	**GE-E947358**
Hours	4198:44
Cycles	2029
Type of Fuel	Jet A1

Figure 3: Sikorsky S-92 Helicopter

1.7 Meteorological Information

Time	0530 UTC
Wind	VARIABLE /02kts
Visibility	10km
Weather	NIL
Cloud	NIL
Temp./Dew point	26/24°C
QNH	1011

1.8 Aids to Navigation

There was no pertinent information on Navigational Aids as it relates this incident. The Helicopter was yet to request for taxi when the incident occurred.

1.9 Communications

There was good communication between the aircraft and the Tower, start-up was requested by the crew and was approved by the Tower. The Incident occurred after start-up when the helicopter doors were closed, and the crew were ready for taxi but had not requested for taxi clearance.

1.10 Aerodrome Information

The aerodrome doubles as both local and International Airport, with two parallel runways 18L/36R, 9,006ft in length and 18R/36L, 12,795ft in length with an elevation of 135ft. The aerodrome is adequately covered for Fire eventualities and also a control area to some surrounding aerodromes. See Figure 4 below.

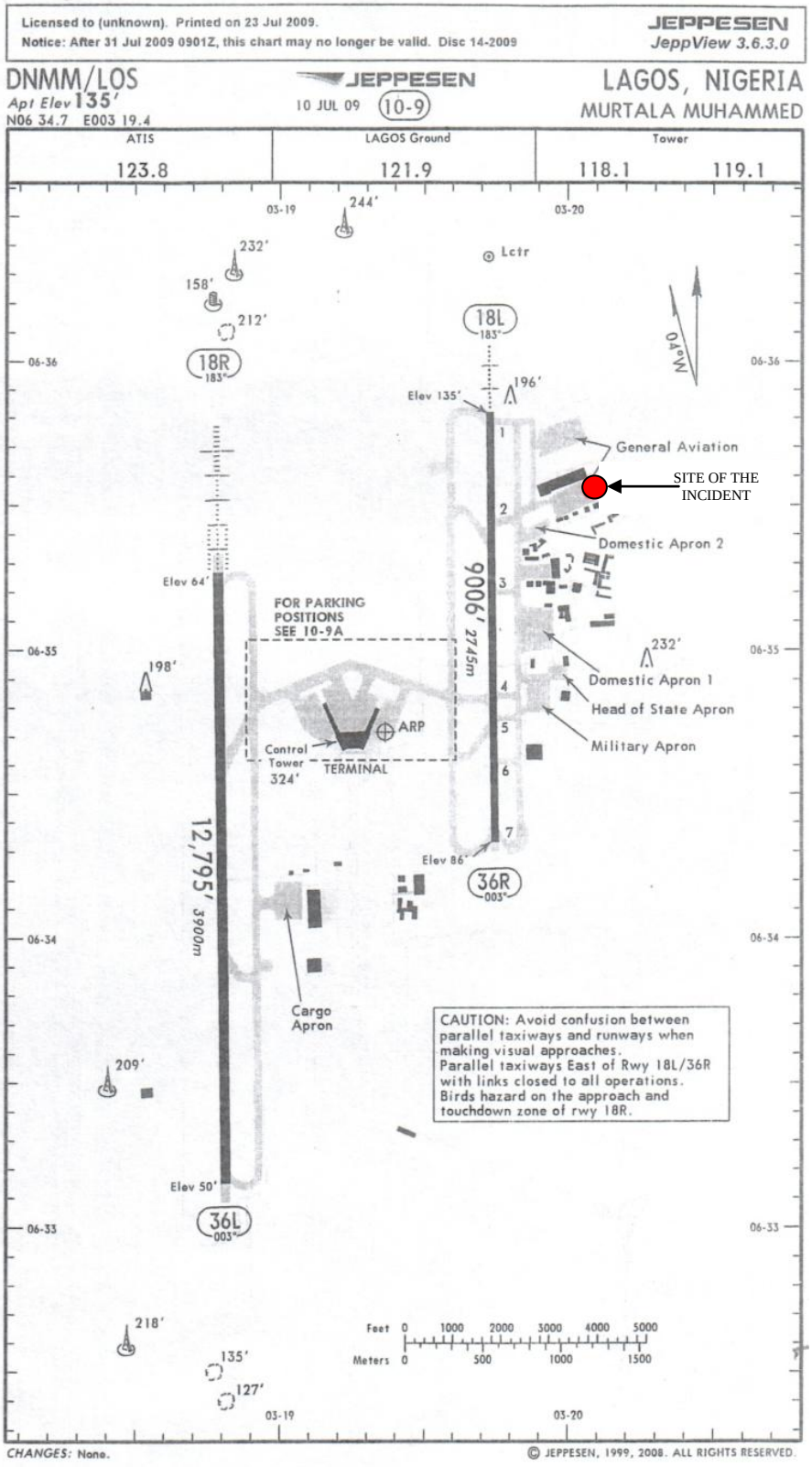


Figure 4: Runway layout (Jeppesen)

1.11 Flight Recorders

The Helicopter is fitted with combined CVR/FDR, that is, both have same part numbers but different serial numbers. The recorders were not removed for decoding.

FLIGHT DATA RECORDER

Part Number	DS 165-102
S/N	001927003
Manufacturer	Penny & Giles

COCKPIT VOICE RECORDER

Part Number	DS 165-102
S/N	003642004
Manufacturer	Penny & Giles

1.12 Wreckage and Impact Information

The helicopter was yet to depart hence was intact with visible damage to the Starboard side, on top of the roof caused by the fire outbreak. The incident happened at the Bristow Helicopter departure ramp in the General Aviation section of the Local Airport wing of Murtala Muhammed Airport, Ikeja, of Lagos State. Nigeria.

1.13 Medical and Pathological Information

Nil.

1.14 Fire

There was fire outbreak as a result of chafing of the electrical harness, arcing and hydraulic leakage which enhanced the fire around the Upper Deck Heat Exchanger Area.

The Bristow Fire personnel were on standby with other ground personnel during the engine start. The fire personnel had big portable fire extinguishers (ABC Powder and CO_2) on a roller. The Co-pilot asserted that there was a burning smell and saw smoke outside the top left window, coupled with a ground personnel beckoning in an urgent manner. The Bristow fire personnel extinguished the fire immediately with their portable Fire Extinguisher. See Figures 5 and 6 below.

