

EASA	AIRWORTHINESS DIRECTIVE
	AD No.: 2014-0078R1 Date: 08 July 2014 Note: This Airworthiness Directive (AD) is issued by EASA, acting in accordance with Regulation (EC) No 216/2008 on behalf of the European Community, its Member States and of the European third countries that participate in the activities of EASA under Article 66 of that Regulation.
This AD is issued in accordance with EU 748/2012, Part 21.A.3B. In accordance with EC 2042/2003 Annex I, Part M.A.301, the continuing airworthiness of an aircraft shall be ensured by accomplishing any applicable ADs. Consequently, no person may operate an aircraft to which an AD applies, except in accordance with the requirements of that AD, unless otherwise specified by the Agency [EC 2042/2003 Annex I, Part M.A.303] or agreed with the Authority of the State of Registry [EC 216/2008, Article 14(4) exemption].	
Design Approval Holder's Name: AIRBUS HELICOPTERS	Type/Model designation(s): AS 332 and EC 225 helicopters
TCDS Number:	EASA.R.002
Foreign AD:	Not applicable
Revision:	This AD revises EASA AD 2014-0078 dated 25 March 2014, which superseded EASA AD 2013-0301 dated 18 December 2013.
ATA 63	Main Rotor Drive – Main Gear Box Bevel Gear Vertical Shaft – Inspection / Modification / Replacement / Limitation
Manufacturer(s):	Airbus Helicopters (formerly Eurocopter, Eurocopter France, Aerospatiale)
Applicability:	AS 332 C, AS 332 C1, AS 332 L, AS 332 L1, AS 332 L2 and EC 225 LP helicopters, all serial numbers (S/N), if equipped with main gearbox (MGB) bevel gear vertical shaft Part Number (P/N) 332A32-5101-00, P/N 332A32-5101-05, P/N 332A32-5101-10 or P/N 332A32-5101-15, all S/N.
Reason:	Two separate events occurred in 2012 on EC 225 LP helicopters carrying out an emergency ditching in the North Sea after warning indication of MGB loss of oil pressure and subsequent additional red alarm on the MGB emergency lubrication system (EMLUB). Subsequent investigation results indicated that, in both cases, a full circumferential crack of the lower vertical shaft of the MGB bevel gear occurred in the area where the two sections of the shaft are welded together. As a result, the vertical shaft ceased to drive the main and backup oil pumps, leading to warning indications of the loss of the MGB main and standby oil lubrication systems. The crew activated the EMLUB system and, following a subsequent warning indicating failure of that system, performed a controlled ditching into the sea. To address the unsafe condition of MGB bevel gear vertical shaft failure, EASA issued Emergency AD 2012-0250-E, which superseded previously issued AD 2012-0225-E, AD 2012-0115-E, AD 2012-0107, AD 2012-0104 and AD 2012-0087-E. Since that AD was issued, the investigation by Airbus Helicopters has determined that the MGB bevel gear vertical shaft failures resulted from a

combination of several factors, including stress hot-spots induced by the shaft geometry, residual stresses in the shaft weld material resulting from the manufacturing process and corrosion pitting inside the shaft on areas where gear spline wear particles had accumulated. Further information is provided in Airbus Helicopters Safety Information Notice (SIN) 2600-S-00.

Prompted by these findings, Airbus Helicopters issued a batch of Alert Service Bulletins (ASB), as ASB EC225-04A009 Revision 3, ASB EC225-45A010 and ASB EC225-05A036 for the EC 225 helicopters, and ASB AS332-01.00.82 Revision 3 and ASB AS332-05.00.96 for the AS 332 helicopters, to provide modifications and instructions for monitoring and detecting vertical shaft crack conditions and, in addition, reducing the likelihood of any shaft crack initiation.

