

AIRWORTHINESS APPROVAL NOTE NO: 22975

APPLICANT: MBB Helicopters

AIRCRAFT TYPE: MBB BK-117 B-1C

REGISTRATION: G-HMBB

CONSTRUCTOR'S NO: 7184

MBB Helicopters
UK Type Certification of the MBB BK117 B-1C in the
Transport Category (Passenger)

1. Introduction

The BK117 is a utility helicopter seating up to 11 persons (including one or two pilots), and with a Group A performance capability. It has a four-bladed hingeless main rotor with glass-fibre-reinforced plastic blades, and a semi-rigid (teetering) two-bladed tail rotor. The helicopter is powered by two Lycoming LTS 101 turbine engines.

The airframe is a conventional rivetted aluminium alloy semi-monocoque design, supported on a skid-type landing gear. Fibre-reinforced plastic is used for the empennage primary structure, and on some non-stressed panels.

An application for UK certification of the MBB BK117 helicopter was received by CAA from MBB on 26th February 1979.

The aircraft, which was jointly developed by MBB and Kawasaki Heavy Industries of Japan (KHI) first flew in June 1979 and was certificated by the German (LBA) and Japanese (JCAB) Authorities in December 1982. FAA certification was granted in March 1983.

The version of the BK117 initially certificated by LBA, JCAB and FAA was the BK117 A-1, with a maximum weight of 2850 kg, and having Lycoming LTS 101-650B-1 engines. In 1985 the A-3 version was certificated, with an increased maximum weight of 3200 kg. The new version featured a tail rotor with twisted blades for improved efficiency, and modified rotor head. The incidence of the horizontal stabilizer end-plates was reduced from 8° to 5°, improving directional control at high forward speed. The emergency floats were increased in size. In 1986 the A-4 version was certificated. The principal changes incorporated in this version were an increased transmission take-off torque limit, an improved torque indication system, and the introduction of both yaw and static longitudinal stability augmentation systems as standard equipment.

The current production version, which is the subject of CAA certification, is the BK117 B-1, which differs from the A-4 version principally in the introduction of LTS 101-750B-1 engines together with other minor improvements. The -750 engine in the BK117 is flat rated to -650 powers, but offers improved hot-day and high-altitude performance. Later production B-1 aircraft have a modified electrical system and offer a Sperry SPZ 7100 Digital AFCS with single-pilot IFR approval as an option. The BK117B-1 was certificated by LBA and FAA in December 1987.

2. CAA Evaluation History

Following receipt of the application from MBB in February 1979 several preliminary discussions of aspects of UK certification (including in particular discussions of transmission testing requirements involving KHI and JCAB) were held between 1979 and 1981. Between 18th and 29th April 1983 (following LBA certification) a full Engineering Evaluation by a CAA team took place, followed by CAA Flight Test Assessments in June, July and December 1983. These visits were concerned with the BK117A-1 version of the aircraft. One further meeting took place between MBB and CAA in October 1983, and written responses to several of the issues raised during the Engineering Evaluation were provided, but in 1984 work on the application was suspended.

In February 1988 MBB visited CAA to re-open the programme, and in June 1988 a further CAA Engineering Evaluation visit to MBB was made. The object of this evaluation was the BK117 B-1 which was (and remains) the current production version. In view of the time which had elapsed, the requirement standard against which the renewed Evaluation was conducted was updated. Further CAA flight assessment took place in July 1988 and November 1989. MBB have now submitted responses to all points raised by CAA during the Engineering Evaluation and Flight Assessments. Further meetings have been held as necessary to discuss the responses, and CAA investigations are now satisfactorily completed.

3. Requirement Standard and UK Additional Requirements

The CAA Airworthiness Requirements applicable to the BK117 B-1 are listed in the document "MBB BK117 B-1, UK Additional Requirements for Certification in the Transport Category, Issue 1 dated November 1990, ref 9/31/Ry2601".