Figure 5: Burnt Cowling

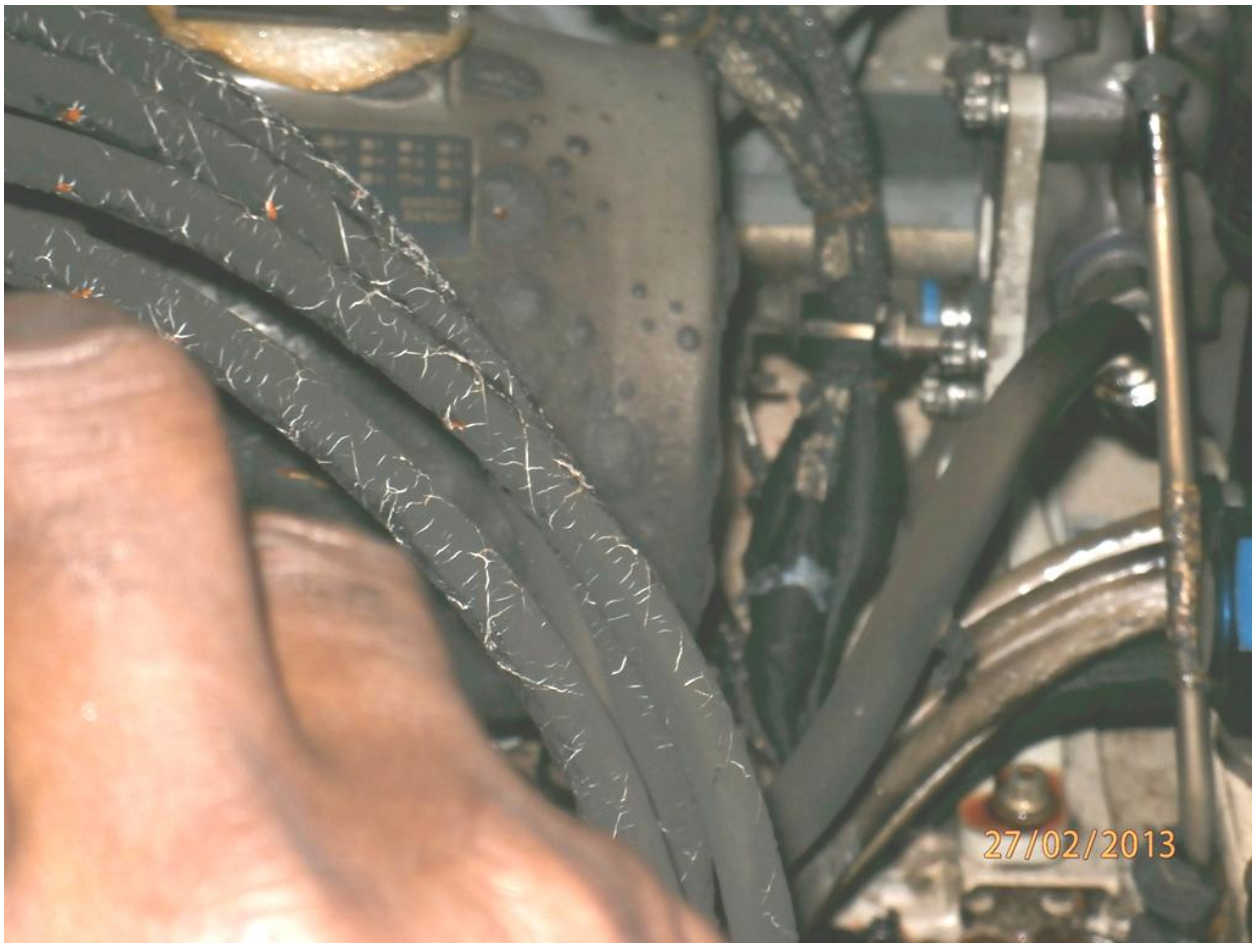


Figure 6: Burnt hoses

1.15 Survival Aspect

The incident was survivable as the helicopter was still on the ramp when the incident occurred. Due to fire outbreak on the RHS upper deck around the main rotor area and the burning smell in the cockpit, the crew carried out an emergency shutdown. The passengers were disembarked as soon as the rotor came to a complete stop. The crew also disembarked without any injuries. There was no smoke or fire in either the cockpit or the cabin.

1.16 Tests and Research

Nil.

1.17 Organizational and Management Information

1.17.1 Bristow Helicopters

Bristow Helicopters (Nigeria) Limited, an affiliate of Bristow Group, is a provider of industrial aviation services offering transportation in the Nigerian oil and gas industry and has been in operation for more than 40 years. During the last eight years, Bristow Helicopters Nigeria has ventured into deep water helicopter services with a commendable safety record.

Bristow Helicopter operations include both the fixed wing and helicopter; the company conducts all its operations in accordance with the approved NCAA Air Operators Certificate (AOC). Operations Manual is developed primarily to guide operations taking place over and within the territory of Nigeria.

1.17.1.1 Alert Service Bulletins (ASB) and Technical Directives (TDs)

ASBs were issued by Sikorsky on S-92A with specific serial numbers of the affected helicopter series for compliance. Technical Directives were issued specifically by Bristow Helicopters to accommodate all other S-92As that were not covered by Sikorsky ASBs.

ASB No. 92-20-002A dated 30th April, 2008 was issued by Sikorsky on S-92A with the subject and effectivity as indicated below:

Subject:

Standard practices – Engine Air Inlet Anti-ice Harnesses – To provide clearance improvements on the Helicopter Top Deck – One-Time Installation and Reposition of Clamps and Hardware

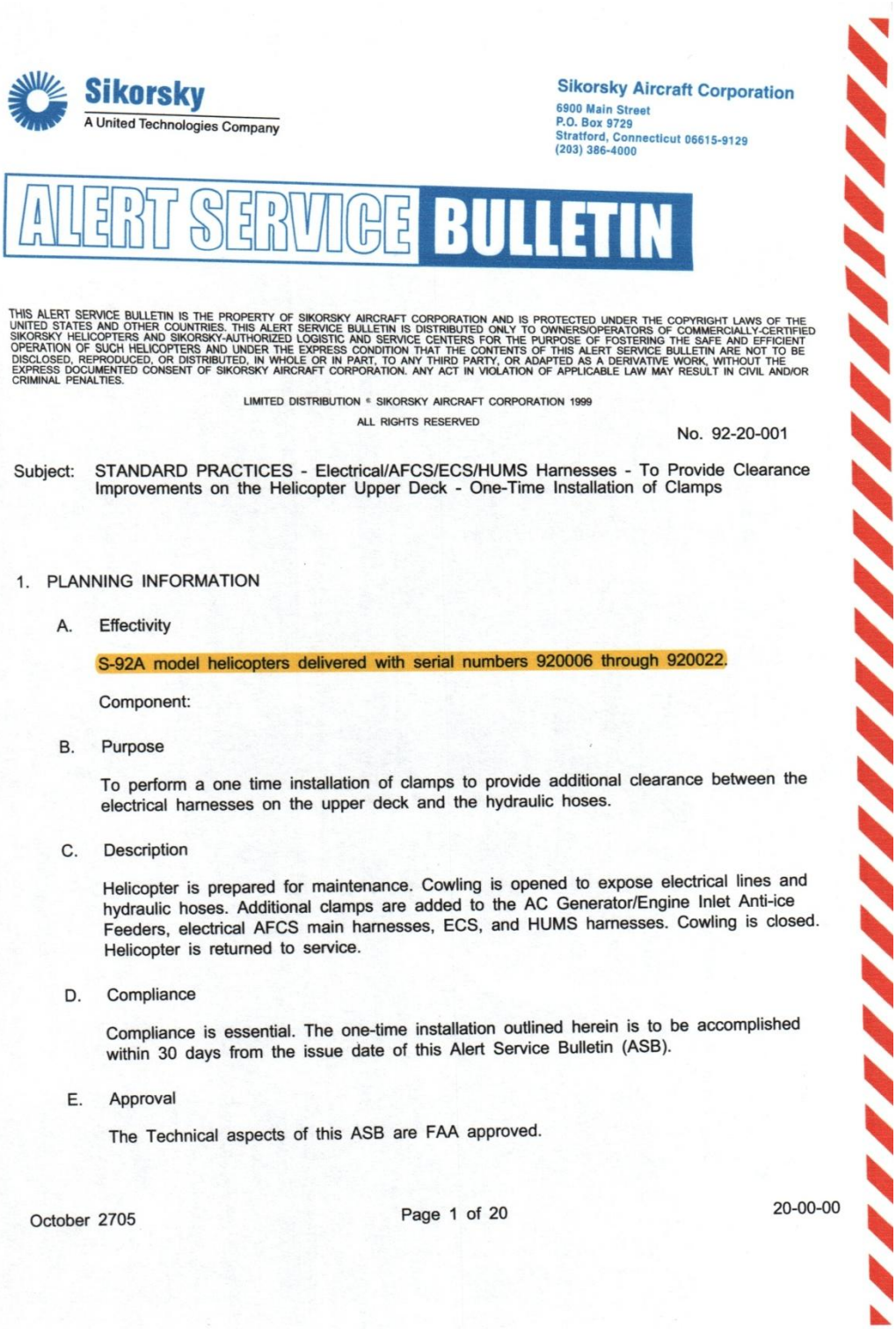
Effectivity:

Model: S-92A helicopters delivered with serial numbers 920006 through 920073

During the course of the investigation, the Sikorsky representative was asked whether there was an ASB that covers the series S-92A with serial number 920075. No positive response was obtained.

TDs were issued before and after the incident of 27th February, 2013. The subject of a TD dated 22nd January, 2013 was to check for chafing on the hydraulic line/electrical loom, LH Aft Main Gear Box (MGB), and effectivity was on all S-92As.

See Figure 7 to Figure 12 below of the Alert Service Bulletins and Technical Directives.



Sikorsky
A United Technologies Company

Sikorsky Aircraft Corporation
6900 Main Street
P.O. Box 9729
Stratford, Connecticut 06615-9129
(203) 386-4000

ALERT SERVICE BULLETIN

No. 92-20-001

Subject: STANDARD PRACTICES - Electrical/AFCS/ECS/HUMS Harnesses - To Provide Clearance Improvements on the Helicopter Upper Deck - One-Time Installation of Clamps

1. PLANNING INFORMATION

A. Effectivity

S-92A model helicopters delivered with serial numbers 920006 through 920022.

Component:

B. Purpose

To perform a one time installation of clamps to provide additional clearance between the electrical harnesses on the upper deck and the hydraulic hoses.

C. Description

Helicopter is prepared for maintenance. Cowling is opened to expose electrical lines and hydraulic hoses. Additional clamps are added to the AC Generator/Engine Inlet Anti-ice Feeders, electrical AFCS main harnesses, ECS, and HUMS harnesses. Cowling is closed. Helicopter is returned to service.

D. Compliance

Compliance is essential. The one-time installation outlined herein is to be accomplished within 30 days from the issue date of this Alert Service Bulletin (ASB).

E. Approval

The Technical aspects of this ASB are FAA approved.

