
SERVICE BULLETIN**N° 139-783****EMERGENCY ALERT****DATE:** April 10, 2024**REV. :** A November 6, 2024

TITLE**ATA 32 – MLG SHOCK ABSORBER INSPECTION****REVISION LOG**

Revision A is issued in order to change the compliance time of this Service Bulletin, reducing the minimum number of landings from which the inspection must be performed. Also, the landings values defined in paragraphs 1.B.2 and 1.B.3, requiring a lower compliance time, are reduced. All the rest of the Service Bulletin is unchanged.

For shock absorber assemblies already compliant with the previous issue of this Service Bulletin, no additional action is needed and the existing planning for the next repetitive inspection can be maintained (every 2000 landings or 12 months, whichever occurs first).

For shock absorber assemblies NOT already compliant with the previous issue of this Service Bulletin but for which the first inspection was already planned, the new lower compliance time for first inspection should be checked and the planning should be revised accordingly.

Revision bars identify changes.

1. PLANNING INFORMATION

A. EFFECTIVITY

All main shock absorber assemblies (SA) P/N 3G3210V00333 or P/N 3G3210V01031 (vendor P/N 1654B0000-01 or P/N 1654C0000-01 respectively) installed on AW139 helicopters or kept in stock.

B. COMPLIANCE

NOTE

The Ultrasonic Testing (UT) inspection must be performed by personnel qualified in accordance with the non-destructive testing requirements of EN4179/NAS410 for Level II or higher, or of an equivalent standard recognized by the competent authority.

NOTE

If the number of landings of a main shock absorber assembly is not known, it shall be calculated multiplying the SA FH by a factor of 6.

1. For installed SA with less than 4000 landings, within and not later than 100 FH after reaching 4000 landings and then every 2000 landings or 12 months, whichever occurs first, after previous inspection.
2. For installed SA with a number of landings from 4000 to 5999, within and not later than 100 FH after the issue of this Service Bulletin and then every 2000 landings or 12 months, whichever occurs first, after previous inspection.
3. For installed SA with a number of landings from 6000 to 6999, within and not later than 50 FH after the issue of this Service Bulletin and then every 2000 landings or 12 months, whichever occurs first, after previous inspection.
4. For installed SA with 7000 landings or more:
 - a. If NOT previously inspected in accordance with Rev. / of this SB, within and not later than 10 FH after the issue of this Service Bulletin
 - b. If already inspected in accordance with Rev. / of this SB, within and not later than 2000 landings or 12 months, whichever occurs first, after previous inspectionand then every 2000 landings or 12 months, whichever occurs first, after previous inspection.

5. For spare SA which have accumulated 4000 landings or more and already inspected since less than 12 months in accordance with this SB or LLI SB 1652C-32-03 in Annex A, every 2000 landings or 12 months, whichever occurs first, after previous inspection once installed.
6. For spare SA which have accumulated 4000 landings or more and already inspected since more than 12 months in accordance with this SB or LLI SB 1652C-32-03 in Annex A, before next installation and then every 2000 landings or 12 months, whichever occurs first, after previous inspection once installed.
7. For spare SA which have accumulated 4000 landings or more and NOT already inspected in accordance with this SB or LLI SB 1652C-32-03 in Annex A, before next installation and then every 2000 landings or 12 months, whichever occurs first, after previous inspection once installed.
8. For spare SA which have accumulated less than 4000 landings, in accordance with paragraph 1.B.1 once installed, even if already inspected in accordance with this SB or LLI SB 1652C-32-03 in Annex A.

C. CONCURRENT REQUIREMENTS

N.A.

D. REASON

Following two occurrences of broken eye end of the Main Shock Absorber piston rod reported in service, an investigation was performed in cooperation with Liebherr-Aerospace Lindenberg (LLI) supplier of the mentioned SA. LLI Service Bulletin 1652C-32-03 has been issued (see Annex A), requiring the inspection of the eye end of the SA by means of a Special Detailed Inspection using Ultrasonic Testing to detect potential cracks.

Leonardo Helicopters has developed this Service Bulletin to manage the application of such inspection requirements for the SA currently installed on AW139 fleet and to prescribe their replacement in case of findings following the inspection.

E. DESCRIPTION

This Service Bulletin provides all the necessary instructions on how to perform a repetitive Special Detailed Inspection of main shock absorber assemblies P/N 3G3210V00333 or P/N 3G3210V01031 (vendor P/N 1654B0000-01 or P/N 1654C0000-01 respectively), as prescribed by LLI Service Bulletin 1652C-32-03.

The inspection is performed using the UT technique and focusing on the SA piston rod eye end to detect cracks development in two specific areas (refer to Figure 2 of LLI SB 1652C-32-03 in Annex A). In case of findings, it is needed to replace the SA with

another unit. Replacing of the SA does not constitute a terminating action for the inspections required under paragraph B. COMPLIANCE.

F. APPROVAL

The technical content of this Service Bulletin is approved under the authority of DOA nr. EASA.21.J.005. For helicopters registered under other Aviation Authorities, before applying the Service Bulletin, applicable Aviation Authority approval must be checked within Leonardo Helicopters customer portal.

EASA states mandatory compliance with inspections, modifications or technical directives and related time of compliance by means of relevant Airworthiness Directives.

If an aircraft listed in the effectivity embodies a modification or repair not LH certified and affecting the content of this Service Bulletin, it is responsibility of the Owner/Operator to obtain a formal approval by Aviation Authority having jurisdiction on the aircraft, for any adaptation necessary before incorporation of the present Service Bulletin.

G. MANPOWER

To comply with this Service Bulletin, the following MMH are deemed necessary:

- approximately one (1) if only the inspection is performed;
- approximately twenty (20) if also the SA replacement is needed.

MMH are based on hands-on time and can change with helicopter configuration, personnel and facilities available. MMH are not comprehensive of the overall hours necessary to get access to work areas and to remove all the equipment that interferes with the application of the prescribed instructions.

H. WEIGHT AND BALANCE

N.A.

I. REFERENCES

I.1 PUBLICATIONS

Following Data Modules refer to AMP:

<u>DATA MODULE</u>	<u>DESCRIPTION</u>	<u>PART</u>
DM01 39-A-00-20-00-00A-120A-A	Helicopter on ground for a safe maintenance.	-
DM02 39-A-07-11-00-00A-028A-A	Helicopter - Lift on jacks - General	-
DM03 39-A-32-11-01-02A-920A-B	Main shock absorber (left main landing gear) - Replacement	-

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<u>DATA MODULE</u>	<u>DESCRIPTION</u>	<u>PART</u>
DM04 39-A-32-12-01-02A-920A-B	Main shock absorber (right main landing gear) - Replacement	-

I.2 ACRONYMS & ABBREVIATIONS

AMDI	Aircraft Material Data Information
AMP	Aircraft Maintenance Publication
CB	Circuit Breaker
DM	Data Module
DOA	Design Organization Approval
EASA	European Union Aviation Safety Agency
FH	Flight Hours
IPD	Illustrated Parts Data Publication
ITEP	Illustrated Tools and Equipment Publication
LH	Leonardo Helicopters
LLI	Liebherr-Aerospace Lindenberg
MMH	Maintenance Man Hours
MLG	Main Landing Gear
N.A.	Not Applicable
P/N	Part Number
SA	Main Shock Absorber
SB	Service Bulletin
SDI	Special Detailed Inspection
S/N	Serial Number
UT	Ultrasonic Testing
WRM	Warranty Reply Memo

I.3 ANNEX

Annex A LLI SB 1652C-32-03 "Inspection of shock absorber piston rod eye end"

J. PUBLICATIONS AFFECTED

N.A.

