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MTR GmbH MTR390

Outlook

- Program depends on a single application, the Airbus Helicopters Tiger attack helicopter
- Production of new Tigers was suspended in 2019, pending new orders

Orientation

Description. Modular, two-shaft, centrifugal-flow, free-turbine aviation turboshaft engine.

Sponsor. Received funding from Germany's Federal Agency for Procurement and Technology as part of Tiger helicopter development program.

Power Class. 1,250-1,450 shp (932-1,081 kW).

Status. Production suspended.

Total Produced. Through 2021, MTR produced an estimated 469 prototype and production engines.

Application. Medium-weight civil and military helicopters.

Price Range. Estimated at $1.49 million.

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MTR390

Source: MTR GmbH

Contractors

Prime

MTU Turbomeca Rolls-Royce GmbH (MTR)	http://www.mtr390.com, Am Söldnermoos 17, Hallbergmoos, Germany, Tel: + 49 811 600 90 10, Fax: + 49 811 600 90 20, Email: info@mtr390.com, Prime

Subcontractor

Collins Aerospace Systems, Engine Components	http://www.collinsaerospace.com, 811 Fourth St, PO Box 65100, West Des Moines, IA 50265-0100 United States, Tel: + 1 (515) 274-1561, Fax: + 1 (515) 271-7201 (Fuel Nozzle)
Safran Transmission Systems	http://www.safran-transmission-systems.com, 18, Blvd Louis-Seguin, Batiment K1, Colombes, France, Tel: + 33 1 41 30 50 10, Fax: + 33 1 41 30 54 12, Email: communication@hispano-suiza-sa.com (Electronic Fuel Computer (FADEC))
The Kahn Companies	http://www.kahn.com, 885 Wells Rd, Wethersfield, CT 06109 United States, Tel: + 1 (860) 529-8643, Fax: + 1 (860) 529-1895, Email: info@kahn.com (Dynamometer)

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

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Technical Data

Design Features. The MTR390 features a two-stage centrifugal compressor with wide chord blades, an annular reverse-flow ring combustor, a single-stage air-cooled gas generator turbine, a two-stage free power turbine, and an integrated reduction and accessory gearbox with an integral oil system. A Full Authority Digital Engine Control (FADEC) provides the engine and system monitoring functions.

Dimensions

	Metric Units	U.S. Units
Length	1,077 mm	42.4 in
Diameter	739 mm	29.1 in
Weight	179 kg	394 lb

Applications

Model Variant	Takeoff Power Rating	Application	Units per Airframe
MTR390-2C	1,285 shp (958 kW)	Airbus Helicopters Tiger	2
MTR390-E	1,464 shp (1,092 kW)	Airbus Helicopters Tiger HAD	2

Variants/Upgrades

MTM380. Original version. It had a four-stage axial compressor and a two-stage HP turbine, resulting in a pressure ratio of approximately 13:1, a maximum T-O rating of 1,035 shp (722 kW), and contingency power of 1,342 shp (1,000 kW). Two demonstrators produced.

MTM385-1. A simplified version of the MTM380, the MTM385-1 differs from the original engine in that it features a two-stage axial compressor plus a single-stage centrifugal radial compressor and a one-stage cooled high-power turbine (HPT). This engine variant develops 1,019 shp (760 kW) at T-O.

MTR390-2C. Current designation of the turboshaft engine for the standard Tiger application. Compared to earlier models, it is lighter, offers better fuel efficiency, and includes a two-stage centrifugal compressor, as opposed to the axial/centrifugal design. The engine reduction gear allows for an output speed of 8,000 rpm.

MTR390-Enhanced. The MTR390-E offers 14 percent more power than the standard engine. Launched in 2005, it was developed to power the Tiger HAD (Helicoptere d'Appui Destruction) variant. It was qualified in 2013 and entered service with the French Army in 2014.

Program Review

Background. The MTR GmbH MTR390 turboshaft engine began as the MTU-Turbomeca MTM380. The original design was initiated in 1978, and the first gas generator ran at MTU's Munich facilities in 1979. Although both firms were quite satisfied with the performance of the new engine, studies in 1980 indicated a need to simplify the design. Thus the 1,100-shp MTM385R was born. This engine made extensive use of components from Turbomeca's 900-shp TM333. (Turbomeca has since been rebranded as a division of Safran.)