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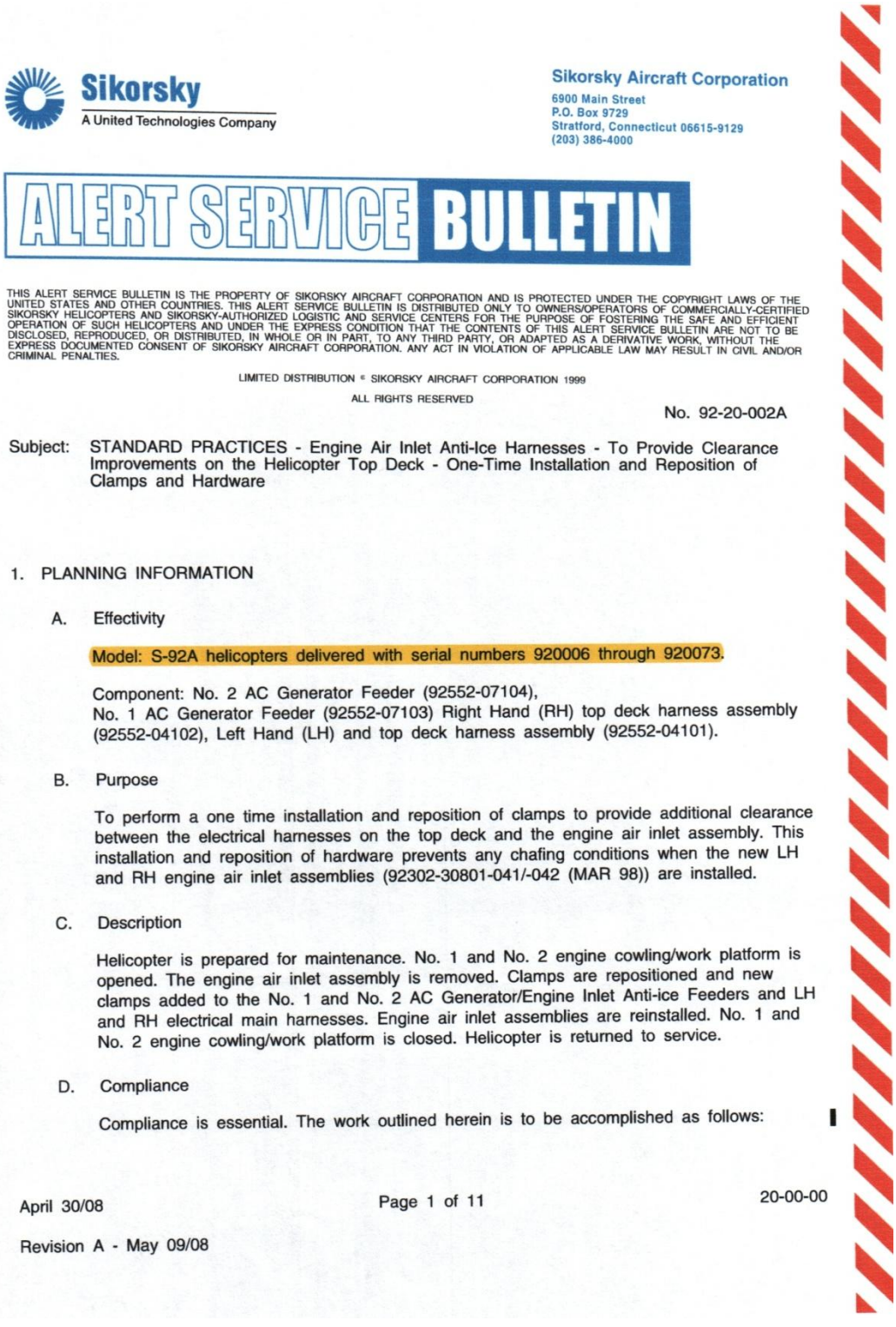
Figure 7: ASB-92-20-001



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ALERT SERVICE BULLETIN

No. 92-20-002A

Subject: STANDARD PRACTICES - Engine Air Inlet Anti-Ice Harnesses - To Provide Clearance Improvements on the Helicopter Top Deck - One-Time Installation and Reposition of Clamps and Hardware

1. PLANNING INFORMATION

A. Effectivity

Model: S-92A helicopters delivered with serial numbers 920006 through 920073.

Component: No. 2 AC Generator Feeder (92552-07104),
No. 1 AC Generator Feeder (92552-07103) Right Hand (RH) top deck harness assembly (92552-04102), Left Hand (LH) and top deck harness assembly (92552-04101).

B. Purpose

To perform a one time installation and reposition of clamps to provide additional clearance between the electrical harnesses on the top deck and the engine air inlet assembly. This installation and reposition of hardware prevents any chafing conditions when the new LH and RH engine air inlet assemblies (92302-30801-041/-042 (MAR 98)) are installed.

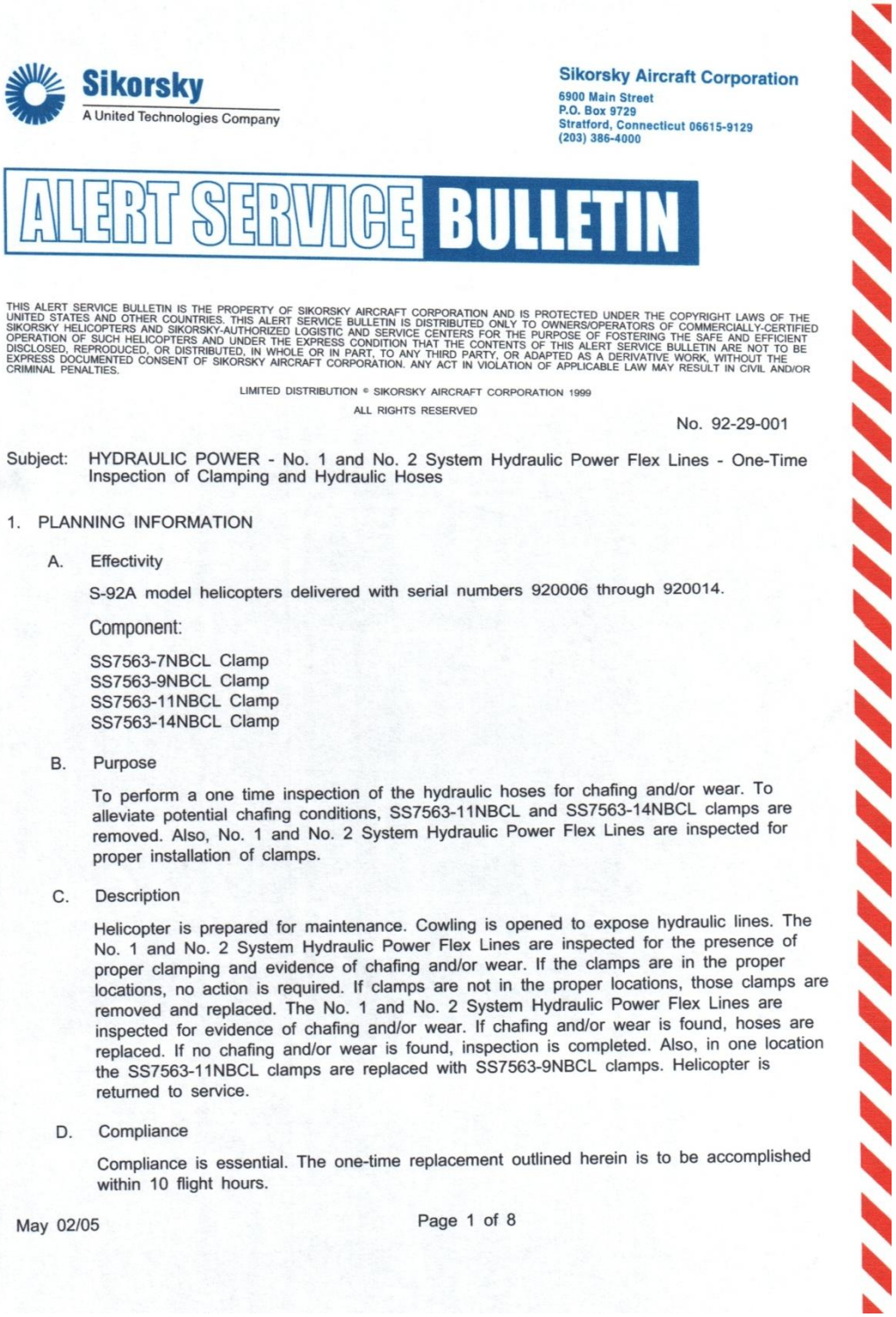
C. Description

Helicopter is prepared for maintenance. No. 1 and No. 2 engine cowling/work platform is opened. The engine air inlet assembly is removed. Clamps are repositioned and new clamps added to the No. 1 and No. 2 AC Generator/Engine Inlet Anti-ice Feeders and LH and RH electrical main harnesses. Engine air inlet assemblies are reinstalled. No. 1 and No. 2 engine cowling/work platform is closed. Helicopter is returned to service.

