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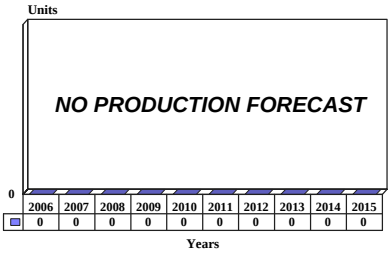
Eurocopter BO 105 - Archived 8/2007

Outlook

- BO 105 production has been completed
- The BO 105 has been replaced in the Eurocopter product line by the EC 135

10 Year Unit Production Forecast
2006 - 2015



Orientation

Description. Five- to seven-seat, twin-turboshaft-engine, single-main-rotor commercial and military utility helicopter.

Sponsor. Ministry of Defense, Federal Republic of Germany.

Status. Production of the BO 105 has been completed.

Total Produced. Approximately 1,403 BO 105s were produced by Eurocopter and its licensees.

Application. Military applications include escort, light observation, anti-tank, and liaison missions. Commercial applications include EMS, resource development, fishery protection, aerial TV and radio reporting, pipeline and utility power line construction support, and forestry protection.

Price Range. BO 105CBS-5, $1.855-$2.2 million in 2003 U.S. dollars.

Contractors

Prime

Eurocopter Deutschland GmbH	http://www.eurocopter.com, Industriestrasse 4, Postfach 1353, Donauworth, 86609 Germany, Tel: + 49 906 71 0, Fax: + 49 906 71 40 11, Prime

Subcontractor

Rolls-Royce Corp	http://www.rolls-royce.com/northamerica, PO Box 420, 2001 S Tibbs Ave, Indianapolis, IN 46206-0420 United States, Tel: + 1 (317) 230-2000, Fax: + 1 (317) 230-6763 (250-C20B Turboshaft; 250-C28C Turboshaft)

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Eurocopter BO 105

BO 105CB

Source: The Royal Netherlands Air Force

Technical Data

(BO 105CBS-5)

Design Features. Twin-turboshaft-powered, single-main-rotor helicopter incorporating a four-blade, semi-rigid rotor system; a semi-bubble type windscreen; four-post skid landing gear; a single main boom; a single vertical fin carrying the tail rotor; and twin horizontal stabilizers each with tip fin. Blade pitch change is the only relative motion permitted by the titanium hub, which is rigidly bolted to the mast. The fiberglass-reinforced plastic rotor blades flap, lead, and lag through their own engineered elasticity. Benefits of this system include instant control response, a high degree of maneuverability, minimal maintenance, and exceptional flight stability. A single anti-torque rotor is mounted high on the vertical fin, and a horizontal stabilizer with two "end-plate" fins is mounted forward of the vertical fin on the helicopter's fuselage.

	Metric	U.S.
Dimensions		
Length overall	11.86 m	38.91 ft
Fuselage maximum width	1.58 m	5.18 ft
Main rotor diameter	9.84 m	32.28 ft
Weight		
Maximum weight	2,500 kg	5,512 lb
Maximal operational weight with external load	2,600 kg	5,732 lb
Capacities		
Usable fuel	570 liters	150.6 gal
Cargo compartment volume	1.3 cu m	45.9 cu ft
Performance(a)		
Fast cruise speed(b)	243 kmph	131 kt
Max range with standard fuel(c)	527 km	285 nm

Propulsion

BO 105CB/CBS/PAH-1/VBH	(2)	Rolls-Royce 250-C20B two-shaft free turbine turboshaft engines rated 313 kW (420 shp) for TO and 298 kW (400 shp) max continuous.
BO 105LS	(2)	Rolls-Royce 250-C28C turboshaft engines rated 373 kW (500 shp) for TO and 368 kW (493 shp) max continuous.

Seating
Standard seating for five persons.

(a)SL, ISA.
(b)At maximum weight.
(c)With takeoff at maximal weight.

Variants/Upgrades

Commercial derivatives were as follows:

BO 105C. Original five-place production model incorporating a hingeless rotor system, fiberglass main rotor blades, and a 57.5-cubic-foot rear cargo area with clamshell doors. A total of 133 were produced between 1973 and 1976.

BO 105CS. Stretched derivative of the C used specifically for executive/corporate operations. Approximately 39 were delivered in 1976 and 1977.

BO 105CB. This improved version of the C, also known as the Twin Jet in the United States, accommodated five people and incorporated two double-width doors on either side of the cabin for easy access. A 1.3-cubic-meter (45.9-cubic-foot) cargo area was accessible either through the rear-loading clamshell doors or directly from the cabin itself. With the rear seat removed and the installation of first aid equipment, the helicopter's cargo compartment could accommodate two stretcher patients.