Subsequently, EASA issued Emergency AD 2013-0138-E, which retained the requirements of EASA AD 2012-0250-E (which was superseded) for EC 225 helicopters equipped with a Vibration Health Monitoring (VHM) system (also known as M'ARMS) pending mandatory modification with a M'ARMS MOD45 monitoring function (MOD 0726994 and MOD 0726978), and required for the other EC 225 and all AS 332 helicopters to perform repetitive Non Destructive Testing (NDT) inspections by Ultrasonic or Eddy Current method, as applicable. Additionally, EASA AD 2013-0138-E (later revised) required repetitive cleaning of the shaft and installation of a new MGB oil jet (MOD 0753021).

Since EASA AD 2013-0138R1 was issued, some of the requirements thereof have expired. Moreover, Airbus Helicopters issued ASB AS332-01.00.82 at Revision 4 to introduce an Ultrasonic NDT method to detect vertical shaft cracks as alternative method to the only Eddy Current inspection available for AS 332 helicopters.

Prompted by these developments, EASA issued AD 2013-0301 to retain the non-expired requirements of AD 2013-0138R1, which was superseded, and to require progressive substitution of Eddy Current inspections with new Ultrasonic inspections on AS 332 helicopters.

After EASA AD 2013-0301 was issued, Airbus Helicopters upgraded the M'ARMS MOD45 software with MOD 0728083 (replacing previous software of MOD 0726978) and amended accordingly the Rotorcraft Flight Manual (RFM) supplement SUP.7 for the M'ARMS MOD45 monitoring function. Airbus Helicopters anticipated an installation of the changes on some M'ARMS-equipped EC 225 helicopters with issuance of SB EC225-45-018 and, thereafter, extended those to the rest of the EC 225 fleet with issuance of ASB EC225-45A010 Revision 3. Furthermore, Airbus Helicopters issued ASB EC225-05A036 Revision 3 and ASB AS332-05.00.96 Revision 3, as applicable to helicopter model, to provide installation of a redesigned vertical shaft plug P/N 332A08-8905-20 (MOD 332A088905) when performing the repetitive cleaning of the shaft.

Following these developments, EASA issued AD 2014-0078, retaining the requirements of EASA AD 2013-0301, which was superseded, and, for M'ARMS-equipped EC 225 helicopters, requiring modification of the M'ARMS MOD45 monitoring function to incorporate the latest software standard concurrent with RFM update. That AD also introduced the possibility of installation of a new plug P/N 332A08-8905-20 in the shaft bore hole.

After EASA AD 2014-0078 was issued, Airbus Helicopters redesigned the MGB bevel gear vertical shaft through modification MOD 0752525, which provides new nitrided shaft P/N 332A32-5109-00/01/05/06. This new shaft design eliminates a possibility of mechanical failure of the shaft. However incorporation of the new shaft requires to keep previous installation of a new MGB oil jet (MOD 0753021), and is incompatible with M'ARMS MOD45 monitoring function (MODS 0726994 and MOD 0728083) as initially required for EC 225 helicopters equipped with a VHM.

Prompted by these design evolutions, Airbus Helicopters issued ASB AS332-63.00.76, ASB EC225-63A019 and SB EC225-45.021 that specify conditions and instructions applicable for a redesigned shaft installation.