D. Compliance

Compliance is essential. The work outlined herein is to be accomplished as follows:

Figure 8: ASB 92-20-002A



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P.O. Box 9729
Stratford, Connecticut 06615-9129
(203) 386-4000

ALERT SERVICE BULLETIN

No. 92-29-001

Subject: HYDRAULIC POWER - No. 1 and No. 2 System Hydraulic Power Flex Lines - One-Time Inspection of Clamping and Hydraulic Hoses

1. PLANNING INFORMATION

A. Effectivity

S-92A model helicopters delivered with serial numbers 920006 through 920014.

Component:

SS7563-7NBCL Clamp
SS7563-9NBCL Clamp
SS7563-11NBCL Clamp
SS7563-14NBCL Clamp

B. Purpose

To perform a one time inspection of the hydraulic hoses for chafing and/or wear. To alleviate potential chafing conditions, SS7563-11NBCL and SS7563-14NBCL clamps are removed. Also, No. 1 and No. 2 System Hydraulic Power Flex Lines are inspected for proper installation of clamps.

C. Description

Helicopter is prepared for maintenance. Cowling is opened to expose hydraulic lines. The No. 1 and No. 2 System Hydraulic Power Flex Lines are inspected for the presence of proper clamping and evidence of chafing and/or wear. If the clamps are in the proper locations, no action is required. If clamps are not in the proper locations, those clamps are removed and replaced. The No. 1 and No. 2 System Hydraulic Power Flex Lines are inspected for evidence of chafing and/or wear. If chafing and/or wear is found, hoses are replaced. If no chafing and/or wear is found, inspection is completed. Also, in one location the SS7563-11NBCL clamps are replaced with SS7563-9NBCL clamps. Helicopter is returned to service.

D. Compliance

Compliance is essential. The one-time replacement outlined herein is to be accomplished within 10 flight hours.

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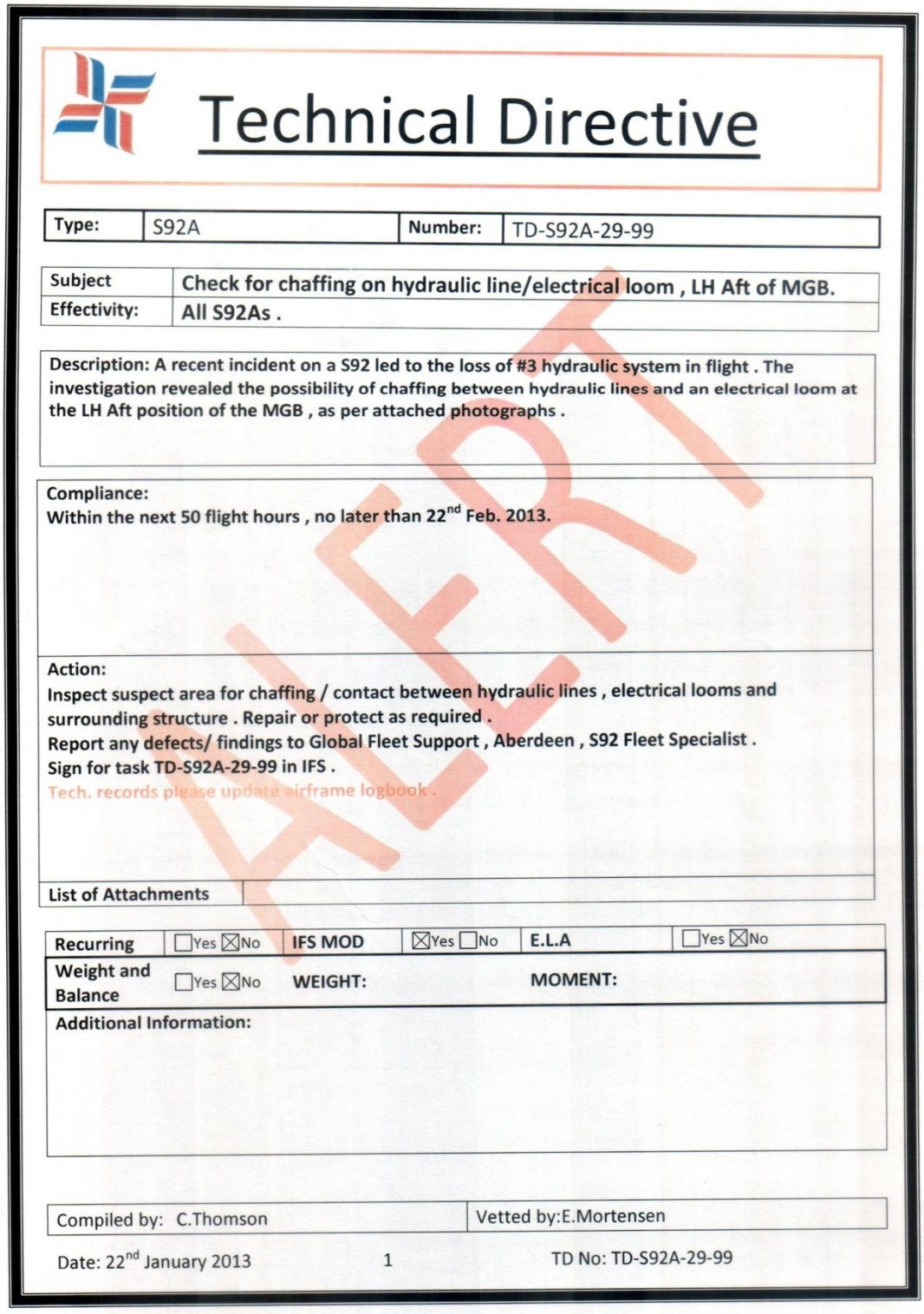
Figure 9: ASB 92-29-001



Technical Directive

Type:	S92A	Number:	TD-S92A-29-99

Subject	Check for chaffing on hydraulic line/electrical loom , LH Aft of MGB.
Effectivity:	All S92As .

Description: A recent incident on a S92 led to the loss of #3 hydraulic system in flight . The investigation revealed the possibility of chaffing between hydraulic lines and an electrical loom at the LH Aft position of the MGB , as per attached photographs .

Compliance:
Within the next 50 flight hours , no later than 22nd Feb. 2013.

Action:
Inspect suspect area for chaffing / contact between hydraulic lines , electrical looms and surrounding structure . Repair or protect as required .
Report any defects/ findings to Global Fleet Support , Aberdeen , S92 Fleet Specialist .
Sign for task TD-S92A-29-99 in IFS .
Tech. records please update airframe logbook .

List of Attachments

Recurring	☐Yes ☒No	IFS MOD	☒Yes ☐No	E.L.A	☐Yes ☒No
Weight and Balance	☐Yes ☒No	WEIGHT:		MOMENT:	

Additional Information:

Compiled by: C.Thomson	Vetted by:E.Mortensen

Date: 22nd January 2013 1 TD No: TD-S92A-29-99

Figure 10: TD-S92A-29-99

Technical Directive

Type:	S92A	Number:	TD-S92A-29-104

Subject	Inspect LH and RH MGB, and Upper Deck Heat Exchanger Area, All 1, 2 and 3 system Hydraulic lines, Clamping, all Components, and wiring Looms for any damage, chaffing, or wear.
Effectivity:	All Bristow S92A's

Description:
Today a Bristow aircraft had a fire whilst the aircraft was running on the ground near the Rotor Head with the Engines running normally. Extensive damage was found in the Heat Exchanger and Hydraulic pump area on RH Side.

Compliance: Comply With After days flying 28th Feb 2013

Action: Comply with the following:

1. General inspection of the area around the cooling fans for evidence of chafing, arcing, hydraulic leaks etc.
2. Detailed inspection to assure compliance with ASB 92-29-001 of No.1, No. 2, and No.3 Hydraulic System Hose Clamps.
3. Detailed inspection to assure compliance with the TD-S92A-29-99 Check for Chaffing on Hydraulic Lines/electrical loom at LH Aft position of the MGB.
4. Check of the heat exchange fan to ensure that the bearings run smooth, no sign of distress, burning, arcing etc.

Note: Report any anomalies found to Fleet Support

List of Attachments See Attached Photo's

Recurring	Yes No X	**IFS MOD**	X Yes No	**E.L.A Affected**	Yes No X
Weight and Balance	Yes No X	**WEIGHT**		**MOMENT**	

Additional Information:

Compiled By: E. Mortensen	Vetted by: R Gould

Date: 27th February 2013 1 TD No: TD-S92A-29-104

Figure 11: TD-S92A-29-104

Technical Directive

Type:	S92A	Number:	TD-S92A-29-105

Subject	**Check of hydraulic pipe/ electrical harnesses for compliance with ASBs 92-20-001 & 92-20-002A.**
Effectivity:	**All S92As .920006 to 920176**

Description:
A recent incident on a company aircraft led to a fire on the upper deck of an S92 . This was due to an electrical harness chafing on a hydraulic pipe , causing a leak which then ignited . Initial investigation show that the harness may not have been compliant with the AMM and previously issued ASBs .

Compliance: Within 25 hours or 7 days ...no later than 8th March .

