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# **Type Acceptance Report**

**TAR 4/21B/22 – Revision 1**

**Columbia Helicopters BV 107-II**



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## Executive Summary

New Zealand Type Acceptance has been granted to the Boeing Vertol 107-II based on validation of FAA Type Certificate no.1H16. There are no special requirements for import.

Applicability is currently limited to the Models and/or serial numbers detailed in Appendix 1, which are now eligible for the issue of an Airworthiness Certificate in the Standard Category in accordance with NZCAR §21.177, subject to any outstanding New Zealand operational requirements being met. (See Section 5 of this report for a review of compliance of the basic type design with the operating Rules.) Additional variants or serial numbers approved under the foreign type certificate can become type accepted after supply of the applicable documentation, in accordance with the provisions of NZCAR §21.43(2).

## 1. Introduction

This report details the basis on which Type Acceptance Certificate No.4/21B/22 was granted in the Standard Category in accordance with NZCAR Part 21 Subpart B.

Specifically the report aims to:

- (a) Specify the foreign type certificate and associated airworthiness design standard used for type acceptance of the model(s) in New Zealand; and
- (b) Identify any special conditions for import applicable to any model(s) covered by the Type Acceptance Certificate; and
- (c) Identify any additional requirements which must be complied with prior to the issue of a NZ Airworthiness Certificate or for any subsequent operations.

## 2. Foreign Type Certificate Details

Manufacturer:	Vertol Division, The Boeing Company
TC Holder:	Columbia Helicopters, Inc (since December 15, 2006)
Model:	107-II
Type Certificate:	1H16
Issued by:	Federal Aviation Agency
MCTOW	17,900 lb. (Category A) 19,000 lb. (Category B) 20,000 lb (in accordance with STC No. SH131NW) Note: See TCDS Note 7 for an increase to 22,000 lb for Class B Rotorcraft-Load combination.
Occupants:	2 crew; 26 pax (2-piece utility door); 39 pax (“airstair” door)
Noise Standard:	Not Applicable

**Engine:** General Electric CT58-110-1 or 2  
[CT58-140-1 installed in accordance with STC SH131NW]

Type Certificate: 1E3  
Issued by: Federal Aviation Agency

### 3. Type Acceptance Certificate

The application for New Zealand type acceptance was from Columbia Helicopters, dated 19 February 2004. The first-of-type example was serial number 5, registered ZK-HCW. The BV107-II is a large twin-turbine powered tandem-rotor transport category helicopter.

Type Acceptance Certificate No. 4/21B/22 was granted on 26 July 2005 to the Boeing Vertol Model 107-II based on validation of FAA Type Certificate 1H16, and includes the General Electric CT58 Series engine based on FAA Type Certificate 1E3. There are no special requirements for import into New Zealand.

This report was raised to Revision 1 under Work Request number 7/21B/36 to record the change in Type Certificate holder responsibility from Boeing to Columbia Helicopters Inc. The application was from the type certificate holder dated March 19, 2007.

The Boeing Vertol 107-II is a large twin-turbine engined Air Transport category helicopter of all-metal semi-monocoque stressed-skin construction. It has tandem 3-bladed fully articulated rotorheads with partially-overlapping blades, which are synchronised by a mix box, forward and aft transmissions and interconnecting drive shafts.

The then independent Vertol company (previously Piasecki) designed the 107 in the late 1950s as a medium lift helicopter for US Army evaluation. Three prototype Lycoming turboshaft powered 107s were built designated YHC1As in 1958. By that time though the Army's interest had switched to what would become the Chinook and it placed no orders. However in February 1961 Vertol (Boeing acquired Vertol in 1960) won a US Marine Corps competition with a developed General Electric T58GE8 powered version of the BV 107, and the type was ordered into production as the CH-46A Sea Knight.

A civilian version was produced as the BV 107-II. However only a small number of civil examples were produced. Eight were used originally by New York Airways in 25-seat layout on their well-known commuter operation, some of which were owned by Pan American Airways. Kawasaki manufactured the helicopter under license as the KV 107-II, and later held the world-wide marketing rights for civil examples. The Boeing Vertol Model 107 was also purchased by the Canadian Armed Forces and the Swedish military.

## 4. Type Data

The type data requirements of NZCAR Part 21B Para §21.43 have been satisfied by supply of the following documents:

(1) ICAO Type certificate:

Helicopter Type Certificate Number 1H16 for 107-II re-issued December 15, 2006  
 FAA Type Certificate Data Sheet Number 1H16 at Revision 11 dated May 17, 2007  
 – Model 107-II approved January 26, 1962

FAA TCDS No. 1E3 CT58-1xx-x Series at Revision 15 dated April 17, 1985

(2) Airworthiness design requirements:

(i) *Airworthiness Design Standards:*

The certification basis of the Boeing Vertol Model 107-II is CAR 7 dated August 1, 1956 including amendments 7-1 through 7-4 plus the Special Conditions for Turbine Powered Rotorcraft in FAA letter to Vertol dated March 31, 1961. Three exemptions and one equivalent level of safety were granted. The exemptions have been reviewed and accepted by the CAA. (The ESL was only applicable to a high-density passenger configuration.) This is an acceptable certification basis in accordance with NZCAR Part 21B Para §21.41 and Advisory Circular 21-1A, because CAR 7 is the predecessor of FAR Part 29, which is the basic standard for Transport Category Rotorcraft called up under NZCAR Part 21 Appendix C. There are no non-compliances and no additional special conditions have been prescribed by the Director under §21.23.