	For the reasons described above, this AD is revised to introduce an optional terminating action by installing a redesigned MGB bevel gear vertical shaft and additional actions required to be accomplished when installing that shaft.
Effective Date:	Revision 1: 15 July 2014 Original issue: 01 April 2014
Required Action(s) and Compliance Time(s):	Required as indicated, unless accomplished previously: (1) For all EC 225 helicopters (regardless whether equipped with Airbus Helicopters M'ARMS VHM system or not), before next flight, after 10 July 2013 [the effective date of the original issue of AD 2013-0138], update the Emergency Procedures of the RFM by inserting a copy of Appendix 1 and 2 of Airbus Helicopters EC225 ASB 04A009 Revision 2 or ASB EC225-04A009 Revision 3, and a copy of Appendix 3 of Airbus Helicopters ASB EC225-04A009 Revision 3, in Section 3 of the RFM of the helicopter. This can also be accomplished by incorporating a later applicable RFM revision. (2) For EC 225 helicopters equipped with a serviceable M'ARMS system, within 52 days after 10 July 2013 [the effective date of the original issue of AD 2013-0138], modify the M'ARMS system of the helicopter by incorporating MOD 0726978 and MOD 0726994 (defined as "M'ARMS MOD45 monitoring") in accordance with instructions of Airbus Helicopters ASB EC225-45A010, and concurrently accomplish the following actions: (2.1) Remove the maximum continuous torque limitation placard, as previously required by EASA AD 2013-0138R1, from the helicopter. (2.2) Update the RFM of the helicopter by inserting RFM supplement SUP.7 at Revision Normal RN0 (code-date 13-20) in accordance with instructions of Airbus Helicopters ASB EC225-45A010. This can also be accomplished by incorporating a later applicable RFM revision. (2.3) Update the Master Minimum Equipment List (MMEL) of the helicopter by inserting a copy of paragraph 4.E of Airbus Helicopters ASB EC225-45A010 in Section 45.00.00 of the MMEL. This can also be accomplished by incorporating a later applicable MMEL revision. (3) For EC 225 helicopters equipped with a serviceable M'ARMS system, within 30 days after 01 April 2014 [the effective date of this AD at original issue], modify the "M'ARMS MOD45 monitoring" of the helicopter by incorporating MOD 0728083 (software upgrade) and update the RFM of the helicopter by inserting RFM supplement SUP.7 at Revision Normal RN2 (code-date 13-42) in accordance with instructions of Airbus Helicopters ASB EC225-45A010 Revision 3. Modification of a helicopter, before 01 April 2014 [the effective date of this AD at original issue], by incorporating MOD0728083 and updating RFM SUP.7 at RN2 in accordance with instructions of Airbus Helicopters SB EC225-45-018 original issue, is acceptable to comply with the requirements of paragraphs (2) and (3) of this AD. (4) After modification of an EC 225 helicopter equipped with a M'ARMS system, as required by paragraph (2) or (3) of this AD, accomplish the following actions: (4.1) Within 25 FH after modifying the helicopter as required by paragraph (2) or (3) of this AD, and, thereafter, at intervals not to exceed 25 FH, check the M'ARMS system in accordance with instructions of Airbus Helicopters ASB EC225-45A010 Revision 3.

- (4.2) If, during operation the helicopter experiences a lightning strike, before next flight, accomplish the applicable corrective actions in accordance with instructions of Airbus Helicopters ASB EC225-45A010 Revision 3.
- (4.3) Inspections and corrective actions accomplished before 01 April 2014 [the effective date of this AD at original issue] in accordance with Airbus Helicopters ASB EC225-45A010 original issue or Revision 1 or Revision 2 are acceptable to comply with the requirements of paragraphs (4.1) and (4.2) of this AD.
- (4.4) If, during operation the helicopter experiences a "MOD45 EXCEED" alert from the M'ARMS system, before next flight, accomplish an Ultrasonic inspection of the installed MGB bevel gear vertical shaft, for absence of cracks in the area of the weld, in accordance with instructions of Airbus Helicopters ASB EC225-04A009 Revision 3, and if any crack is found, before next flight, replace the vertical shaft with a serviceable part in accordance with an approved maintenance instructions.

Note 1: From 01 October 2013, an Ultrasonic inspection is the only acceptable NDT inspection method that can be used on EC 225 helicopters.