Action:

1. IAW AMM TASKS 29-00-00-210-001 , 29-00-00-210-002 and 29-00-00-215-001 Inspect hydraulic lines and electrical harnesses . These tasks were originally issued as ASBs 92-20-001 & 92-20-002A . Please note that from aircraft serial number 920085 there is an alternate routing for the RH Inlet 115V. wiring , refer to 29-00-00-210-001,Sheet 6. For aircraft prior to 920085 please refer to 29-00-00-210-001 Sheet 4 . Note that the RH Inlet wiring branches off from the **upper side** of the main loom . Failure to do this will greatly reduce the clearance to the hydraulic lines .
   For all aircraft , regardless of serial number , these tasks must be complied with in full .

Please pay particular attention to any 115 V electrical harnesses and hydraulic line interfaces.

2. Sign for task in IFS . TD-S92A-29-105.
3. Tech. Records please make entry in Airframe Log book .

Note , the 375 and 1500 hour maintenance inspections contain these tasks .

List of Attachments	

Recurring	☐Yes ☒No	IFS MOD	☒Yes ☐No	E.L.A	☐Yes ☒No
Weight and Balance	☐Yes ☒No	WEIGHT		MOMENT	

Compiled by:C.Thomson	Vetted by:E.Mortensen

Date:1st March , 2013 1 TD No: TD-S92A-29-105

Figure 12: TD-S92A-29-105

1.17.1.2 Maintenance Organization

BGI Aviation Technical Services (BATS) is the maintenance outfit contracted to maintain Bristow aircraft. BATS commenced operations in November 2012 (See Appendix A). It is duly certified by NCAA as an AMO after Bristow Helicopters Nigeria Limited (BHNL) and Pan African Airlines Nigeria (PAAN) relinquished their AMOs.

It is the responsibility of BATS to implement ASBs and TDs as necessary.

BGI Aviation Technical Services (BATS) provides engineering and technical services to the Nigerian aviation market. Their headquarters is located at GRA Ikeja Lagos, while a service office which includes a fully equipped heavy maintenance hangar and management offices, is situated at the General Aviation Area of Murtala Muhammed Airport. Similarly the company has a full maintenance hangar in addition to its support facilities in Port Harcourt, Rivers State, Nigeria. In addition, BATS also operates from customer bases in Warri, Calabar, Eket and Escravos.

1.17.1.3 QA/EFS - Bristow Quality Assurance/Engineering Fleet Support

Bristow Quality Assurance/Engineering Fleet Support has oversight responsibility to liaise with the manufacturer where there are discrepancies or omissions in the implementation of ASBs that affect the continuous Airworthiness requirement and operation of aircraft in its fleet.

The investigation observed some deviations from this role.

1.17.2 Nigerian Airspace Management Agency (NAMA)

NAMA is an Air Navigation Service Provider with the mandate to manage the Nigerian Airspace consistent with the requirement of ICAO SARPs. NAMA provided the start-up clearance and the navigational guide for departure. It also provides information to the appropriate organizations in the event of emergencies.

There was no evidence that the ATC knew about the fire incident and the passengers' evacuation.

1.18 Additional Information

The fire occurred at the forward RHS upper deck around the main rotor area but there was no fire indication in the cockpit.

NCAA was notified of the incident and was present at the incident site and authorized Bristow to carry out repair work on the damaged area.

The Sikorsky technical representative was present to observe the repair work done.

Bristow Fire personnel extinguished the fire.

There was no evidence to indicate that the fire incident was reported to the ATC.

1.19 Useful or Effective Investigation Techniques

Nil.

2.0 ANALYSIS

2.1 The Flight Crew

The crew were qualified to fly the aircraft. The Captain had over 1600 flying hours on type and a total flying experience of 5260 hours on helicopter. AIB has no record of previous incident or accident on the captain. The captain can be said to be well experienced in helicopter operation.

The co-pilot on the other hand may be said to be new on the S-92A helicopter with 142 hrs but also experienced in helicopter operation with total flying experience at 2060hrs.

After the rotors stopped, passengers were evacuated successfully without injuries and the fire was extinguished a few seconds later without fire getting into the cabin or cockpit. Since the fire started forward RHS around the main rotor assembly, the crew's prompt response in shutting down the engines enhanced the ability of fire personnel to put it out.

2.2 Maintenance

BATS has the responsibility for maintenance of Bristow Helicopters' aircraft. It is its responsibility to ensure that all Alert Service Bulletins issued by the manufacturers and Technical Directives issued by the operators are complied with.

ASBs indicate the subject matter, stating what needs to be done, with specific emphasis on the serial numbers of affected aircraft or equipment, the purpose of the ASB, description of how the work should be done, the period of compliance, the manpower, and materials needed for the job, etc.

ASB No. 92-20-002A dated 30th April, 2008 was issued by Sikorsky on S-92A with the subject and effectivity as indicated below:

Subject:

Standard practices – Engine Air Inlet Anti-ice Harnesses – To provide clearance improvements on the Helicopter Top Deck – One-Time Installation and Reposition of Clamps and Hardware.

Effectivity:

Model: S-92A helicopters delivered with serial numbers 920006 through 920073. However, the ASB did not cover the serial number of the incident aircraft. This was the reason for the non compliance on serial number 920075 helicopter.

During the course of the investigation, the Sikorsky representative was asked whether there was an ASB that covers the series S-92A with serial number 920075. No positive response was obtained.

Records showed that Bristow Helicopters issued a Technical Directive (TD) TD-S92A-29-99 on the 22nd January, 2013.

Subject:

Check for chafing on hydraulic line/electrical loom, LH Aft of MGB.

Effectivity:

All S-92As

Compliance:

Within the next 50 flight hours, no later than 22nd February, 2013.

The TD-S92A-29-99 issued by Bristow did not fully contain the dictates of the ASBs 92-20-001; 92-20-002A; 92-29-001 issued by Sikorsky requesting operators to carry out a One-Time Installation/Inspection of clamps on the Upper Deck which includes the RH and LH sides of the upper deck. The TD from Bristow only authorized the inspection/check for chafing on hydraulic line/electrical loom on the LH Aft of MGB which is on the Upper Deck. If the TD had included the check of the RH part of the Upper deck, the chafing on the Upper Deck would have been detected. The TD was issued on 22nd January, 2013 with the compliance not later than 22nd February, 2013.

The incident on 5N-BOA Sikorsky S-92A with serial number 920075 happened on the 27th February, 2013, five days after the expiration of the Technical Directive TD-S92A-29-99 compliance date. See Figure 10 above and Figure 13 below. Note: See Figure 14 through Figure 19 for other pictures on damage to the aircraft.