K. SOFTWARE ACCOMPLISHMENT SUMMARY

N.A.

2. MATERIAL INFORMATION

A. REQUIRED MATERIALS

A.1 PARTS

NOTE

Following parts are needed only if SA replacement is deemed necessary after the inspection and will be supplied only if the required documentation is provided, as detailed in the industry support information section.

#	P/N	ALTERNATIVE P/N	DESCRIPTION	Q.TY	LVL	NOTE	LOG P/N
1	3G3210V00333 or 3G3210V01031		Main shock absorber assy	1	.	(1)	-

Refer also to IPD for the spares materials required to comply with the AMP DMs referenced in the accomplishment instructions.

A.2 CONSUMABLES

Refer to the "MATERIAL INFORMATION" section of Liebherr SB 1652C-32-03 in Annex A for the consumable materials required to comply with this Service Bulletin.

Refer also to AMDI for the consumable materials required to comply with the AMP DMs referenced in the accomplishment instructions.

A.3 LOGISTIC MATRIX

N.A.

NOTES

(1) The P/N to be ordered is the same as the one inspected and to be replaced.

B. SPECIAL TOOLS

The following special tools, or equivalent, are necessary to accomplish this Service Bulletin:

#	P/N	DESCRIPTION	Q.TY	NOTE	PART
2	Commercial	Light source	1	(B1)	-
3	Commercial	Mirror	1	(B1)	-
4	Commercial	UT portable flaw detector equipment	1	(B1) (B2)	-
5	Commercial	Cable with microdot connector	1	(B1) (B3)	-
6	1654A0100-01W02	Reference specimen	1	(B4)	-
7	uTA45-5-S0024 or UTA 4X4,5 45-5 P	Wedge and probe	1	(B4) (B5)	-

Refer also to ITEP for the special tools required to comply with the AMP DM referenced in the accomplishment instructions.

SPECIAL TOOLS NOTES

- (B1) Item to be procured as local supply.
- (B2) Any UT portable flaw detector equipment is fit for purpose with conventional UT.
Refer also to the designated NDT inspector for details and availability of the item.
- (B3) This item should be suitable for connecting the probe, provided with microdot connector, to the available UT portable flaw detector equipment. Refer also to the designated NDT inspector for details and availability of the item.
- (B4) Item to be procured through LH. Please contact Leonardo Helicopters Division order administration to request the tool supply on a free of charge basis. For details, see the industry support information section below.
- (B5) Probe and wedge are bonded together in a single P/N, so not separated. The probe is equipped with microdot connector.

C. INDUSTRY SUPPORT INFORMATION

Owners/Operators who comply with the instructions of this Service Bulletin no later than the applicable date in the "Compliance" section will be eligible to receive required materials and special tools on free of charge basis, except for Consumable Materials. Only in case SA replacement is needed because of findings following the UT inspection, please issue relevant MMIR form to your Warranty Administration Dpt. including the NDT Inspection Report in Figure 1 signed and stamped, evidence of the number of the landings of the inspected SA (e.g. SA or MLG log card), if available, and photo of the inspected SA showing corresponding S/N with such evidence.

If one of the requested document/information is not provided, MMIR will be rejected.

With reference to special tools note (B4), the MMIR form must NOT be issued to procure the special tools, because these will be provided on a free of charge basis. Please place a free of charge PO related to Wedge (P/N uTA45-5-S0024 or UTA 4X4,5 45-5 P) and Specimen (P/N 1654A0100-01W02) to be shared directly to your Order Administrator.

NOTE: WRM will include RETURN MATERIAL AUTHORIZATION (RMA) number; the SA P/N 3G3210V00333 or P/N 3G3210V01031 has to be returned to LHD within thirty (30) calendar days after the shipment of the replacement part. In case of missing return within thirty (30) calendar days, Customer will be invoiced for the price of the replacement SA.

NOTE: Customers who fail to comply with the instructions in this Service Bulletin before the compliance date are not eligible for the aforementioned special policy.

3. ACCOMPLISHMENT INSTRUCTIONS

GENERAL NOTES

Place an identification tag on all components that are re-usable, including the attaching hardware that has been removed to gain access to the modification area and adequately protect them until their later re-use.

NOTE

Skip steps 1, 2 and 8 for SA kept in stock.

1. In accordance with AMP DM 39-A-00-20-00-00A-120A-A, prepare the helicopter on ground for a safe maintenance. Disconnect the battery, all electrical power sources and/or the external power supply.
2. In accordance with the applicable steps of AMP DM 39-A-07-11-00-00A-028A-A, lift the helicopter on jacks.

NOTE

The following Ultrasonic Testing (UT) inspection must be performed by personnel qualified in accordance with the non-destructive testing requirements of EN4179/NAS410 for Level II or higher, or of an equivalent standard recognized by the competent authority.

NOTE

To better clarify the inspection procedure and the expected results, also refer to the video tutorial available, for reference only, on Leonardo Customer Portal (<https://leonardo.canto.global/b/VQ2MN>).

3. In accordance with LLI SB 1652C-32-03 in Annex A, paragraph 3.C PROCEDURE steps from (1) through (4) included, inspect the SA piston rod eye end.
4. With reference to Table 4 of LLI SB 1652C-32-03 in Annex A, record the outcome of the inspection in the Inspection Report in Figure 1 and fill it out with every other required information. Send it thru technical query on Leonardo WebPortal or to Product Support Engineering (engineering.support.lhd@leonardo.com, and for North, Central and South America also to AWPC.Engineering.Support@leonardocompany.us).

NOTE

SA kept in stock that are classified as not serviceable
must be returned to LH and replaced with another unit.

In that case skip to step 7.

5. If the inspected SA has been classified as not serviceable, perform following step 6 to replace it. Otherwise skip to step 7 and plan the next inspection in accordance with the applicable compliance time, as specified in paragraph B. COMPLIANCE.
6. In accordance with AMP DM 39-A-32-11-01-02A-920A-B or 39-A-32-12-01-02A-920A-B, replace the damaged SA with another unit and send the removed SA to LH. Plan the next inspection of the installed SA in accordance with the applicable compliance time, as specified in paragraph B. COMPLIANCE.

NOTE

Recording of accomplishment via EASA Form 1, as
reported in LLI SB in Annex A (ref step 3.D
CORRECTIVE ACTION), is only applicable to activities
performed by LLI in its service centers.

NOTE

If the number of landings of the SA is not known, it shall
be calculated multiplying its FH by a factor of 6.

7. Record for compliance with this Service Bulletin on SA log card and on MLG log card.
8. Return the helicopter to flight configuration and record for compliance with this Service Bulletin on the helicopter logbook.
9. Gain access to My Communications section on Leonardo WebPortal and compile the "Service Bulletin Application Communication".