The requirement standard for LBA certification of the BK117 A-1, and of subsequent versions, is FAR 29 including amendments 29-1 to 29-16 (adopted 28 September 1978) plus LBA Special Conditions dated 3 January 1980.

Additional Requirements, for CAA Certification of the BK117 B-1 in the Transport Category, have been defined as a result of the Engineering and Flight Evaluations described in paragraph 2 above. These Additional Requirements are presented in the above referenced document. CAA certification is based on LBA certification, together with compliance with these Additional Requirements.

4. Compliance with UK Additional Requirements

MBB have defined a kit, for retrofit into a standard BK117 B-1 aircraft, which will convert the aircraft to a new version, designated BK117 B-1C, which complies with the UK Additional Requirements. This kit is applicable to BK117 B-1 aircraft serial no. 7184 and subsequent production. Earlier production aircraft have an electrical system which does not comply with CAA requirements.

The method of compliance which has been agreed between MBB and CAA as satisfying the Requirements for UK Type Certification of the BK117 B-1C aircraft, and which is achieved by the MBB conversion kit (part no. 117-810021) is as follows:

4.1 AR1 Structures

- (a) Front windshields of increased thickness, part no. 117-810051, are to be fitted. A reinforced crest cowling part no. 117-810041, which protects the hydraulic pack mounted on the cabin roof, is also to be installed. These components have been demonstrated by tests to withstand impact with a two-pound bird under all required conditions.
- (b) The fatigue life information published by the manufacturer in the Maintenance Manual adequately satisfies this requirement.
- (c) Control lever part no. 105-42121 is not acceptable for use on UK-registered aircraft, and is to be replaced with a new part no. 105-42126, having an increased fatigue life.

4.2 AR2 Electrical Systems

- (a) Two 25 amp-hour capacity nickel-cadmium batteries are to be fitted, and have been shown by analysis to have capacity adequate for half the maximum endurance of the helicopter, when operating under visual or instrument flight rules. No limitations on the operation of the aircraft are necessary.

- (b) An electrical load analysis is to be provided for each aircraft delivered for UK certification.
- (c) The revised electrical system, introduced into production by MBB for aircraft serial no. 7184 and all subsequent production, includes provision of a 'Battery off' indication in the cockpit.
- (d) Aircraft delivered for UK certification will be equipped with two landing lights. A fixed landing light, part no. 117-98294 and a fully steerable landing/searchlight, part no. 117-875031 are both to be installed in the aircraft nose. Flight Manual supplements 10-5 and 10-26 respectively refer.

4.3 AR3 Powerplant

- (a) A Racal V694 16-channel Automatic Voice Alerting Device is to be installed, and will provide an audible (voice) warning of engine fire. A number of other voice warnings will also be provided by the AVAD.
- (b) The Lycoming LTS101-750B-1 engines will incorporate modifications LTS101B-72-50-0116 and LTS 101B-73-10-0127. (Engines which have these modifications installed at initial manufacture are identified by a serial number which ends with either an 'A' or a 'B').

The aircraft is to be modified by embodiment of MBB Service Bulletin BK117-60-105, or by the embodiment of an equivalent modification during production.

4.4 AR4 Fuel System

MBB Service Bulletin BK117-90-104 is applicable to aircraft up to and including serial no. 7261 and provides improved electrical bonding between the landing gear and the airframe.

MBB Service Bulletin BK117-90-105 Revision 1 is applicable to aircraft up to and including serial no. 7241. The SB installs electrostatic dischargers at the tips of the main rotor blades and on the tail skid, improves main rotor blade electrical bonding, and modifies the fuel tank vent system outlets.

MBB Service Bulletin BK117-60-107 is applicable to aircraft up to and including serial no. 7215 and removes the fuel return lines which return unused fuel from the engines to the fuel tank vent system.

The above Service Bulletins together satisfy the requirements of Additional Requirement 4, and will be installed in aircraft for the UK register where applicable. Production aircraft subsequent to the applicability quoted will have equivalent modifications embodied during manufacture.

