EASA	EMERGENCY AIRWORTHINESS DIRECTIVE
	AD No.: 2012-0250-E **Date: 21 November 2012** Note: This Emergency 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:	**Type/Model designation(s):**
EUROCOPTER	AS 332 and EC 225 helicopters

TCDS Number:	EASA.R.002
Foreign AD:	Not applicable
Supersedure:	This AD supersedes EASA Emergency AD 2012-0225-E dated 25 October 2012.

ATA 63	**Main Rotor Drive – Main Gear Box Bevel Gear Vertical Shaft – Inspection / Replacement / Limitation / Amendment**
Manufacturer(s):	Eurocopter (formerly EUROCOPTER France)
Applicability:	AS 332 C, AS 332 C1, AS 332 L, AS 332 L1, AS 332 L2 and EC 225 LP helicopters, all serial numbers, if equipped with Main Gear Box (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 Serial Number (S/N).
Reason:	In May 2012, an EC 225 LP helicopter carried 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. 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 MGB emergency lubrication system and, following a subsequent warning indicating failure of that system, performed a controlled ditching into the sea. Results from the investigation of the failed shaft revealed that the crack had initiated from an oxidation pit found in the chamfer of the vertical shaft welding stop hole. This bore hole is fitted with a plastic plug under which corrosion took place in a confined area of the hole chamfer whose shape had been previously modified by a production change in the manufacturing process of the MGB bevel gear. A thorough review of the production files identified the S/Ns of MGB bevel gear vertical shafts manufactured after the production change as a batch of potentially affected parts.

	Although the corroded vertical shaft failed after a low number of accumulated flight hours, the investigation showed that failure could not be precluded at any specific value of accumulated flight hours, therefore the crack could have initiated at low MGB torque levels. For this reason, the AS 332 models were considered to be affected in the same way as EC 225 helicopters. The investigation also determined that, prior to the flight during which the helicopter ditched, the Vibration Health Monitoring (VHM) system installed on the helicopter had identified a rising trend in certain monitoring parameters associated with the MGB oil pump drive system. To address the unsafe condition of MGB bevel gear vertical shaft failure, EASA issued Emergency AD 2012-0115-E, which superseded previously issued AD 2012-0107, AD 2012-0104 and Emergency AD 2012-0087-E. AD 2012-0115-E applied to all AS 332 and EC 225 helicopters equipped with potentially affected shafts, identified by S/N. The AD required for those helicopters, when equipped with a serviceable VHM system and flying over water in either Instrument Meteorological Conditions (IMC) or at night, to download and review specific VHM data at different intervals, depending on the helicopters model. For helicopters without VHM, or with an unserviceable VHM system, the AD imposed a restriction to limit flight over water operation to day visual flight rules (Day VFR) only. Since that AD was issued, a report was received following the ditching in the North Sea of another EC 225 LP helicopter. The helicopter ditched following the same warning circumstances that occurred in the May 2012 accident, i.e. indication of MGB loss of oil pressure and subsequent red alarm on the MGB emergency lubrication system activated by the crew. The affected helicopter was equipped with a MGB bevel gear vertical shaft with a S/N not subject to the VHM monitoring required by EASA AD 2012-0115-E. While the investigation was at an early stage, the cause of this new ditching seemed to result from the failure of that vertical shaft. Additionally, the analysis of the data recorded by the VHM system of the helicopter, prior to the flight during which it ditched, also showed some VHM rising trends. As an immediate temporary action EASA issued Emergency AD 2012-0225-E, retaining the requirements of AD 2012-0115E, which was superseded, extending its applicability to all P/N 332A32.5101.xx MGB bevel gear vertical shafts, regardless of S/N and in addition, reducing the time intervals for downloading and reviewing the VHM data and requiring this for any flight over water. Furthermore, for helicopters without a VHM system installed, and helicopters with an unserviceable VHM AD 2012-0225-E prohibited over water flight. Since AD 2012-0225-E was issued, initial results from the investigation of the second ditching confirmed another failure of the MGB bevel gear vertical shaft P/N 332A32.5101.00 with full circumferential cracking in the vicinity of the weld that joins the two section of the shaft. However, this new crack did not initiate in the shaft welding stop hole, distinguishing it from the first shaft failure and consequently leading to reconsideration of the contributory causes as analysed so far. Re-analysis of the unsafe condition in the light of two failures of the same P/N shaft from two batches of parts, with different accumulated flight hours, showed a similar crack propagation development. The second investigation also confirmed clear indications of increased vibration in the records of certain parameters of the VHM system on both affected helicopters. In addition, Eurocopter have shown that crack propagation is slower with reduced Maximum Continuous Power (MCP). Moreover, it has been determined that it is possible to perform a High Frequency Eddy Current inspection (HFEC) of the vertical shaft without removal and complete disassembly of the MGB. Apart from the broken vertical shafts, no significant signs of degradation on any of the other components of the two failed MGBs have been found. Stress