Page 3 of the TD showing hydraulic chafed line

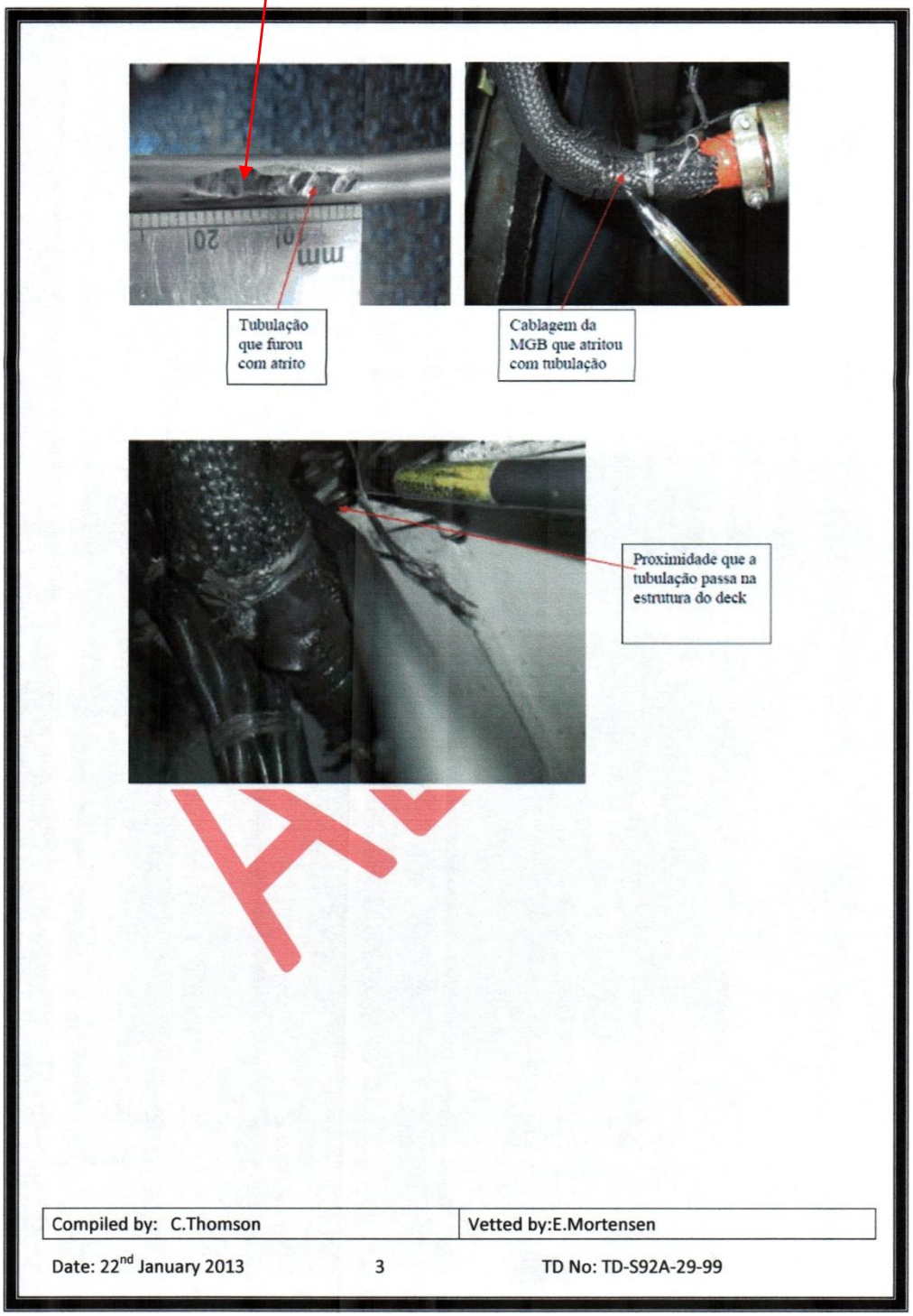


Figure 13 Hydraulic Chafed Line

2.3 QA/EFS - Bristow Quality Assurance/Engineering Fleet Support

The investigation observed that Bristow Quality Assurance/Engineering Fleet Support as part of their functions, could have raised the issue of the exclusion of serial number 920075 in the ASB 92-20-002A issued by the manufacturer.

Furthermore, QA/EFS was expected to evaluate conclusively the continuous Airworthiness requirement relating to the above ASB and the TD-S92A-29-99 which limited the implementation of the Directive to the LH Aft of MGB on the Upper Deck only.

2.4 Bristow Fire Control Service/System

Bristow Fire Control Service/System is coordinated by the Health Safety & Environment (HSE) unit, headed by the HSE Manager.

The Fire personnel consist of two categories: Firefighters and Fire Wardens. The Fire Wardens are trained by the HSE department for crowd control and use of fire extinguishers. The Firefighters are basically engineers, hangar floormen and ramp personnel trained by FAAN Fire Service. This set of personnel undergo refresher training every two years. The firemen were effective and efficient as expected.

Bristow Helicopters needs to ensure that crew members communicate all forms of emergency to the ATC since portable fire extinguishers may not always be adequate, and so put the FAAN Fire Service on standby.

3.0 CONCLUSIONS

3.1 Findings

3.1.1 The Helicopter was manufactured in 2007 with total Flight Hours of 3157:41

3.1.2 The incident occurred after start-up in daylight.

3.1.3 The captain is a Spaniard.

3.1.4 The pilots were certified to fly the aircraft.

3.1.5 The Captain and Co-pilot had 1680 and 142 hours on type respectively.

3.1.6 There were eight passengers plus two crew members onboard at the time of the incident.

3.1.7 The crew perceived a burning smell in the cockpit which confirmed to the crew that there was a problem with the helicopter.

3.1.8 Ground personnel signaled to the crew indicating there was a problem.

3.1.9 There was fire outbreak that was quickly put out.

3.1.10 Bristow fire personnel were available with appropriate firefighting equipment to extinguish the fire.

3.1.11 Emergency Engines Shutdown and Evacuation was initiated after the rotor stopped.

3.1.12 There was discoloration of the cowlings partly due to hydraulic leakage and fire.

3.1.13 The right heat exchanger blades were damaged

3.1.14 The fragments of the damaged heat exchanger fan blades were not found.

3.1.15 There was heavy hydraulic leakage due to arcing which punctured the high pressure hydraulic pipelines.

3.1.16 The Fire Service from the Federal Airports Authority of Nigeria was not notified

3.1.17 There was no evidence to show that the ATC knew about the fire problem and the evacuation of passengers.

3.1.18 The ASB 92-20-002A did not cover the S-92A aircraft serial number 920075.

3.1.19 Bristow Quality Assurance/Engineering Fleet Support did not highlight the omission of aircraft serial number 920075 in the effectivity list of the ASB.

3.1.20 The TD issued before the incident contained Check for chafing on the hydraulic line/electrical loom on the LH Aft of MGB only, excluding the RH side.

3.2 Causal Factor

115v cable loom chafed and arced with hydraulic pipeline, puncturing it and causing high pressure leak which ignited on contact with hot surface of the Right Hand heat exchanger, resulting in fire on the Upper Deck.

3.3 Contributory Factors

3.3.1 The effectivity of the aircraft was excluded in the Alert Service Bulletin ASB No. 92-20-002A issued by the manufacturer.

3.3.2 The Technical Directive TD-S92A-29-99 did not include Check/Inspection of the right hand side of the Upper Deck.

4.0 SAFETY RECOMMENDATIONS

4.1 Safety Recommendation 2016-001

Bristow Quality Assurance/Engineering Fleet Support should always evaluate the implementation of all ASBs and TDs conclusively as they affect:

a. the effectivity, operations, and continuous airworthiness requirement of all aircraft;

b. establish follow-up procedures with manufacturers where either omissions or discrepancies occur;

c. carry out necessary prompt safety actions to redress any unsafe situation prior to final resolution.

4.2 Safety Recommendation 2016-002

Bristow Helicopters should ensure that the crew reports all emergencies to the ATC for onward communication to the appropriate authority.

SAFETY ACTION

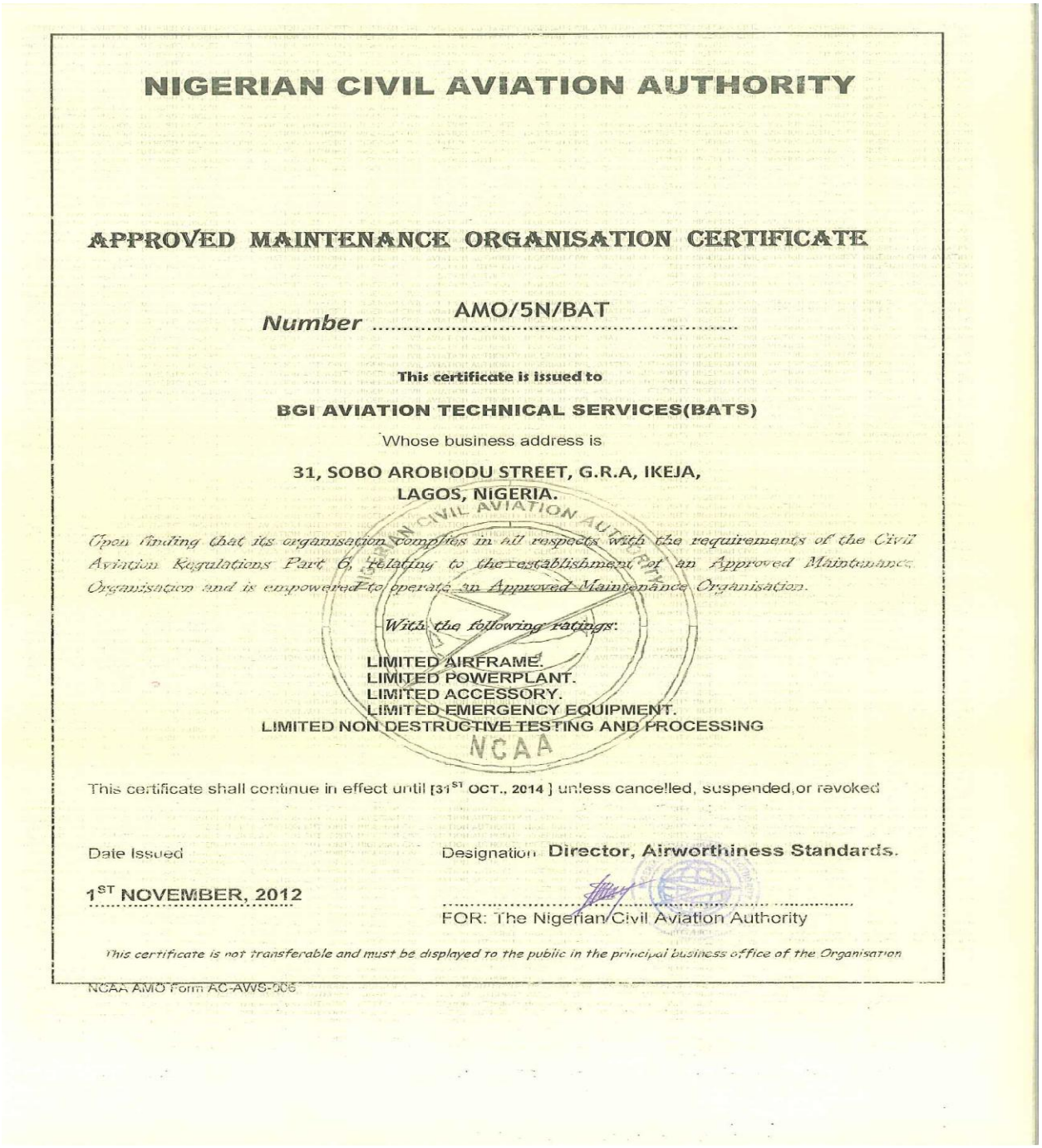
Bristow Helicopters Nigeria Limited issued a Technical Directive, **TD-S92A-29-104** following the incident.