As an alternative, send the attached compliance form to the following mail box:

engineering.support.lhd@leonardo.com

and (for North, Central and South America) also to:

AWPC.Engineering.Support@leonardocompany.us

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Date				Location			
Helicopter	S/N		FH		Landings		
MLG	LH	RH	P/N	S/N	FH	Landings	
	☐	☐					
SA	P/N		S/N	FH	Landings		

Inspection results <i>(refer to Table 4 of LLI SB 1652C-32-03 in Annex A)</i>		
Upper inspection area	No findings (<40%)	☐
	Acceptable for use (40-80%)	☐
	Not acceptable (>80%)	☐
Lower inspection area	No findings (<40%)	☐
	Acceptable for use (40-80%)	☐
	Not acceptable (>80%)	☐

NDT technician details		
Name	Company/Service centre name	Signature

Notes:

Figure 1

ANNEX A

LLI SB 1652C-32-03

INSPECTION OF SHOCK ABSORBER PISTON ROD EYE END

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LIEBHERR-AEROSPACE LINDENBERG GmbH

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or contact us on our website:

<http://www.liebherr.aero>**SERVICE BULLETIN****STANDARD****MAIN LANDING GEAR - RETRACTABLE SHOCK ABSORBER -
INSPECTION OF SHOCK ABSORBER PISTON ROD EYE END****1. PLANNING INFORMATION****A. EFFECTIVITY**

(1) Unit affected:

– Shock Absorber, Main Landing Gear (L/H and R/H)

(2) Part Numbers affected:

– 1654B0000-01 (LHD PN 3G3210V00333)

– 1654C0000-01 (LHD PN 3G3210V01031)

NOTE: Where all above listed part numbers are affected and/or not further specified in this service bulletin, the nomenclature “1654X0000-XX” will be used.

B. CONCURRENT REQUIREMENTS

None

C. REASON

Two occurrences of a broken eye end of the shock absorber piston rod were reported.

D. DESCRIPTION

This service bulletin inspects the main landing gear shock absorber piston rod for potential cracks in the eye end by means of a Special Detailed Inspection (SDI) using Ultrasonic Testing (UT) Equipment.

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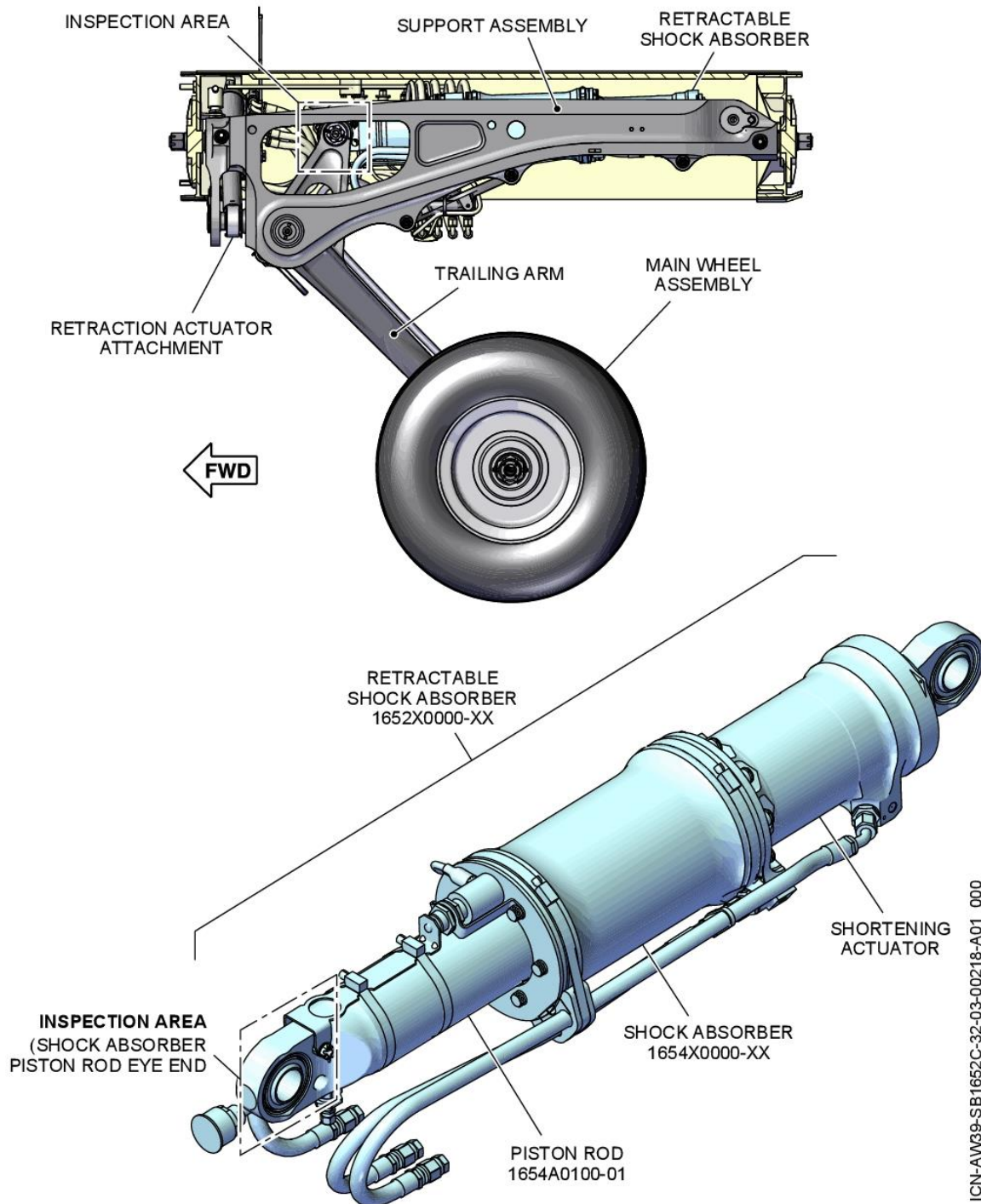
The inspection can be done on a shock absorber installed on the main landing gear (on-helicopter) or in the repair shop/ at MRO.

Results of the UT inspection may indicate a major material damage resulting into an immediate replacement of the shock absorber.

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Ultrasonic Inspection of Shock Absorber Piston Rod Eye End
Figure 1

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E. COMPLIANCE

Mandatory - Service Bulletin must be accomplished

F. APPROVAL

The technical content of this document has been reviewed by Leonardo Helicopters and is approved under the authority of DOA ref. EASA.21J.005.

G. MANPOWER

- (1) The estimated time to accomplish this service bulletin on one main landing gear/ one shock absorber is 0.3 man-hours (MH).

A detailed break-down of the man-hours is provided below:

- Access/Preparation: 0.1 MH (1 man / 0.1 hr)
- Disassembly: n/a
- Inspection: 0.2 MH (1 man / 0.2 hr)
- Assembly: n/a
- Re-Identification: n/a
- Testing: n/a

NOTE: If the inspection is done on both main landing gears on a helicopter, then estimate 0.6 man-hours (MH).

- (2) The estimated elapsed time (shop duration or down time) required to accomplish the inspection on one main landing gear/ one shock absorber is 0.3 hours.

NOTE: If the inspection is done on both main landing gears on a helicopter, then estimate 0.6 hours elapsed time.

H. WEIGHT AND BALANCE

Not changed

I. ELECTRICAL LOAD DATA

Not changed

J. SOFTWARE ACCOMPLISHMENT SUMMARY

Not applicable

K. REFERENCES

- Liebherr-Aerospace Component Maintenance Manual (CMM) 32-13-01
- This Service Bulletin is covered by a Leonardo Helicopters Service Bulletin. Under no circumstances should the inspected equipment, resulting from the application of this SB, be installed or operated on the helicopter unless the Leonardo Helicopters SB is approved.