	analysis of the EC 225 MGB with a failed vertical shaft supports continued operation of the transmission to allow controlled power-on landing as performed in the two ditching events. As a result the flight manual emergency procedures have been revised to address the specific indications of vertical shaft failure. Furthermore, EASA also reconsidered the overwater flight limitation associated to the failure scenario. For the reasons described above, this AD which supersedes EASA AD 2012-0225-E requires, for EC 225 helicopters, Rotorcraft Flight Manual (RFM) amendment, improved procedure for acquiring VHM data, or HFEC inspection, to ensure timely detection of any vertical shaft cracking, MCP reduction for level flight and prohibits certain operations. In addition, for AS 332 helicopters, this AD prohibits certain operations and requires HFEC inspection. Based on further investigation additional AD actions may follow.
Effective Date:	22 November 2012
Required Action(s) and Compliance Time(s):	Required as indicated, unless accomplished previously: (1) For all EC 225 helicopters (regardless whether equipped or not with the Eurocopter M'ARMS VHM system), before next flight, after the effective date of this AD, update the Emergency Procedures of the RFM by inserting a copy of the Appendix 1 and 2 of Eurocopter EC225 Alert Service Bulletin (ASB) No.04A009 revision 2 in Section 3 of the RFM of the helicopter. (2) For EC 225 helicopters equipped with a serviceable M'ARMS system, and operated over areas where emergency landing to ground is not possible within 10 minutes at Vy, after the effective date of this AD, accomplish the following actions: (2.1) Before next flight, install a placard "**MAXIMUM CONTINUOUS TORQUE LIMITED TO 70% DURING LEVEL FLIGHTS AT IAS≥ 60 KTS** " in full view of the pilots, in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2. (2.2) Before next flight, download M'ARMS data to review records of the indicator named MOD-45, accumulated over the last 20 Flight Hours (FH), and report to Eurocopter any MOD-45 download with inadequate records acquisition rate or any MOD-45 indication exceeding red threshold, in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2, and, before next flight, accomplish Eurocopter instructions accordingly. (2.3) Within 3 FH, and thereafter at intervals not to exceed values calculated in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2, download M'ARMS data to review MOD-45 indicator acquisitions recorded over the last performed flights and report to Eurocopter any MOD-45 indication exceeding red threshold, in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2, and before further flight, accomplish Eurocopter instructions accordingly. (2.4) If, during the MOD-45 reviews as required by paragraph (2.3) of this AD, the last MOD-45 record occurred between 2 FH and 3 FH before the actual accumulated FH, carry out one maintenance flight, with minimum required flight crew and no passengers, for M'ARMS acquisition of additional records in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2, and thereafter, before next flight, accomplish MOD-45 indicator record download and review in compliance with paragraph (2.3) of this AD. (2.5) If, during the MOD-45 reviews as required by paragraph (2.3) of this AD, the last MOD-45 record occurred more than 3 FH before the actual accumulated FH, before next flight, inspect the installed MGB bevel gear vertical shaft, for absence of cracks in the area of the