- (5) For EC 225 helicopters not equipped with a M'ARMS system, and EC 225 helicopters equipped with an unserviceable M'ARMS system, after 23 December 2013 [the effective date of EASA AD 2013-0301], accomplish one of the actions specified in paragraph (5.1) or (5.2) or (5.3) of this AD, as applicable:
 - (5.1) Before next flight, install a placard "**OPERATIONS WHICH DO NOT ENABLE EMERGENCY LANDING ON THE GROUND WITHIN 10 MINUTES AT Vy ARE PROHIBITED**" in full view of the pilots in accordance with the instructions of Airbus Helicopters EC225 ASB 04A009 Revision 2 or ASB EC225-04A009 Revision 3.
 - (5.2) For helicopters operated over areas where emergency landing to ground is not possible within 10 minutes at Vy, **at reduced MCP flight regime**:
Before next flight, install a placard "**MAXIMUM CONTINUOUS TORQUE LIMITED TO 70% DURING LEVEL FLIGHTS AT IAS $\geq$ 60 KTS**" in full view of the pilots in accordance with the instructions of Airbus Helicopters EC225 ASB 04A009 Revision 2 or ASB EC225-04A009 Revision 3. Concurrently, and, thereafter, at intervals not to exceed 11,5 FH, accomplish an Ultrasonic inspection of the installed MGB bevel gear vertical shaft, for absence of cracks in the area of the weld, in accordance with the instructions of Airbus Helicopters ASB EC225-04A009 Revision 3, and if any crack is found, before next flight, replace the vertical shaft with a serviceable part in accordance with the approved maintenance instructions.
 - (5.3) For helicopters operated over areas where emergency landing to ground is not possible within 10 minutes at Vy, **at non-reduced MCP flight regime**:
Before next flight and, thereafter, at intervals not to exceed 8 FH, accomplish an Ultrasonic inspection of the installed MGB bevel gear vertical shaft, for absence of cracks in the area of the weld, in accordance with the instructions of Airbus Helicopters ASB EC225-04A009 Revision 3, and if any crack is found, before next flight, replace the vertical shaft with a serviceable part in accordance with the approved maintenance instructions.

See Note 1 of this AD.

- (6) Following rectification of the M'ARMS system for an EC 225 helicopter equipped with an unserviceable Airbus Helicopters M'ARMS system, the requirements of paragraphs (2), (3) and (4) of this AD, as applicable, must

be applied to that helicopter. Concurrently, the placard as previously required by paragraph (5.1) or (5.2) of this AD, as applicable, must be removed from the helicopter.

- (7) For all AS 332 helicopters (regardless whether equipped with Airbus Helicopters EuroARMS or EuroHUMS VHM system or not), after 23 December 2013 [the effective date of EASA AD 2013-0301], accomplish either the action specified in paragraph (7.1) of this AD, or the actions specified in paragraph (7.2) of this AD:

- (7.1) Before next flight, install a placard **“OPERATIONS WHICH DO NOT ENABLE EMERGENCY LANDING ON THE GROUND WITHIN 10 MINUTES AT Vy ARE PROHIBITED”** in full view of the pilots in accordance with the instructions of Airbus Helicopters AS332 ASB 01.00.82 Revision 2 or ASB AS332-01.00.82 Revision 3 or Revision 4.
- (7.2) For helicopters operated over areas where an emergency landing to ground is not possible within 10 minutes at Vy:
Before next flight, and thereafter at intervals not to exceed the values specified in Table 1 below, as applicable to helicopter model, accomplish an Ultrasonic or Eddy Current inspection of the installed MGB bevel gear vertical shaft for absence of crack in the area of the weld in accordance with the instructions of Airbus Helicopters ASB AS332-01.00.82 Revision 4, and if any crack is found, before next flight, replace the vertical shaft with a serviceable part in accordance with the approved maintenance instructions.

Table 1

Helicopter Model	Inspection interval (i.e. max. flight time permitted between two NDT inspections)	
	Eddy Current	Ultrasonic
AS 332 L2	10 FH	11,5 FH
AS 332 C, AS 332 C1, AS 332 L, AS 332 L1	11 FH	12,5 FH

Note 2: An Eddy Current inspection could be used until 31 March 2014. From 1 April 2014, an Ultrasonic inspection is the only acceptable NDT method that can be used on AS 332 helicopters.

- (8) [deleted]
- (9) For all EC 225 and AS 332 helicopters, within 52 days after 10 July 2013 [the effective date of the original issue of AD 2013-0138], remove any MGB bevel gear vertical shaft with a P/N 332A32-5101-00, P/N 332A32-5101-05, P/N 332A32-5101-10 or P/N 332A32-5101-15, having a S/N from M330 (inclusive) through M340 (inclusive) and from S/N M370 (inclusive) through M5000 (exclusive), replace it with a serviceable part in accordance with approved maintenance instructions and comply with the requirements of this AD as applicable to helicopter model and P/N of the installed vertical shaft.
- (10) For all EC 225 and AS 332 helicopters, accomplish the following actions:
- (10.1) Initially, within the compliance time thresholds specified in Table 2 of this AD, as applicable, and, thereafter, at intervals not to exceed 400 FH or 24 months, whichever occurs first, clean the inside of the installed MGB bevel gear vertical shaft in accordance with instructions of Airbus Helicopters ASB EC225-05A036 original issue or Revision 1 or Revision 2 or Revision 3 or ASB AS332-

05.00.96 original issue or Revision 1 or Revision 2 or Revision 3, as applicable to helicopter Model.