L. PUBLICATIONS AFFECTED

- Liebherr-Aerospace Component Maintenance Manual (CMM) 32-13-01

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M. INTERCHANGEABILITY

Not affected

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2. **MATERIAL INFORMATION**

A. **MATERIAL - PRICE AND AVAILABILITY**

- (1) The implementation of this Service Bulletin is free-of-charge (FOC) for the operator.
- (2) Any additional work (such as repair) required to re-certify the equipment beyond the scope of the SB will be invoiced separately.
- (3) Contact Liebherr-Aerospace for more information at one of the addresses that follow:

(a) For operators in Europe and Africa

LIEBHERR-AEROSPACE LINDENBERG GmbH
Customer Service
Pfaenderstrasse 50-52
88161 Lindenberg
Germany
Phone: +49 (0)8381 460
Fax: +49 (0)8381 46 4103
rfq.lli@liebherr.com

(b) For operators in North, Central and South America

LIEBHERR AEROSPACE SALINE
Customer service
1465 Woodland Drive
Saline, Michigan 48176
U.S.A.
Phone: +1 73 44 29 72 25
Fax: +1 73 44 29 53 57

(c) For operators in Asia Pacific Region

LIEBHERR AEROSPACE SINGAPORE
Customer service
8 Pandan Avenue
Singapore 609384
Singapore
Phone: +65 62 65 23 05
Fax: +65 62 65 26 57

(d) For operators in China

LIEBHERR AEROSPACE CHINA
Customer Service
319 Gao She North Road
Shanghai Pilot Free Trade Zone
201208 Shanghai
P.R. China
Phone: +86 21 20 33 78 01
Fax: +86 21 20 33 78 00

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(e) For operators in Middle East

LIEBHERR AEROSPACE MIDDLE EAST
 Customer Service
 Jebel Ali Free Zone (South)
 Plot No. S. 10508
 P.O.Box 2540
 Dubai - U.A.E.
 Phone: +971 4 88 91 888
 Fax: +971 4 88 91 777

B. INDUSTRY SUPPORT INFORMATION

None

C. LIST OF COMPONENTS

- (1) The material listed in [Table 1](#) is to be ordered **only** in case of a positive finding and corrective action in accordance with paragraph 3.C.(5).

Material to be Ordered
 Table 1

New PN	QTY	Keyword	Old PN	QTY	Instruction/ Disposition	Price (e.c. 2024)
1654B0000-01 (3G3210V00333) or * 1654C0000-01 (3G3210V01031)	1	Shock Absorber	-	-	replace	FOC
* For proper part number selection and usage/interchangeability on next higher assy refer to Liebherr-Aerospace CMM 32-13-01 or the applicable aircraft maintenance documentation. Part numbers in brackets are Leonardo Helicopters (LHD) part numbers.						

NOTE: Contact Liebherr-Aerospace for the availability of the items.

- (2) The material supplied by the operator is listed in [Table 2](#):

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Material supplied by the Operator/MRO
Table 2

Material Name and Number	Group	Specification	Supplier Code and Address
Lint-free Cloth (M204)	Cloth	DEF 1410-1 A A59323	Local Purchase
Ethyl Alcohol (M202)	Cleaning Agent	O-E-00760 Type III	Local Purchase
Ultrasonic Contact Oil	Oil	-	Local Purchase

D. SUB-COMPONENTS TO BE RE-IDENTIFIED

None

E. TOOLING

- Standard Aerospace Tool-Set
- Inspection Mirror
- Inspection Flashlight

F. SPECIAL TOOLS

(1) The Special Tools necessary to accomplish this SB are listed in [Table 3](#):

Special Tools
Table 3

Part Number	Keyword	Vendor	Used For
USM 35 XS - or equivalent -	Ultrasonic Flaw Detector, digital	Baker Hughes Company - or other -	Ultrasonic Inspection
1654A0100-01W02	Reference Specimen	D9893 Liebherr-Aerospace Lindenberg GmbH	Ultrasonic Inspection
UTA45-5-S0024	Customized Ultrasonic Probe with preformed Wedge	IMG Ultrasuoni - Mandello del Lario / Sede via agli Archi 8/C 23826 Mandello del Lario (LC) Italy img@img-us.com	Ultrasonic Inspection
N/A	Cable equipped with Microdot connector on probe side.	local supply	Ultrasonic Inspection

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NOTE: For the procurement of the Special Tools refer to the applicable Leonardo Helicopters Service Bulletin.

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3. ACCOMPLISHMENT INSTRUCTIONS

A. GENERAL

- (1) This paragraph describes all necessary steps to do a Special Detailed Inspection (SDI) using Ultrasonic Testing (UT) equipment of the main landing gear shock absorber PN 1654X0000-XX for potential cracks in the eye end of the piston rod PN 1654A0100-01.
- (2) The inspection must be done by a certified inspector for non-destructive testing Level II or higher, in accordance with EN4179/NAS410 or any equivalent certification satisfactory to the applicable local airworthiness authority.
- (3) The inspection can be done ON-AIRCRAFT, in REPAIR SHOP or at MRO.

B. PREPARATION

None

C. PROCEDURE

(1) DEFINITION OF INSPECTION AREA

- (a) The Inspection Area is defined in [Figure 2](#) and [Figure 3](#). Two separate Inspection Areas are to be observed, one at the UPPER side and one at the LOWER side of the piston rod eye end. With the landing gear installed on the helicopter the Inspection Area is partially obstructed by surrounding structure. An inspection mirror and an inspection flashlight is inevitable to gain visibility access to the Inspection Area.

With the shock absorber partially compressed, the accessibility to the Inspection Area is limited. The accessibility to the Inspection Area is improved and more convenient for the UT inspection, when the landing gear is in a fully extended position. In that position the upper trailing arm lever is positioned in the middle of the access hole in the support assembly, providing good access to the UPPER and LOWER Inspection Area. Refer to [Figure 2](#), [Sheet 1](#).

(2) CLEANING

- (a) Clean the piston rod eye end of the shock absorber PN 1654X0000-XX with a lint-free cloth (M204) and ethyl alcohol (M202).
- (b) Thoroughly clean the UPPER and LOWER Inspection Area of the piston rod eye end with a lint-free cloth (M204) and ethyl alcohol (M202).

Make sure that there is no dirt, contamination, residues of oil, grease or other substances on the surface of the UPPER and LOWER Inspection Area.

(3) SPECIAL DETAILED INSPECTION (SDI) USING ULTRASONIC TESTING (UT) EQUIPMENT

(a) TEST SET-UP / PREPARATION

- 1 Connect the ultrasonic sensor with the ultrasonic flaw detector.
- 2 Set the ultrasonic flaw detector to following Parameters:

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NOTE: Initial gain value may differ depending on hardware used.

Gain (initial): 35 dB
Material of Reference Specimen PN 1654A0100-01W02: 15-5PH
Material of the Piston Rod PN 1654A0100-01 (Test Item): 15-5PH
Frequency: 5 MHz
Angle in steel (shear wave): 45°
Gain (adjusted on Reference Specimen): adjusted to 80% FSH
Probe operating speed: same as used during calibration
Scan lines: 5
Velocity (ASTM E494): 3230 m/s
Zero (probe delay): 5.000 µs
Delay (screen): 0.000 mm
Screen range: 32 mm
Gate start: 8,00 mm
Gate width: 8,00 mm
Gate level: 40% FSH

(b) **ULTRASONIC INSPECTION**

The Reference Specimen has two notches inside the main bore, one at the UPPER side and one at the LOWER side of the eye end. Each notch simulates a potential crack at the expected location. However, only one of the two notches is required for UT calibration purposes. The other notch is for back-up purposes only. The UT inspection of the Reference Specimen leads to an ultrasonic echo indication as shown in [Figure 4](#).