	weld, by HFEC in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2, and if any crack is found, before next flight, replace the vertical shaft with a serviceable part. (2.6) Inspection of the installed MGB bevel gear vertical shaft, for absence of cracks in the area of the weld, by HFEC in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2, allows, if no crack is found, to fly the helicopter up to 10 FH maximum without compliance with the requirements of paragraph (2.3) of this AD. (3) For EC 225 helicopters not equipped with a M'ARMS system, and EC 225 helicopters equipped with an unserviceable M'ARMS system, after the effective date of this AD, accomplish either actions required by paragraph (3.1) of this AD or actions required by paragraphs (3.2) and (3.3) of this AD: (3.1) Before next flight, remove from the helicopter and from the RFM any placard and copy of EASA AD as previously required by EASA AD 2012-0225-E, and concurrently, 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 instructions of Eurocopter EC225 ASB No.04A009 revision 2, (3.2) Before next flight, remove from the helicopter and from the RFM any placard and copy of EASA AD as previously required by EASA AD 2012-0225-E, and concurrently, install a placard "**MAXIMUM CONTINUOUS TORQUE LIMITED TO 70% DURING LEVEL FLIGHTS AT IAS≥ 60 KTS** " in full view of the pilots, in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2, (3.3) Before next flight, and thereafter at intervals not to exceed 10 FH, inspect the installed MGB bevel gear vertical shaft, for absence of cracks in the area of the weld, by HFEC in accordance with instructions of Eurocopter EC225 ASB No.04A009 revision 2, and if any crack is found, before next flight, replace the vertical shaft with a serviceable part. (4) Following rectification of the M'ARMS system for an EC 225 helicopter equipped with an unserviceable Eurocopter M'ARMS system, paragraph (2) of this AD applies to that helicopter. Concurrently, the placard as previously required by paragraph (3.1) of this AD can be removed from the helicopter. (5) For all AS 332 helicopters (regardless whether equipped or not with Eurocopter EuroARMS or EuroHUMS VHM system), after the effective date of this AD, accomplish one of the following actions: (5.1) Before next flight, remove from the helicopter and from the RFM any placard and copy of EASA AD as previously required by EASA AD 2012-0225-E, and concurrently, 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 instructions of Eurocopter AS332 ASB No.01.00.82 revision 2. (5.2) Before next flight, and thereafter at intervals not to exceed 10 FH, inspect the installed MGB bevel gear vertical shaft, for absence of crack in the area of the weld, by HFEC in accordance with instructions of Eurocopter AS332 ASB No.01.00.82 revision 2, and if any crack is found, before next flight, replace the vertical shaft with a serviceable part. (6) For all AS 332 helicopters (regardless whether equipped or not with Eurocopter EuroARMS or EuroHUMS VHM system), installation of a MGB bevel gear vertical shaft with a P/N 331A32-3115-xx is a terminating action

	to the requirements of this AD. Concurrently, remove any placard and copy of EASA AD 2012-0225-E or placard installed in accordance with paragraph (5.1) of this AD, as applicable, from the helicopter and RFM. (7) For all EC 225 and all AS 332 helicopters, after the effective date of this AD, do not install on a helicopter any MGB bevel gear vertical shaft with a P/N 332A32.5101.00, 332A32.5101.05, 332A32.5101.10 or 332A32.5101.15 with S/N from M330 (inclusive) through M340 (inclusive) and from S/N M370 (inclusive) through M5000 (exclusive).
Ref. Publications:	Eurocopter EC225 ASB No.04A009 Revision 2 dated 21 November 2012 Eurocopter AS332 ASB No.01.00.82 Revision 2 dated 21 November 2012 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. The results of the safety assessment have indicated the need for immediate publication and notification, without the full public consultation process. 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: EUROCOPTER (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.