Subject: Inspect LH and RH MGB, and Upper Deck Heat Exchanger Area, All 1, 2, and 3 system Hydraulic lines, Clamping all Components, and wiring Looms for any damage, chafing, or wear

Effectivity: All Bristow S92As
Date: 27th February 2013

APPENDICES

Appendix A



NIGERIAN CIVIL AVIATION AUTHORITY

APPROVED MAINTENANCE ORGANISATION CERTIFICATE

Number AMO/5N/BAT

This certificate is issued to

BGI AVIATION TECHNICAL SERVICES(BATS)

Whose business address is

31, SOBO AROBIODU STREET, G.R.A, IKEJA,
LAGOS, NIGERIA.

Upon finding that its organisation complies in all respects with the requirements of the Civil Aviation Regulations Part 6, relating to the establishment of an Approved Maintenance Organisation and is empowered to operate an Approved Maintenance Organisation.

With the following ratings:

LIMITED AIRFRAME.
LIMITED POWERPLANT.
LIMITED ACCESSORY.
LIMITED EMERGENCY EQUIPMENT.
LIMITED NON DESTRUCTIVE TESTING AND PROCESSING

NIGERIAN CIVIL AVIATION AUTHORITY NCAA

This certificate shall continue in effect until [31ST OCT., 2014] unless cancelled, suspended,or revoked

Date Issued

1ST NOVEMBER, 2012

Designation Director, Airworthiness Standards.

FOR: The Nigerian Civil Aviation Authority

This certificate is not transferable and must be displayed to the public in the principal business office of the Organisation