After Rolls-Royce plc joined the other two partners, MTU and Turbomeca, in 1988, the engine designation was changed – to MTR390. Rolls-Royce has a 20 percent work share and a 33.3 percent financial share in the engine effort.

Partners in the consortium include:

- MTU Motoren- und Turbinen-Union GmbH
- Turbomeca Engine Division (now Safran)
- Rolls-Royce plc, Military Aero Engines Ltd

Each partner has a one-third financial share in the joint venture. The work share is as follows: MTU, 40 percent; Safran, 40 percent; and Rolls-Royce, 20 percent.

The MTR390 has benefited from research and development by German manufacturers and the German

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Ministry of Research and Technology. MTU's GNT-1 (Gasgenerator Neuer Technologie) 1,500-shp (1,118 kW) demonstrator was first run in 1984, and, as its first application, the basic engine design (MTM385) was chosen to power the Tiger.

MTR390 Engine Work Share Agreement. While each of the three firms has a share in the MTR company, the current design, development, and production work share of the engine is as follows:

Rolls-Royce. Rolls-Royce has been responsible for designing and building 20 percent of the engine's hardware, with that work including development of the engine's two-stage free-power turbine section. Design work reproduced the low-risk features developed for the low-pressure section of the Rolls-Royce Turbomeca RTM322 turboshaft.

MTU. MTU has developed the combustor and single-stage generator turbine. Some combustor work was performed by Rolls-Royce and Turbomeca as well.

Safran. Safran has worked on the dual centrifugal compressor, with help from Rolls-Royce.

Turbomeca Australasia. In August 2004, Turbomeca Australasia supplied the first two locally assembled MTR390 engines to Australian Aerospace (a subsidiary of Airbus SE) for installation in the first of 18 Australian-built Tiger armed reconnaissance helicopters (ARHs) already completed at that time. The engine modules were shipped from Turbomeca in France to Turbomeca Australasia for final assembly. Turbomeca Australasia also fitted the engines' pipe work and electrical control units, and conducted the engine testing.

Applications

Airbus Helicopters Tiger. The French-German Airbus Helicopters (formerly Eurocopter) Tiger is an advanced technology, twin-engine, anti-tank/close air support helicopter sponsored by the French and German ministries of defense. The helicopter series has a maximum operational weight (with external load) of 14,553 pounds (6,600 kg) and a maximum cruise speed of 146 knots (271 kmph).

The Tiger program was launched in 1984. The final program approval was granted and formal go-ahead announced in 1987. Engine qualification/certification was completed in 1993.

First flight of the initial production Tiger occurred in August 2002. The initial production HAP, called HAP S01, made its first flight in March 2003.

In March 2004, the HAP version of the Tiger received military type certification from the French armament agency Delegation Generale pour l'Armement (DGA). Later that month, the European military procurement agency, Organisation Conjointe de Cooperation en matiere d'Armement (OCCAR), granted qualification for the HAP. Type certification and qualification were required prior to the start of HAP deliveries to the French Army.

A second model, the Helicoptere d'Appui Destruction (HAD), is a more powerful multirole version of the Tiger. It has the roof-mounted sight and 30mm cannon of the HAP, but is powered by an uprated version of the MTR390 engine, called the MTR390-Enhanced, or MTR390-E. The MTR390-E is approximately 14 percent more powerful than the original MTR390-2C version.

In August 2004, the UHT version was granted type certification by the German armament agency, Bundesamt für Wehrtechnik und Beschaffung (BWB), and qualification by OCCAR, enabling UHT deliveries to the German Army to begin.

Forecast Rationale

MTR developed the MTR390 for the Airbus Helicopters Tiger attack helicopter. As with all single-application engine programs, its production is tied to continued airframe production.

Airbus has suspended production of the Tiger due to a lack of orders. Airbus' Tiger production facility will work on upgrades to the existing fleet as the manufacturer searches for new customers.

The Tiger competes against other established attack helicopters from Bell, Boeing, and Russian Helicopters. It is a candidate to fill helicopter requirements in a number of countries, so a new order is possible, even if it remains a longshot (no new orders for the Tiger have been secured since 2003).

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