4.5 AR5 Flight Deck

- (a) Airspeed indicators part no. 117-940481 having revised marking to indicate VNO are to be installed. The cockpit placards which indicate the variation of VNE with temperature and altitude are to be replaced with placards (part no. 117-810021.20) which include the statement "VNO = VNE - 10%" (see Flight Manual, pages 2-21 and 2.25).
- (b) Torque meter (part no. 117-940711), TOT indicators (part no. 117-940571) and triple tachometer (part no. 117-940541) having revised markings are to be installed (see Flight Manual, page 2-22).
- (c) Revised cockpit door jettison instruction placards, part no.117-400131 (LH) and .104(RH) are to be installed. (see Flight Manual, page 2.26).
- (d) Placard part no. 117-88156, to be installed adjacent to the mechanical cargo hook release lever, identifies the function and method of operation. (see Flight Manual, page 10-2-4).
- (e) A revised guarded cargo hook release switch is to be installed on the pilot's collective lever.
- (f) A revised control box (part no. 117-413981) is to be installed on the pilot's collective grip. The revised box is narrower and will provide improved clearance between the cyclic and collective levers at extreme travel.
- (g) The Emergency Flotation Armed indication light is to be made dimmable by installation of the CAA Retrofit Electrical Kit, part no. 117-98329B.
- (h) The CAA Retrofit Electrical Kit will also introduce a non-dimmable amber Master Caution light in place of the standard red dimmable Master Warning.
- (i) The fire extinguisher arming switches are to be relabelled to indicate that they also cause the fuel valves to close.

4.6 AR6 Radio

The radio station and audio systems of each individual aircraft must be assessed for compliance with these requirements.

4.7 Equipment-Air Navigation Order

Compliance with this requirement must be assessed for individual aircraft, taking account of the nature of operations intended. The emergency flotation system (see Flight Manual Supplement 10-47) is approved and satisfies the requirements for flight over water (ANO Art. 30(6)). The Racal AVAD system installed to comply with AR3(a) will also, in conjunction with the radio altimeter, provide the voice warning required for flight over water (ANO Schedule 4 Scale EE).

4.8 AR8 Cabin Interior

- (a) Passenger seat belts part no. 117-86197 are to be installed and will comply with CAA requirements for release angle.
- (b) A Flight Manual Limitation states that in the normal eight-seat configuration, baggage or cargo may not be carried behind the seats unless the Sound Isolating Wall (see FMS 10-34) is installed. The baggage compartment so formed has been demonstrated to comply with the applicable requirements. The Sound Isolating Wall installation includes a smoke detector to provide indication of smoke in the baggage bay.

4.9 AR9 Flight Manual

MBB Helicopters Flight Manual MBB BK117 B-1C is approved by CAA at Revision 1. The Flight Manual includes Supplements for all manufacturer's optional equipment items which are currently approved by CAA for the type.

4.10 AR10 Approval for Flight in IMC

- (a) A revised standby artificial horizon is to be installed.
- (b) Two high intensity cockpit lights, (storm lights) part no. 117-98296, are to be installed.

(Compliance with AR10(a) and (b) is not required if other equipment required for IFR flight is not installed).

5. Noise Certification

Noise certification of BK117 B-1C aircraft is not required. Although application for certification of the B-1 version was made for LBA on 9th December 1986 (i.e. later than 1st August 1986), it is accepted that the noise levels of the B-1 version are not higher than the A-4 version (which has the same maximum weight and the same powers available under sea level standard day conditions). The A-4 version was certificated by LBA in July 1986.

6. Type Approval

The MBB BK117 B-1C helicopter complies with the requirements for UK Certification in the Transport Category (Passenger). CAA Type Certificate and Type Certificate Data Sheet FR 19 have been issued to signify this approval.

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For the Civil Aviation Authority
Date3.September.1991.....