Table 2

Shaft S/N	Compliance Time
S/N <u>before</u> S/N M5000 (exclusive)	Within 150 FH or 1 month, whichever occurs first after 10 July 2013 [the effective date of the original issue of EASA AD 2013-0138]
S/N <u>after</u> S/N M5000 (inclusive), and with less than 250 FH since new or overhaul	Before accumulation of 400 FH since new or since overhaul
S/N <u>after</u> S/N M5000 (inclusive), and with 250 FH or more since new or overhaul	Within 150 FH or 1 month, whichever occurs first after 10 July 2013 [the effective date of the original issue of EASA AD 2013-0138]

- (10.2) Concurrent with each cleaning, for those MGB bevel gear vertical shaft having a S/N before S/N M5000 (exclusive), as required by paragraph (10.1) of this AD, after 01 April 2014 [the effective date of this AD at original issue], replace the plug in the shaft bore hole with a plug P/N 332A08-8901-20 corresponding to MOD 332A088901, or P/N 332A08-8905-20 corresponding to MOD 332A088905 in accordance with the instructions of Airbus Helicopters ASB EC225-05A036 Revision 3 or ASB AS332-05.00.96 Revision 3, as applicable to helicopter model.

Plug replacement accomplished before 01 April 2014 [the effective date of this AD at original issue] in accordance with Airbus Helicopters ASB EC225-05A036 original issue or Revision 1 or Revision 2 or ASB AS332-05.00.96 original issue or Revision 1 or Revision 2, as applicable to helicopter model, is acceptable to comply with the requirements of this paragraph.

- (10.3) Within 150 FH after 10 July 2013 [the effective date of the original issue of EASA AD 2013-0138], modify the MGB of the helicopter by incorporating MOD 07-53021 for replacement of one MGB oil jet in accordance with the instructions of Airbus Helicopters ASB EC225-05A036 original issue or Revision 1 or Revision 2 or Revision 3 or ASB AS332-05.00.96 original issue or Revision 1 or Revision 2 or Revision 3, as applicable to helicopter model.

- (11) For all AS 332 helicopters: Modification of a helicopter as required by paragraph (10.3) of this AD, combined with optional installation on that helicopter of a MGB bevel gear vertical shaft having P/N 331A32-3115-xx, or P/N 332A32-5109-00, or P/N 332A32-5109-01, or P/N 332A32-5109-05, or P/N 332A32-5109-06, constitutes terminating action for the requirements of paragraphs (7), (10.1) and (10.2) of this AD for that helicopter.
- (12) For all AS 332 helicopters modified as specified in paragraph (11) of this AD, the placard previously installed as required by paragraph (7.1) of this AD, may be removed from the cockpit of the helicopter in accordance with instructions of Airbus Helicopters ASB AS332-63.00.76.
- (13) For all EC 225 helicopters: Modification of a helicopter as required by paragraph (10.3) of this AD, combined with optional installation on that helicopter of a MGB bevel gear vertical shaft having P/N 332A32-5109-00, or P/N 332A32-5109-01, or P/N 332A32-5109-05, or P/N 332A32-5109-06, and for helicopter equipped with a M'ARMS system, removal of the M'ARMS system as required by paragraph (16) of this AD, constitutes