- 1 Take the **Reference Specimen** PN 1654A0100-01W02.
- 2 Apply ultrasonic contact oil on the inspection area of the Reference Specimen.

NOTE: Re-apply the ultrasonic contact oil during the testing, as necessary.
- 3 Position the Ultrasonic Sensor at the location shown in [Figure 5](#) on the Reference Specimen (about 12 o'clock on UPPER side or 6 o'clock on LOWER side). Move the Ultrasonic Sensor back and forth to detect the 12-mm hole indication. Use this 12-mm hole indication as a reference geometry for starting point.

NOTE: Do not move the probe beyond scanning area (towards the flat area) of the reference specimen as an ultrasonic indication will appear in the recording gate as shown in [Figure 6](#): it is not a relevant indication to be evaluated.
- 4 Move the Ultrasonic Sensor towards the end of the sliding piston for roughly 8 mm from the starting point above. An indication from the notch should appear. Refer to [Figure 4](#).
- 5 Move the Ultrasonic Sensor back and forth to find the position of the maximised indication from the notch.
- 6 Adjust the Gain at the Ultrasonic Flaw Detector to set the indication from the notch to **80% FSH**. Refer to [Figure 4](#). Keep that gain setting.

NOTE: The signal-to-noise ratio should be greater than 4:1.

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7 Repeat Steps 3 thru 5 several times on the Reference Specimen until you get a good routine in finding the indications from the hole (starting position) and from the notch. If necessary, re-adjust the gain setting on the ultrasonic flaw detector to receive a reliable 80% FSH indication from the notch.

8 Record the Gain Setting on the Service Bulletin Findings Record - Appendix A - attached to this Service Bulletin.

9 Get access to the **Piston Rod** PN 1654A0100-01 (Test Item) installed on the helicopter. Refer to [Figure 2](#).

10 Apply ultrasonic contact oil on the inspection area of the Test Item.

NOTE: Re-apply the ultrasonic contact oil during the testing, as necessary.

11 Do the UT Inspection moving the sensor back and forth from the 12-mm hole indication (starting point) ([Figure 5](#)) to the end nose of the piston rod eye end ([Figure 7](#)) to detect a potential crack at the expected location (within the recording gate) on the Piston Rod PN 1654A0100-01. Observe the display of the Flaw Detector for indications within and above the Recording Gate.

Make sure that you cover the entire inspection area with proper couplant in accordance with the UT Scan Lines illustrated in [Figure 2, Sheet 2](#).

NOTE: Do not move the probe beyond scanning area (towards the flat area) of the reference specimen as an ultrasonic indication will appear in the recording gate as shown in [Figure 6](#): it is not a relevant indication to be evaluated.

12 Make sure that you do the UT inspection on both, the UPPER and LOWER inspection area. Refer to [Figure 2, Sheet 2](#).

13 Check the calibration on the Reference Specimen PN 1654A0100-01W02 to verify that the amplitude of the notch indication is 80% FSH. If the check fails, repeat the sequence of operations in para. 3.C.(3) (a) and 3.C.(3) (b).

14 Record the Findings on the Service Bulletin Findings Record - Appendix A - attached to this Service Bulletin, using the [Table 4](#) for the evaluation of the test results.

(c) EVALUATION OF TEST RESULTS

The evaluation of test results shall be in accordance with below criteria:

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Evaluation of Test Results
Table 4

Case	Indication	Action
A	- Indications smaller than 20% FSH (Noise) - Single or Multiple Indications smaller than 40% FSH within Recording Gate - Any Indications outside Recording Gate	- Reporting in accordance with para 3.C.(4) - No further action is required within the scope of this Service Bulletin.
B	Single or Multiple Indications equal to or greater than 40% FSH but lower than 80% FSH within Recording Gate	- After post-inspection calibration (3.C.(3) (b) Step 13), check again the amplitude of the indication detected on the Piston Rod PN 1654A0100-01 (Test Item). - If indication equal to or greater than 40% FSH and lower than 80% FSH within the Recording Gate is confirmed, then report in accordance with paragraph 3.C.(4). - No further action is required within the scope of this Service Bulletin.
C	Single or Multiple Indications equal to or greater than 80% within Recording Gate	- Finding representative of a potential crack. - After post-inspection calibration (3.C.(3) (b) Step 13), check again the amplitude of the indication detected on the Piston Rod PN 1654A0100-01 (Test Item). - Reporting in accordance with paragraph 3.C.(4) - Shock Absorber PN 1654X0000-XX to be replaced in accordance with paragraph 3.C.(5)

(4) REPORTING

The reporting required in this Service Bulletin is additional to the common Part 145 certification reporting for the accomplishment of this Service Bulletin and is required for statistical analysis. The filled-out Service Bulletin Findings Record shall be sent to Liebherr-Aerospace in any case, independent of the findings.

- Make sure that the Service Bulletin Findings Record - Appendix A - attached to this Service Bulletin is properly filled-out with all data determined in paragraph 3.C.(3)(b)8 and 3.C.(3)(b)13.
- Send the filled-out Service Bulletin Findings Record to Liebherr-Aerospace at following eMail address:

LLI_1652C-32-03_FEEDBACK@LIEBHERR.COM

(5) CORRECTIVE ACTION (@ OPERATOR /MRO)

This paragraph is **only** applicable, if a potential crack has been detected in accordance with paragraph 3.C.(3)(c) Case C.

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- (a) Replace the shock absorber PN 1654X0000-XX in accordance with the applicable aircraft maintenance documentation.
- (b) Send the removed shock absorber PN 1654X0000-XX to one of following addresses with Reference to this Service Bulletin (Reason for Removal: "SB 1652C-32-03 FINDING"):

LIEBHERR-AEROSPACE LINDENBERG GmbH
Pfaenderstrasse 50-52
88161 Lindenberg
Germany

OR

LIEBHERR AEROSPACE SALINE
1465 Woodland Drive
Saline, Michigan 48176
U.S.A.

(6) CORRECTIVE ACTION (@ LIEBHERR-AEROSPACE SHOP)

This paragraph is applicable for shock absorbers PN 1654X0000-XX returned to Liebherr-Aerospace in accordance with paragraph 3.C.(5).

- (a) Do an Ultrasonic Inspection (UT) of the piston rod PN 1654A0100-01 of the returned shock absorber PN 1654X0000-XX.
 - 1 If the crack is **confirmed** by UT inspection, then replace the piston rod PN 1654A0100-01 of the shock absorber PN 1654X0000-XX with a new or refurbished piston rod PN 1654A0100-01 in accordance with Liebherr-Aerospace CMM 32-13-01.
 - 2 If **no crack** is confirmed by UT inspection, then no action is required on the shock absorber PN 1654X0000-XX within the scope of this service bulletin.
- (b) Record the accomplishment of this Service Bulletin on the EASA Form 1 of the repaired unit and next higher assy, if applicable.
- (c) Record the accomplishment of this Service Bulletin on the Log-Card of the repaired unit and next higher assy, if applicable.

D. RE-IDENTIFICATION OF THE EQUIPMENT

No re-identification is necessary on units inspected in accordance with this Service Bulletin.

NOTE: The evidence of accomplishment of this Service Bulletin is provided by the entry in the Log-Card and EASA Form 1.