NCAA AMO Form AC-AWS-008

OTHER PICTURES OF DAMAGE TO THE AIRCRAFT

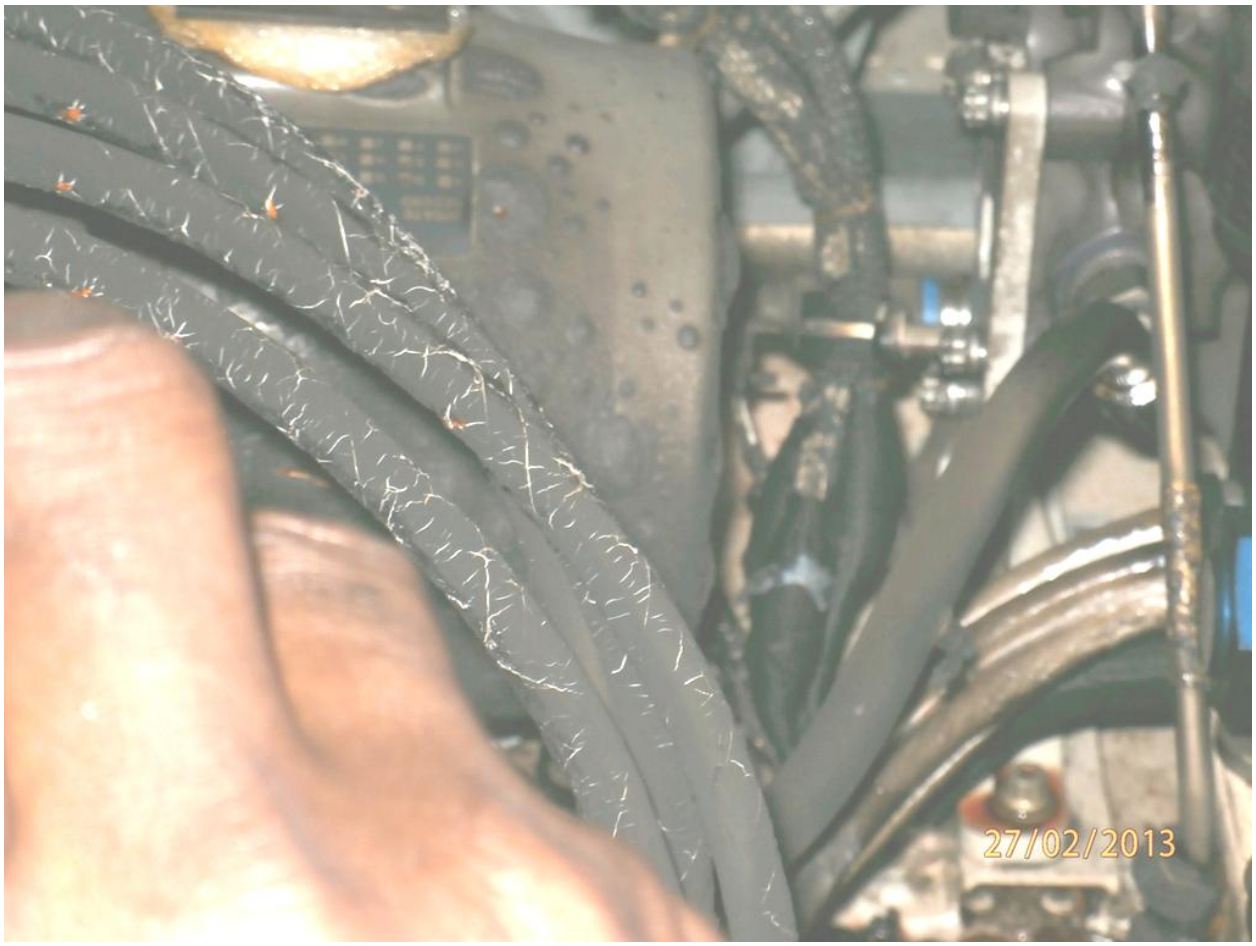


Figure 14: Burnt hoses

Figure 15: Leaked Hydraulic Fluid

Figure 16: Leaked Hydraulic Fluid

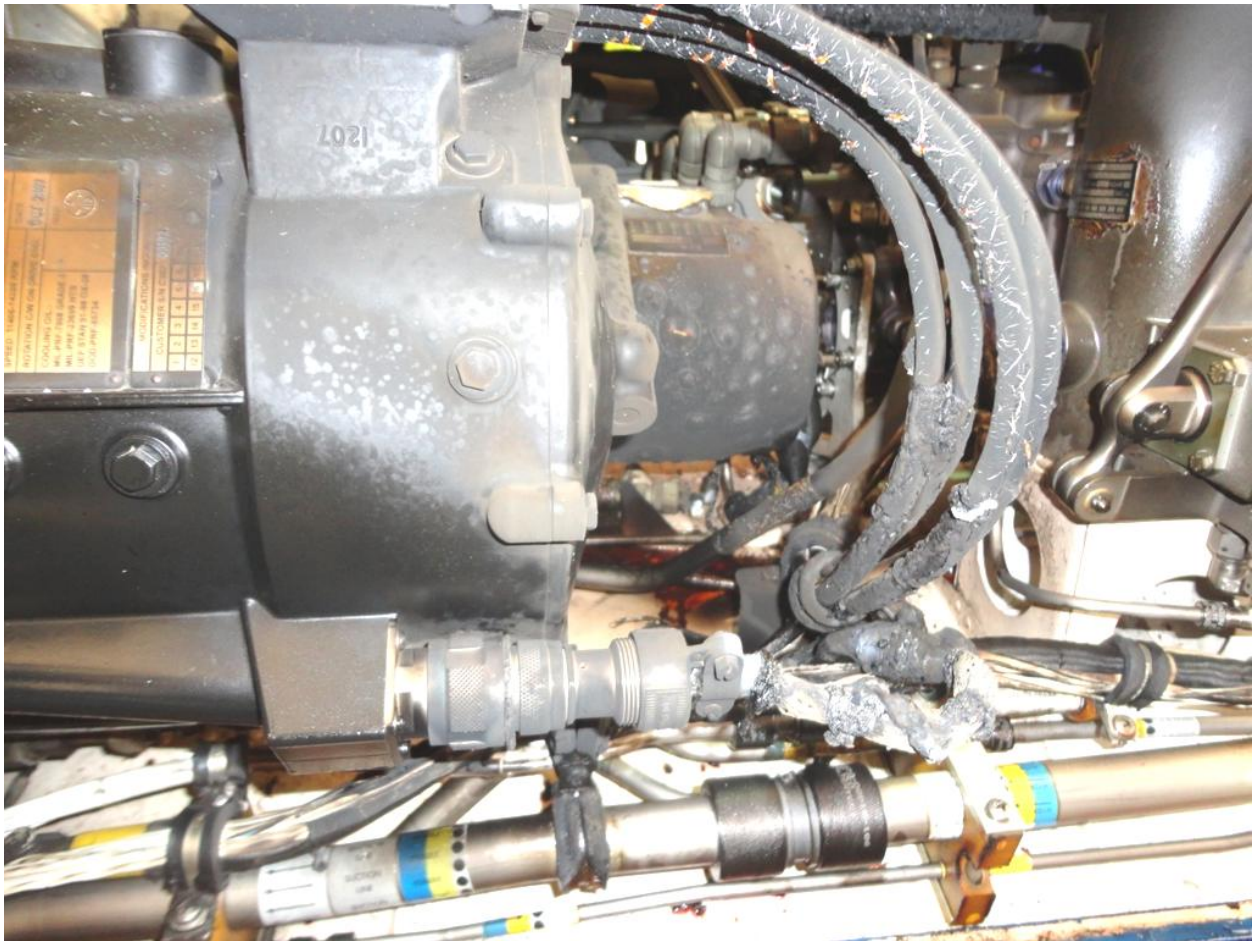


Figure 17: Burnt Out Area around the Heat Exchanger

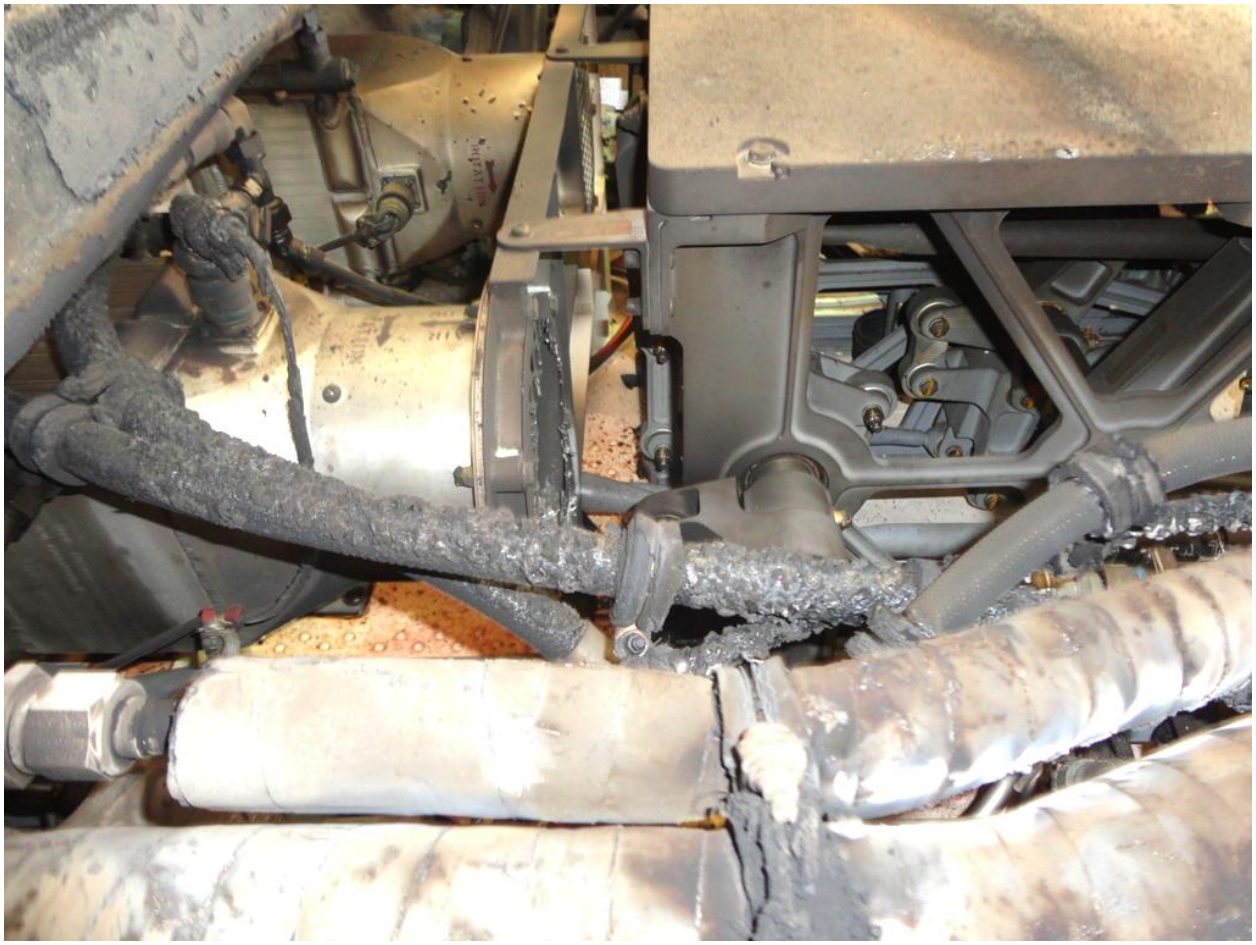


Figure 18: Burnt Out Area

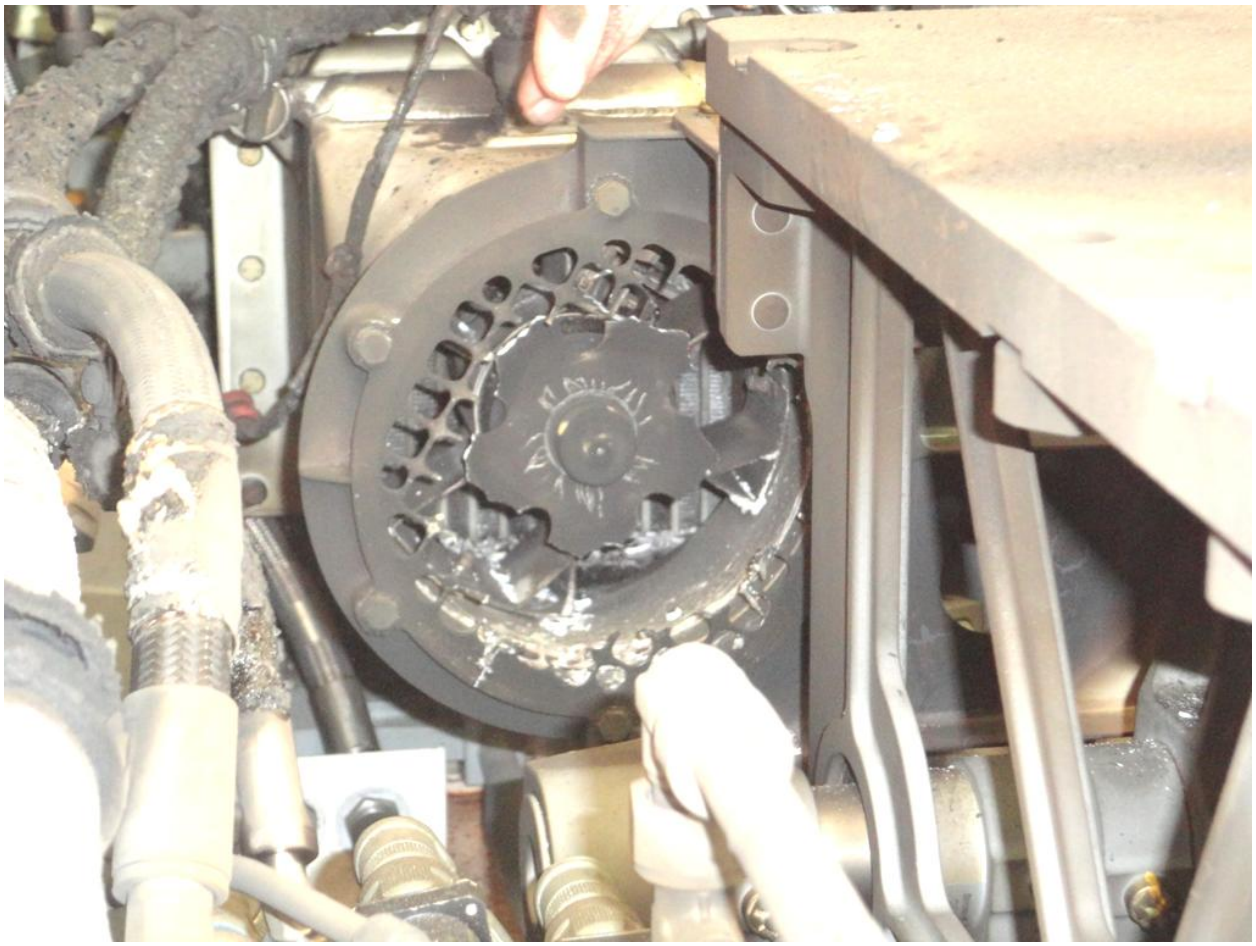


Figure 19: Damaged Right Heat Exchanger