	terminating action for the requirements of paragraphs (1), (2), (3), (4), (5), (6), (10.1) and (10.2) of this AD as applicable for that helicopter. (14) For all EC 225 helicopters modified as specified in paragraph (13) of this AD, the RFM update of the Emergency Procedures as previously required by paragraph (1) of this AD, may be removed from the RFM of the helicopter in accordance with instructions of Airbus Helicopters ASB EC225-63A019. This can also be accomplished by incorporating a later applicable RFM revision. (15) For EC 225 helicopters not equipped with a M'ARMS system, and EC 225 helicopters equipped with an unserviceable M'ARMS system: For helicopter modified as specified in paragraph (13) of this AD, any placard previously installed as required by paragraph (5.1) and (5.2) of this AD, as applicable, may be removed from the helicopter cockpit in accordance with instructions of Airbus Helicopters ASB EC225-63A019. (16) For EC 225 helicopters equipped with M'ARMS system: Concurrently with installation of a MGB bevel gear vertical shaft having P/N 332A32-5109-00, or P/N 332A32-5109-01, or P/N 332A32-5109-05, or P/N 332A32-5109-06 on a helicopter modified as required by paragraph (10.3) of this AD, accomplish the actions as specified in paragraphs (16.1), (16.2) and (16.3) of this AD. Refer to Airbus Helicopters ASB EC225-63A019 for detailed information. (16.1) Remove from the helicopter a "M'ARMS MOD45 monitoring" system (MOD 0726994 and MOD 0728083), previously installed as required by paragraphs (2) and (3) of this AD, in accordance with instructions of Airbus Helicopters SB EC225-45.021. (16.2) Update the MMEL of the helicopter by inserting a copy of Appendix 4.C of Airbus Helicopters SB EC225-45.021 in Section 45.00.00 of the MMEL. This can also be accomplished by incorporating a later applicable MMEL revision. (16.3) The RFM supplement SUP.7 previously inserted as required by paragraphs (2) and (3) of this AD, may be removed from the RFM of the helicopter.
Ref. Publications:	Airbus Helicopters EC225 ASB 04A009 Revision 2 dated 21 November 2012 and ASB EC225-04A009 Revision 3 dated 08 July 2013. Airbus Helicopters ASB EC225-45A010 original issue, dated 08 July 2013 and Revision 1 dated 15 August 2013, and Revision 2 dated 19 December 2013, and ASB EC225-45A010 Revision 3 dated 18 March 2014. Airbus Helicopters ASB EC225-05A036 original issue, dated 08 July 2013 and Revision 1 dated 19 July 2013 and Revision 2 dated 19 December 2013 and ASB EC225-05A036 Revision 3 dated 19 March 2014. Airbus Helicopters AS332 ASB 01.00.82 Revision 2, dated 21 November 2012, and ASB AS332-01.00.82 Revision 3 dated 08 July 2013 and Revision 4, dated 17 December 2013. Airbus Helicopters ASB AS332-05.00.96 original issue, dated 08 July 2013 and Revision 1 dated 19 July 2013 and Revision 2 dated 17 December 2013 and ASB AS332-05.00.96 Revision 3 dated 19 March 2014. Airbus Helicopters SB EC225-45-018 original issue, dated 20 December 2013. Airbus Helicopters ASB EC225-63A019 original issue, dated 07 July 2014 Airbus Helicopters SB EC225-45.021 original issue, dated 02 May 2014.

	Airbus Helicopters ASB AS332-63.00.76 original issue, dated 07 July 2014 The use of later approved revisions of these documents is acceptable for compliance with the requirements of this AD.
Remarks:	1. If requested and appropriately substantiated, EASA can approve Alternative Methods of Compliance for this AD. 2. Based on the required actions and the compliance time, EASA have decided to issue a Final AD with Request for Comments, postponing the public consultation process until after publication. 3. Enquiries regarding this AD should be referred to the Safety Information Section, Executive Directorate, EASA. E-mail: ADs@easa.europa.eu. 4. For any question concerning the technical content of the requirements in this AD, please contact: AIRBUS HELICOPTERS (STDI) – Aéroport de Marseille Provence 13725 Marignane Cedex, France Telephone +33 (4) 42 85 97 97, Facsimile +33 (4) 42 85 99 66 E-mail: Directive.technical-support@eurocopter.com.