E. TEST

None

F. CLOSE-UP

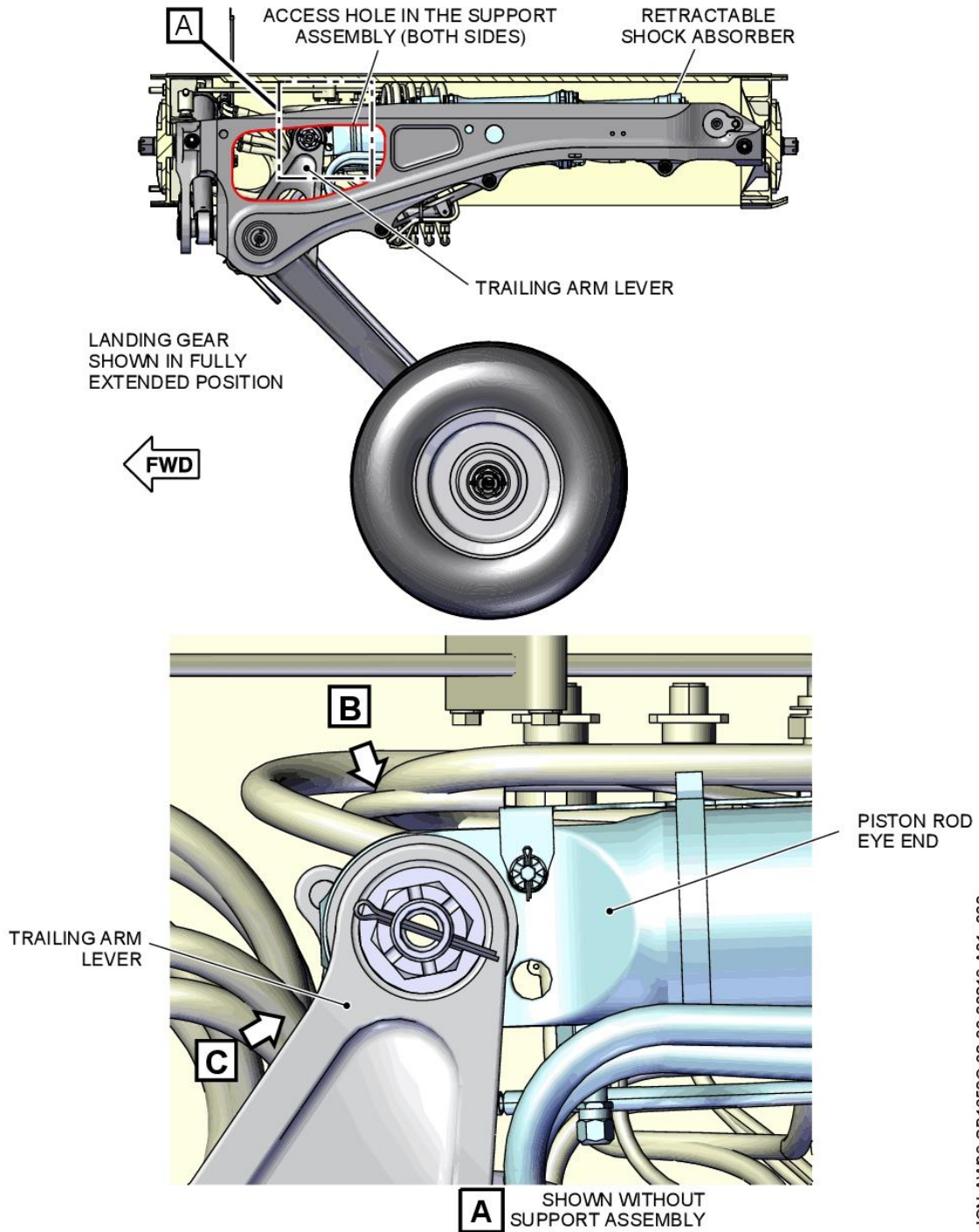
None

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Inspection Area
(Sheet 1 of 2)
Figure 2