BO 105CBS. Developed by MBB in response to a request from former U.S. marketing agent Boeing Vertol, this derivative made its first flight in 1975. Known as the Twin Jet II, the machine incorporated a 0.25-meter (10-inch) fuselage plug forward of the front structural cross tube, permitting accommodation of up to six passengers. Aimed at the corporate market segment, the CBS provided increased passenger leg room, additional space for cabin accessories, and an improved cabin environment. The Twin Jet II was certificated in early 1983 by the U.S. FAA for IFR operation with SFAR Pt 29-4, requiring two pilots, radar, Loran-C, and a separate battery, but not a stability augmentation system (SAS), which was available as an option.

BO 105CBS-5. In 1993, Eurocopter introduced a new BO 105CBS variant, then called the EC Super Five. It was later known as the BO 105CBS-5. FAA certification of the new model was received in late 1993. Improvements in the BO 105CBS-5 included new rotor blades, a modified hydraulic system, a scavenge oil filter system, a new engine starter, dual flight controls, retractable landing lights, and a windshield wiper. The new rotor blades provided an increase in rotor lift of 150 kilograms (330 pounds) in standard conditions. Other improvements included a three percent overall reduction in fuel consumption, lower overall vibration, improved stability, and better single-engine operation.

BO 105LS (Lift-Stretch). MBB announced this model in January 1979. First flight occurred in October 1981. Five preproduction helicopters were built in 1984, and German certification was attained in July of that year. Intended for external load operations at higher gross weights than the standard BO 105CBS, the BO 105LS featured an uprated ZF FS 112 transmission to accept the higher output of twin Rolls-Royce 250-C28C engines, each rated at 500 shp at takeoff. The main gearbox accepted 416 shp from each engine at takeoff power or 394 shp for maximum continuous operation. Single-engine restricted input was 493 shp for maximum continuous operation or 550 shp for 2.5 minutes at takeoff. Maximum takeoff weight was increased, as were climb rate, maximum operating altitude, and hover ceilings both in and out of ground effect. Range was, however, slightly less than for the CBS.

Super Lifter. Eurocopter developed a version of the BO 105LSA-3 called the Super Lifter. This version featured new main rotor blades that provided an increase in rotor lift of approximately 150 kilograms (330 pounds) in hover flight at constant power. These main rotor blades were the same type as those used on the BO 105CBS-5. The Super Lifter was also equipped with an improved tail rotor derived from the BK 117C1. The maximum mission weight of the Super Lifter with external load was 2,850 kilograms (6,283 pounds), with

an external load hook capability of approximately 1,300 kilograms (2,866 pounds). Empty weight of the model was about 1,300 kilograms (2,866 pounds). Useful load was more than 1,500 kilograms (3,307 pounds).

Military derivatives and upgrade programs were as follows:

BO 105M (VBH) Military Variant. In 1976, the West German Parliament approved plans to purchase 227 VBH liaison/light observation helicopters for the Heeresflieger (Army Air Corps), replacing Alouette IIs. However, only 100 units were subsequently ordered, and deliveries began in 1979. Under a $3.0 million contract, Apparatebau Gauting supplied Honeywell (Sperry Flight Systems) equipment for the VBH as well as the PAH-1 variant. In cooperation with MBB, SFIM of France developed a mast-mounted observation system for the VBH. The 100th unit was delivered in 1984.

BO 105P (PAH-1) Military Variant. At the same time that the VBH buy was approved, West Germany authorized procurement of 212 PAH-1 anti-tank helicopters. These aircraft were fitted with an SFIM stabilized target acquisition and tracking sight, and with outrigger wings that carry a total of six HOT missiles. The first series production aircraft was ready for delivery on schedule in September 1979, but systems integration led to considerable delay, and the first production PAH-1 was not handed over until December 1980. The 212th unit was delivered in 1984.

PAH-1 Upgrades. A total of 70 German Army PAH-1s later underwent extensive upgrading. The service's entire fleet of more than 200 PAH-1s was to be upgraded, but the program was reduced in late 1992 to cover only 70 helicopters.

The 70 upgraded PAH-1s had new main rotor blades and improved oil cooling and engine intakes. They then underwent integration of the Euromissile HOT 2 anti-tank missile, installation of a digital fire-control system, and retrofit of a new lightweight launching system and racks. The HOT 2 anti-tank missile replaced the helicopters' HOT 1 missiles.

The PAH-1 modernization program was originally planned as a two-phase effort. However, Phase 2 was subsequently canceled. This phase would have involved installation of night vision equipment and improved self-defense capability. The PAH-1 helicopters were also to receive self-defense measures, possibly including infrared flare and chaff dispensers and a laser warning receiver.