The certification basis of the CT58 Series is CAR 13 effective June 15, 1956 as amended by 13-1 through 13-6. CAR 13 is the predecessor of FAR Part 33, which is the basic standard for aircraft engines called up in NZCAR Part 21 Appendix C.

(ii) *Special Conditions:*

Nil

(iii) *Equivalent Level of Safety Findings:*

Exemption No.188 – (Regulatory Docket No.978) against the provisions of CAR 7.612(a)(2)(ii) and (3) which require specific accuracy standards for the ASI. Boeing contended that this accuracy was not necessary in the climb if the climb calibration is repeatable and safe flight is possible at any speed within that range for Category B operations. The exemption was granted provided airspeeds are represented by unique, repeatable and readable indications to insure the pilot can avoid flight in the restricted height-velocity diagram and consistently realize the field lengths specified in the RFM.

Exemption No.188A – Subsequent to the granting of Exemption 188 the company was able to improve the airspeed indicating system to comply with the calibration accuracy requirements of 7.612(a)(2)(ii), (3% or 5 mph, whichever is greater) and this was deleted from the exemption.

Exemption No.374 – Against the provisions of CAR 7.612(a)(3)(i) for Category A operations, on the grounds the accuracy is very difficult to attain at the lower speeds. This level of accuracy is not required at those speeds, as most Category A takeoff and landings are vertical and further safe flight operations have been demonstrated without such speed accuracy. The exemption was granted subject to the same conditions as Exemption number 188.

- (iv) *Airworthiness Limitations:*
  - See Note 4 on TCDS (Boeing Service Bulletin 107-04-1001)
- (3) Environmental Certification:
  - Not Applicable
- (4) Certification compliance listing:
  - Vertol Division Report No.107-X-29 – Summary of Reports Submitted to FAA
  - Vertol Division Boeing Report No.107-X-217 – Compliance to Civil Aeronautics Manual, Part 7 – Boeing-Vertol 107 Model II
- (5) Flight Manual: FAA Approved Rotorcraft Flight Manual – Boeing/Kawasaki 107-II Issued by Columbia Helicopters Inc. – Publication 107-1 (Applicable to specified S/N: See Section I) – CAA Accepted as AIR 2864
- (6) Operating Data for Aircraft and Engine:
  - (i) *Maintenance Manual:*
    - Columbia Helicopters 107 Maintenance Manual – Publication 107-2
    - Boeing-Vertol 107 Overhaul Manual – Publication 107-5
    - Boeing-Vertol 107 Maintenance Schedule – Publication 107-6
  
    - SEI-182 Maintenance Manual – CT58 Turboshaft Engines
    - SEI-183 Overhaul Manual – CT58 Turboshaft Engines
    - SEI-185 Accessories Overhaul Manual and Illustrated Parts Catalog
  - (ii) *Current service Information:*
    - Boeing V-107 Service Bulletins, Tandem/Service Notes
  
    - CT58 Service Bulletins
  - (iii) *Illustrated Parts Catalogue:*
    - Columbia Helicopters 107 IPC – Publication 107-4
    - SEI-181 Illustrated Parts Catalog – CT58 Turboshaft Engines
- (7) Agreement from manufacturer to supply updates of data in (5) and (6):
  - CAA 2171 from Columbia Helicopters Inc, dated 03/19/07
- (8) Other information:
  - Historical Record of Major Alterations – BV 107-II Ser. No.5, N6675D
  
  - Boeing Letter 8-7000-FAA-994 dated 15 December 2006 – Request for Transfer of Type Certificates 1H16 and H9EA to Columbia Helicopters Inc.



## 5. Additional New Zealand Requirements

Compliance with the retrospective airworthiness requirements of NZCAR Part 26 is a prerequisite for the grant of a type acceptance certificate.