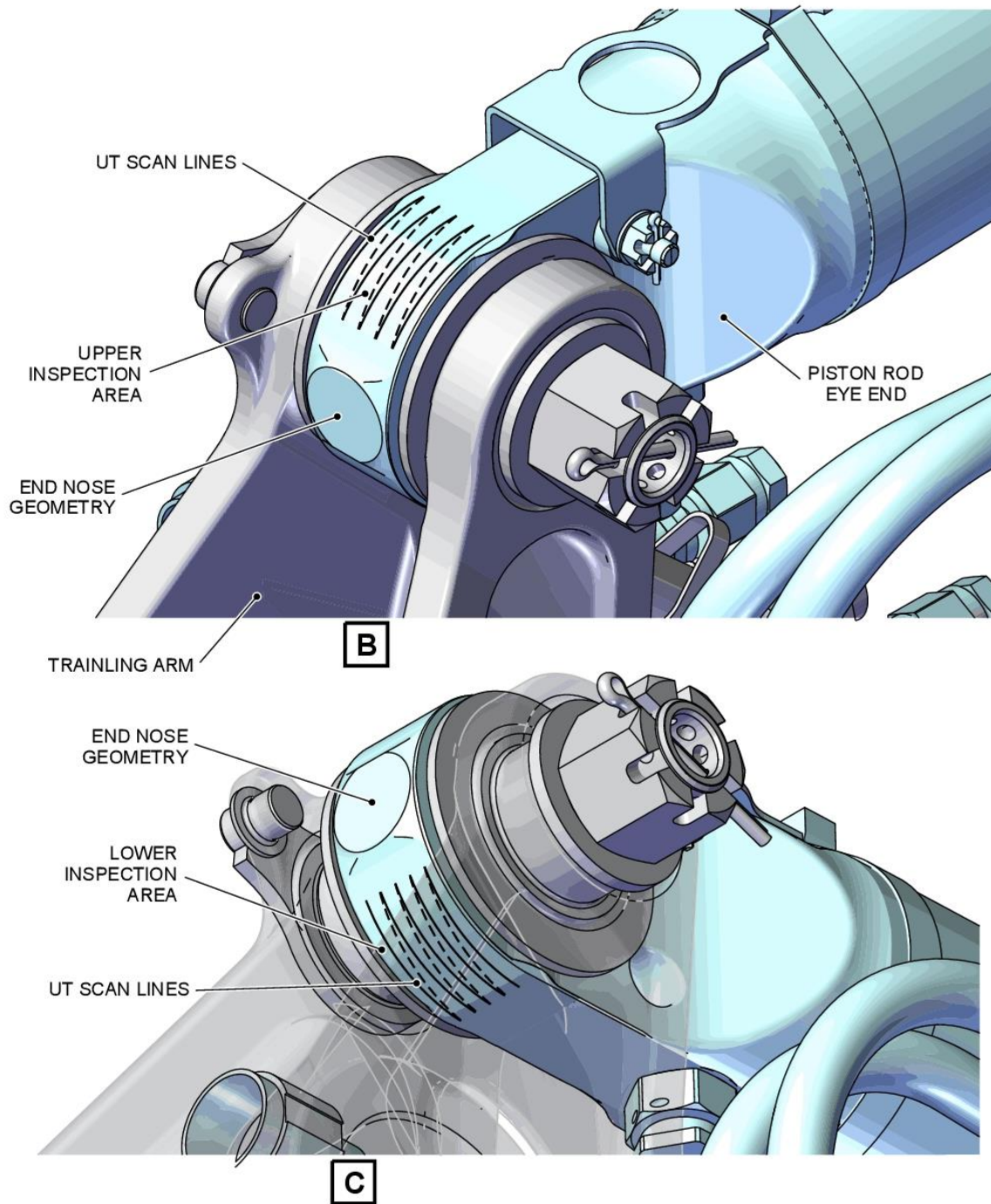
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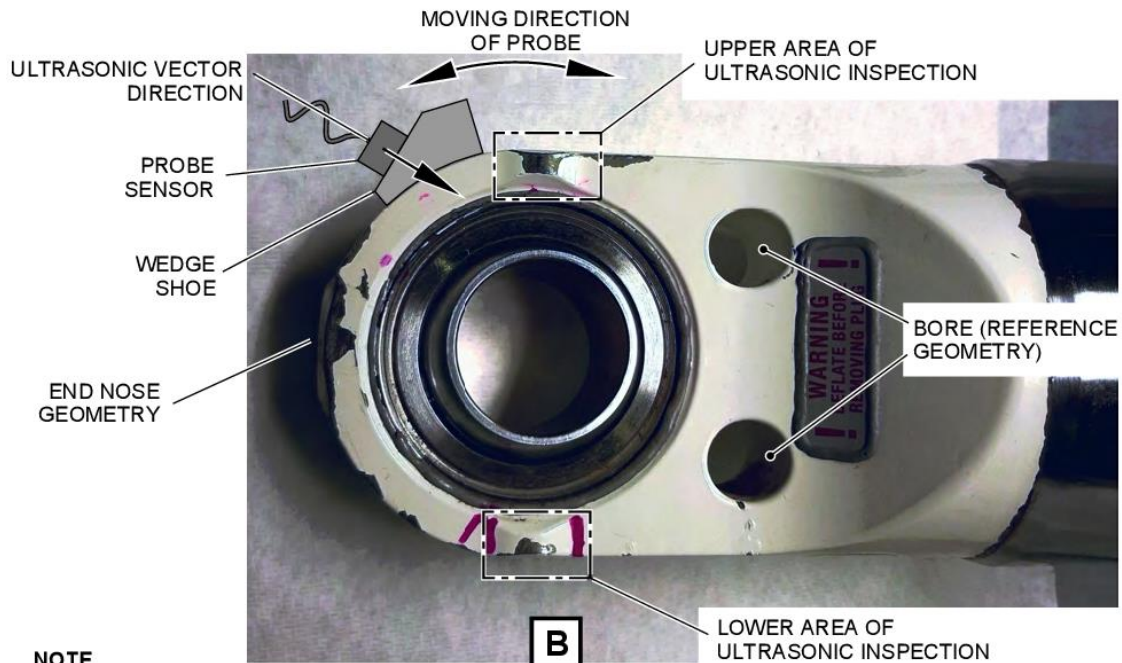
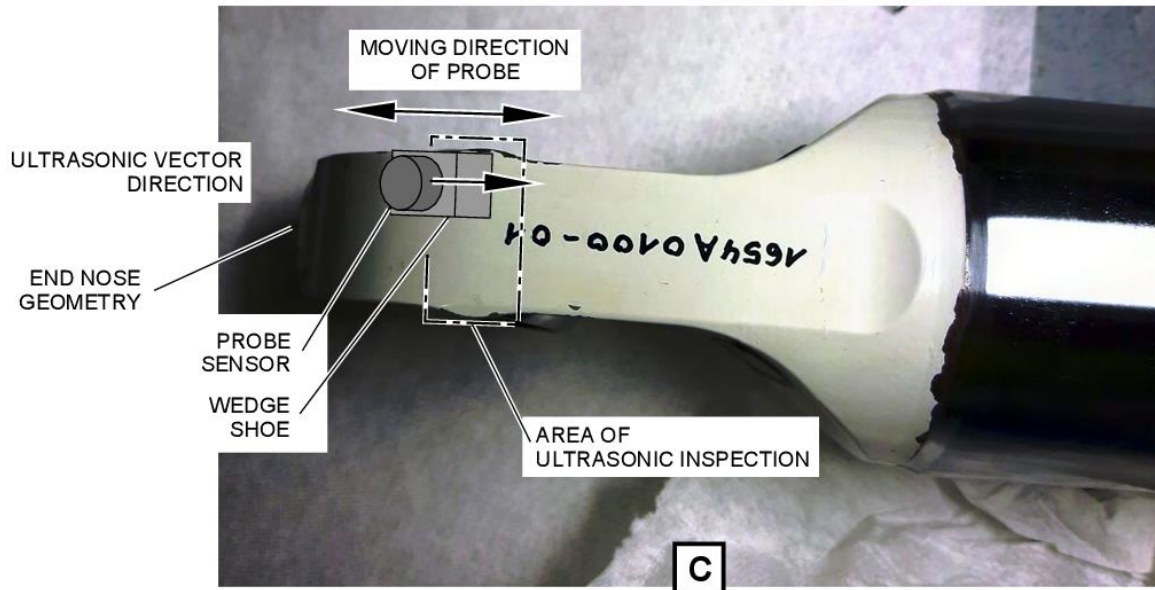
Inspection Area
(Sheet 2 of 2)
Figure 2

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NOTE

Ultrasonic inspection of the piston rod eye end shall be performed in the installed condition. Picture above show the piston rod separated from the landing gear for clarification of the accomplishment procedure only.

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Ultrasonic Inspection
Figure 3

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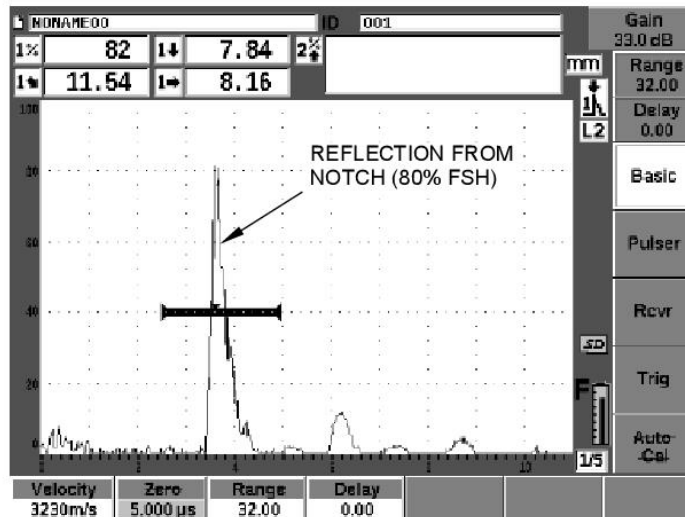
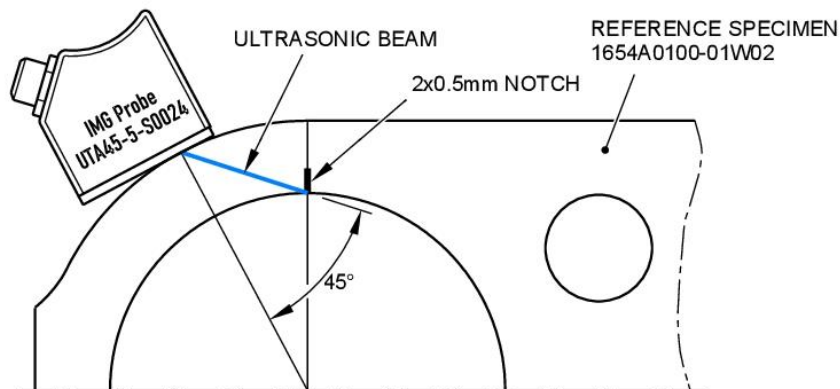
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Calibration on the notch of Reference Specimen
Figure 4