Tentative plans had also called for a total of 54 German Army PAH-1 helicopters to be converted to a BSH-1 fire support and escort configuration. However, this effort was canceled in 1992.

Program Review

Background. In 1962, the West German firm Bolkow (later merged into Messerschmitt-Bolkow-Blohm, or MBB) initiated design studies of a light utility helicopter under a West German government contract. Construction of three prototypes began in 1964, and all had flown by December 1967. Two of these were powered by Allison 250-C18 engines, while the third used MAN-Turbo 6022s. The second prototype pioneered the rigid non-articulated rotor system used on all later production BO 105s. Two preproduction aircraft followed the prototypes; these were completed in the spring of 1969. West German and U.S. certification with the 250-C20 engine were obtained in August 1971 and March 1972, respectively. The Federal Republic of Germany procured 100 VBH observation/liaison variants, plus 212 PAH-1 anti-tank versions. VBH deliveries began in 1979, and the initial PAH-1 delivery took place in December 1980.

In 1969, Boeing Vertol signed a licensing agreement providing for marketing and production of the BO 105 in North America. The U.S. company delivered 70 units prior to leaving the program. MBB subsequently set up its own marketing subsidiary to promote both the BO 105 and the MBB/Kawasaki BK 117 on the North American continent.

Licensed Programs. Licensed production/assembly of the BO 105 began in 1974 in the Philippines, where Philippine Aerospace Development Corp (PADC) assembled/fabricated 45 percent of the components and imported the rest from MBB. PADC completed 60 units. In Indonesia, Indonesian Aerospace (IAe) built approximately 131 machines. The Spanish Army operates approximately 69 BO 105s in observation and anti-tank roles, and Construcciones Aeronauticas SA (CASA) assembled 57 of these under license.

In mid-1985, Enaer announced that it would license-build the BO 105 in Chile. However, negotiations later collapsed and no assembly or production took place.

The South Korean Defense Ministry awarded a $110 million contract in 1997 to Daewoo Heavy Industries for 12 BO 105s. The first two helicopters were built by Eurocopter in Germany and were delivered in 1999. Korea Aerospace Industries (which absorbed Daewoo's Aerospace Division in 1999) assembled the remaining

10 helicopters, which were completed by the end of 2000.

Canadian Program. Eurocopter Canada (formerly MBB Helicopter Canada Ltd) began to manufacture the BO 105LS in late 1985. The BO 105LS was the first product to be built by MBB Helicopter Canada. Establishing the MBB subsidiary in Canada cost CAD72.6 million, of which MBB contributed slightly more than half. An additional CAD14 million was provided by the Ontario provincial government and nearly CAD21 million by the federal government in Ottawa.

In 1991, MBB transferred all design and certification responsibility for the BO 105LS to MBB Helicopter Canada as part of the company's restructuring and merger with Aerospatiale under the Eurocopter banner.

Timetable

Month	Year	Major Development
	1962	Design initiated
	1964	Prototype construction begun
Feb	1967	First flight of initial prototype
	1969	First flight of pre-series BO 105
Aug	1971	West German certification with 250-C20 engine obtained
Mar	1972	FAA certification with 250-C20 engine obtained
	1976	West German government approval for procurement of VBH/PAH-1 military variants
	1977	FAA single-pilot IFR certification
	1979	Initial VBH deliveries
Dec	1980	Initial PAH-1 deliveries
Jul	1985	BO 105LS certificated in West Germany
	1985	Canadian coproduction begun

Worldwide Distribution/Inventories

Military/Government Operators

Operator	Designation	QTY
Bahrain Air Force	BO 105	3
Bahrain Navy	BO 105CBS	2
Brunei Air Force	BO 105CB	6
Chile Air Force	BO 105	1
Chile Navy	BO 105C	6
Chile Police	BO 105C	5
Chile Police	BO 105LSA-3	2
Colombia Navy	BO 105CB	2
Germany Army	BO 105P	104
Germany Police	BO 105C	22
Indonesia Army	BO 105	17
Indonesia Navy	BO 105C	8
Indonesia Police	BO 105C	10
Jordan Police	BO 105	3
Korea, Republic of (South), Army	BO 105	12
Lesotho Police	BO 105	1
Mexico Navy	BO 105C	6
Mexico Navy	BO 105CB	6
Netherlands Police	BO 105	4
Peru Air Force	BO 105	5
Peru Police	BO 105LSA-3	3