### Civil Aviation Rules Part 26

#### Subpart B - Additional Airworthiness Requirements

##### Appendix B - All Aircraft

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
B.1	Marking of Doors and Emergency Exits	<i>To be determined on an individual aircraft basis</i>
B.2	Crew Protection Requirements - CAM 8 Appdx. B # .35	Not Applicable – Agricultural Aircraft only

##### Appendix E - Helicopters

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
E.1	Doors and Exits	CAR 7.354(c) and (e), 7.357(d)(2)
E.2.1	Emergency Exit Marking	CAR 7.357(e)(1)

Compliance with the following additional NZ operating requirements has been reviewed and were found to be covered by either the original certification requirements or the basic build standard of the aircraft, except as noted:

### Civil Aviation Rules Part 91

#### Subpart F - Instrument and Equipment Requirements

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
91.505	Shoulder Harness if Aerobatic; >10 pax; Flight Training	CAR 7.605(b)
91.507	Pax Information Signs - Smoking, safety belts fastened	<i>Operational Requirement – Compliance as applicable</i>
91.509 Min. VFR	(1) ASI (2) Machmeter (3) Altimeter (4) Magnetic Compass (5) Fuel Contents (6) Engine RPM (7) Oil Pressure	CAR 7.603(a) N/A – No Mach limitations CAR 7.603(b) CAR 7.603(h) CAR 7.604(e) CAR 7.604(n) CAR 7.604(h)
91.511 Night	(1) Turn and Slip (2) Position Lights	CAR 7.603(f) CAR 7.632
91.513	VFR Communication Equipment	<i>Operational Requirement – Compliance as applicable</i>
91.517 IFR	(1) Gyroscopic AH (2) Gyroscopic DI (3) Gyro Power Supply (4) Sensitive Altimeter	CAR 7.603(e) CAR 7.603(g) <i>Operational Requirement</i> CAR 7.603(b)
91.519	IFR Communication and Navigation Equipment	<i>Operational Requirement – Compliance as applicable</i>
91.523	Emergency Equipment (a) More Than 10 pax - First Aid Kits per Table 7 - Fire Extinguishers per Table 8 (b) More than 20 pax - Axe readily acceptable to crew (c) More than 61 pax - Portable Megaphones per Table 9	<i>Operational Requirement – Compliance as applicable</i> <i>Operational Requirement – Compliance as applicable</i> <i>Operational Requirement – Compliance as applicable</i> <i>Operational Requirement – Compliance as applicable</i>
91.529	ELT – TSO C91a after 1/4/97 (or replacement)	<i>To be determined on an individual aircraft basis</i>
91.531	Oxygen Indicators - Volume/Pressure/Delivery	<i>Operational Requirement – Compliance as applicable</i>
91.533	Oxygen for Unpressurized Aircraft >30 min above FL100 - Supplemental for crew, 10% Pax - Therapeutic for 3% of Pax Above FL100 - Supplemental for all Crew, Pax - Therapeutic for 1% of Pax - 120l PBE for each crew member	<i>Operational Requirement – Compliance as applicable</i> Oxygen system not fitted as standard (Table 1 in RFM Section 2 – Limitations gives maximum density altitude as 13,000 feet.)
91.541	SSR Transponder and Altitude Reporting Equipment	<i>Operational Requirement – Compliance as applicable</i>
91.543	Altitude Alerting Device - Turbojet or Turbofan	Not Applicable – Requirement for aeroplanes only
91.545	Assigned Altitude Indicator	Not Applicable – Requirement for aeroplanes only
A.15	ELT Installation Requirements	<i>To be determined on an individual aircraft basis</i>

## Civil Aviation Rules Part 135

### Subpart F - Instrument and Equipment Requirements

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
135.355	Seating & Restraints – Shoulder harness for flight-crew seats	Shoulder harness fitted as standard – See RFM Fig.1-2 #20
135.357	Additional Instruments (Powerplant and Propeller)	BV 107-II has instruments required under FAR §29.1305
135.359	Night Flight	Landing light, Pax compartment
135.361	IFR Operations	Speed, Alt, spare bulbs/fuses
135.363	Emergency Equipment (Part 91.523 (a) and (b))	<i>Operational Requirement – Compliance as applicable</i>
135.367	Cockpit Voice Recorder Appendix B.3 requires TSO C84 or TSO C123	<i>Operational Requirement – Compliance as applicable</i> Applicable as minimum crew is 2 and certificated seating capacity is at least 26 – CVR fitted to s/n 5 per FAA/DER Approved Form 8110-3
135.369	Flight Data Recorder Appendix B.4 requires TSO C124 and ULD to TSO C121	<i>Operational Requirement – Compliance as applicable</i> Applicable as maximum passengers is 26 or 39 (when airliner “airstair” type door installed) – Honeywell digital FDR fitted to s/n 5 in accordance with STC SR00923SE
135.371	Additional Attitude Indicator	Not Applicable – Not turbo jet or turbofan powered

### Attachments

The following documents form attachments to this report:

- Photographs first-of-type example BV107-II s/n 5 ZK-HCW
- Three-view drawing Boeing Vertol Model 107-II
- Copy of FAA Type Certificate Data Sheet Number 1H16

### Sign off

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David Gill  
Team Leader Airworthiness

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Checked – AWE3 Peter Gill  
Date: 25 May 2007

### Appendix 1

#### List of Type Accepted Variants:

Model:	Applicant:	CAA Work Request:	Date Granted:
BV 107-II *	Columbia Helicopters NZ Limited	4/21B/22	26 July 2005

\* Applicability is serial numbers covered under AIR 2864