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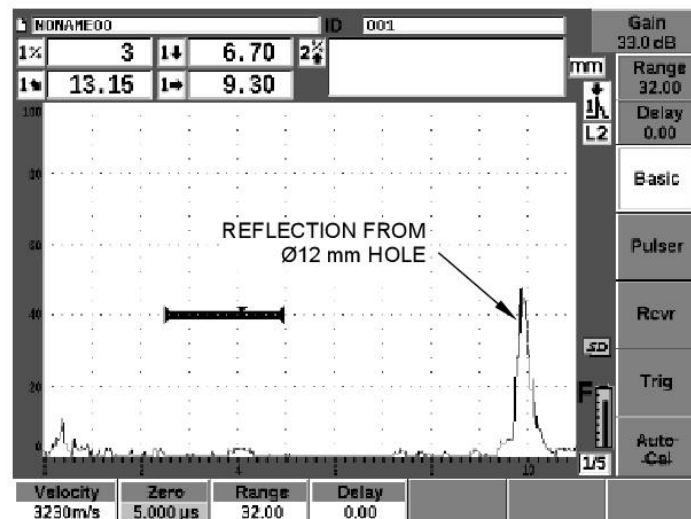
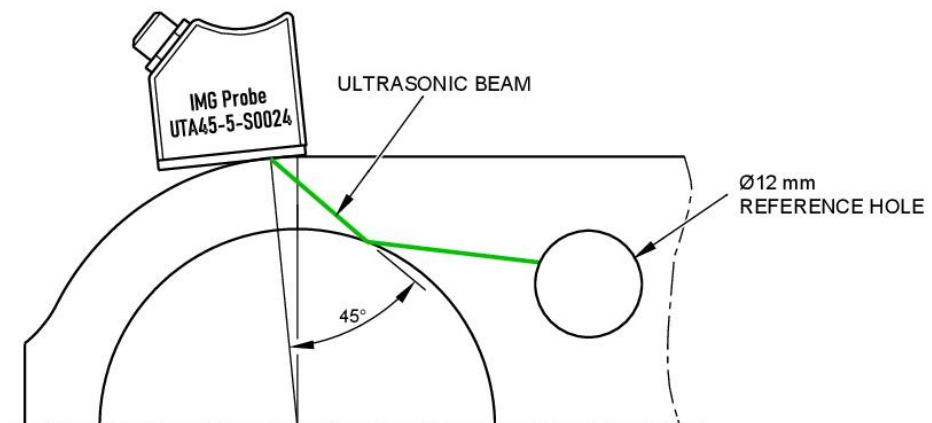
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Ultrasonic indication from the 12 mm hole (starting point)
Figure 5

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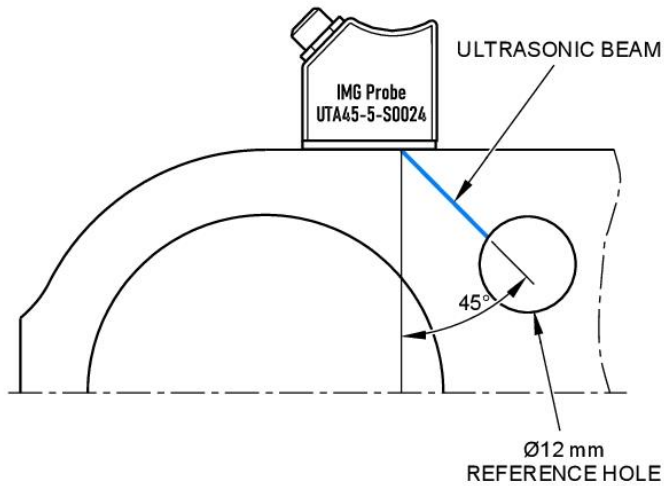
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WARNING:
PROBE BEYOND SCANNING AREA
(FLAT AREA)

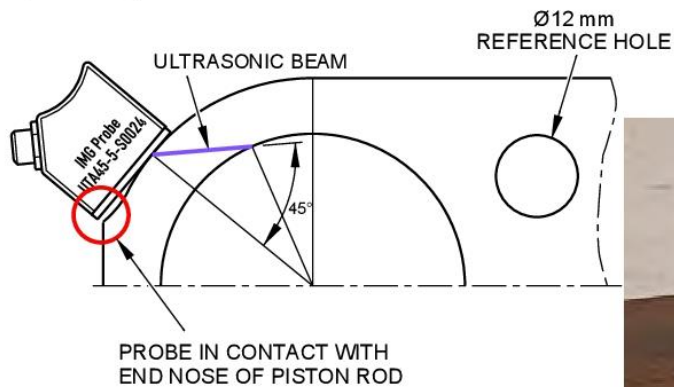


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Example of wrong signal
Figure 6

NOTE:

END POINT OF SCANNING AREA
(NOSE END)



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Probe in contact with the nose (End point)
Figure 7

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Service Bulletin Findings Record				LIEBHERR	
Service Bulletin: 1652C-32-03 Title: MAIN LANDING GEAR – RETRACTABLE SHOCK ABSORBER – INSPECTION OF SHOCK ABSORBER PISTON ROD EYE END					
Operator	Aircraft-Reg.		Aircraft [FH]		Aircraft [FC]
MLG ☐ LH ☐ RH	MLG Part Number	MLG Serial Number	MLG [FH]		MLG [FC]
Shock Absorber (SA) (1654X0000-XX)	SA Part Number	SA Serial Number	SA [FH]		SA [FC]
Date of Insp.:	Location of Insp.:				
send to: LLI_1652C-32-03_FEEDBACK@LIEBHERR.COM					
Gain determined on Reference Specimen and used on Test Item (SB paragraph 3.C.(3)(b)8): _____ dB					
UT Inspection Results (SB paragraph 3.C.(3)(b)13): UPPER Inspection Area: ☐ Indication (< 40% FSH) → Case A: acceptable ☐ Indication (< 80% FSH) → Case B: acceptable → Peak Value: _____ % FSH ☐ Indication (≥ 80% FSH) → Case C: not acceptable → Peak Value: _____ % FSH LOWER Inspection Area: ☐ Indication (< 40% FSH) → Case A: acceptable ☐ Indication (< 80% FSH) → Case B: acceptable → Peak Value: _____ % FSH ☐ Indication (≥ 80% FSH) → Case C: not acceptable → Peak Value: _____ % FSH					
Other Findings/Observations:					

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Appendix A

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Please send to the following address: LEONARDO S.p.A. CUSTOMER SUPPORT & SERVICES - ITALY PRODUCT SUPPORT ENGINEERING & LICENSES DEPT. Via Giovanni Agusta, 520 21017 Cascina Costa di Samarate (VA) - ITALY Tel.: +39 0331 225036 Fax: +39 0331 225988		SERVICE BULLETIN COMPLIANCE FORM		Date:	
		Number:			
		Revision:			
Customer Name and Address:			Telephone:		
			Fax:		
			B.T. Compliance Date:		
Helicopter Model	S/N	Total Number	Total Hours	T.S.O.	
Remarks:					
Information: We request your cooperation in filling this form, in order to keep out statistical data relevant to aircraft configuration up-to-date. The form should be filled in all its parts and sent to the above address or you can communicate the application also via Technical Bulletin Application Communication Section placed in Leonardo AW Customer Portal - MyCommunications Area. We thank you beforehand for the information given.					