Eurocopter BO 105

Operator	Designation	QTY
Philippines Navy	BO 105	5
South Africa Government	BO 105CBS	1
South Africa Police Service	BO 105	16
Spain Army	BO 105	69
Spain Police	BO 105CB	12
Spain Police	BO 105CBS	3
Sudan Air Force	BO 105	5
Sudan Police	BO 105	20
Sweden Military Helicopter Wing	BO 105CBS	20
Transport Canada	BO 105	15
Trinidad & Tobago Defence Force Air Wing	BO 105C	3
United Arab Emirates- Abu Dhabi Police Air Wing	BO 105	3
United States Government	BO 105	1

Forecast Rationale

Eurocopter no longer produces the BO 105. The light twin has been replaced in the company's product line by the more advanced EC 135. In its last few years, sales of the BO 105 had been hurt by stagnation in the civil utility market as well as strong market competition from newer models from AgustaWestland and Bell.

Meanwhile, licensed production of the NBO-105 version in Indonesia by Indonesian Aerospace (IAe) is over as well. IAe has three completed NBO-105s in stock. The Indonesian Army and the Indonesian Navy have each budgeted for the acquisition of one NBO-105, thus accounting for two of the helicopters in IAe's inventory. IAe president Nuril Fuad has proposed that the Army take the last remaining NBO-105 as well.

Ten-Year Outlook

Civil

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative			
Aircraft	**(Engine)**	**thru 05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**Total 06-15**
EUROCOPTER													
BO 105CB/CBS (CIVIL)	250-MTU-C20B	171	0	0	0	0	0	0	0	0	0	0	0
BO 105LS (CIVIL)	250-C28C	57	0	0	0	0	0	0	0	0	0	0	0
Subtotal - EUROCOPTER		228	0	0	0	0	0	0	0	0	0	0	0
MBB													
BO 105 (CIVIL)	250-C20B	337	0	0	0	0	0	0	0	0	0	0	0
Subtotal - MBB		337	0	0	0	0	0	0	0	0	0	0	0
CASA (Licensee)													
BO 105 (CIVIL)	250-C20B	19	0	0	0	0	0	0	0	0	0	0	0
Subtotal - CASA (Licensee)		19	0	0	0	0	0	0	0	0	0	0	0
INDONESIAN AEROSPACE (Licensee)													
NBO-105 (CIVIL)	250-C20B	94	0	0	0	0	0	0	0	0	0	0	0
Subtotal - INDONESIAN AEROSPACE (Licensee)		94	0	0	0	0	0	0	0	0	0	0	0
PADC (Licensee)													
BO 105 (CIVIL)	250-C20B	42	0	0	0	0	0	0	0	0	0	0	0
Subtotal - PADC (Licensee)		42	0	0	0	0	0	0	0	0	0	0	0
Total Production		720	0	0	0	0	0	0	0	0	0	0	0

Military

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative			
Aircraft	**(Engine)**	**thru 05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**Total 06-15**
EUROCOPTER													
BO 105CB/CBS (MIL.)	250-MTU-C20B	30	0	0	0	0	0	0	0	0	0	0	0
Subtotal - EUROCOPTER		30	0	0	0	0	0	0	0	0	0	0	0
MBB													
BO 105 (MIL.)	250-C20B	167	0	0	0	0	0	0	0	0	0	0	0
BO 105M VBH	250-MTU-C20B	100	0	0	0	0	0	0	0	0	0	0	0
BO 105P PAH-1	250-MTU-C20B	215	0	0	0	0	0	0	0	0	0	0	0
Subtotal - MBB		482	0	0	0	0	0	0	0	0	0	0	0
CASA (Licensee)													
BO 105 (MIL.)	250-C20B	106	0	0	0	0	0	0	0	0	0	0	0
Subtotal - CASA (Licensee)		106	0	0	0	0	0	0	0	0	0	0	0
INDONESIAN AEROSPACE (Licensee)													
NBO-105 (MIL.)	250-C20B	37	0	0	0	0	0	0	0	0	0	0	0
Subtotal - INDONESIAN AEROSPACE (Licensee)		37	0	0	0	0	0	0	0	0	0	0	0
KOREA AEROSPACE INDUSTRIES (Licensee)													
BO 105CBS-5 (MIL.)	250-MTU-C20B	10	0	0	0	0	0	0	0	0	0	0	0
Subtotal - KOREA AEROSPACE INDUSTRIES (Licensee)		10	0	0	0	0	0	0	0	0	0	0	0
PADC (Licensee)													
BO 105 (MIL.)	250-C20B	18	0	0	0	0	0	0	0	0	0	0	0
Subtotal - PADC (Licensee)		18	0	0	0	0	0	0	0	0	0	0	0
Total Production		683	0	0	0	0	0	0	0	0	0	0	0