

ARCHIVED REPORT

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Engine Alliance GP7000

Outlook

- The GP7000 is one of two engine options for the Airbus A380 superjumbo airliner
- Airbus announced in February 2019 that Emirates' decision to cancel most of its remaining orders for the A380 will lead to an A380 production shutdown in 2021
- All A380s remaining in Airbus' backlog are to be powered by competing Rolls-Royce Trent engines.

Orientation

Description. High-bypass-ratio turbofan engine.

Sponsor. The GP7000 was developed jointly by a GE Aviation-Pratt & Whitney alliance.

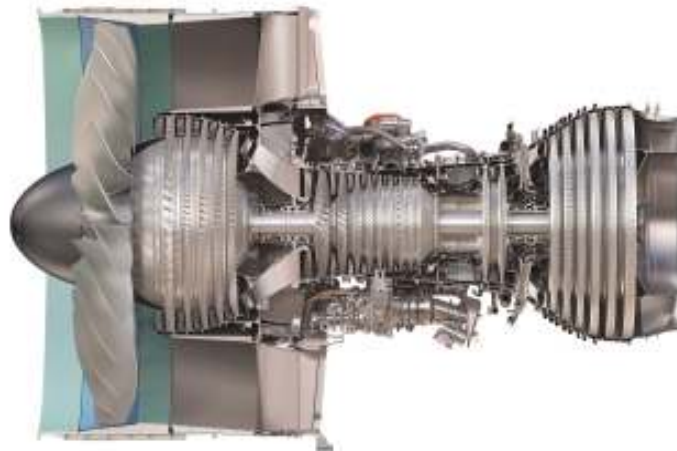
Power Class. 70,000-81,500 lbst (311-363 kN).

Status. In production.

Total Produced. An estimated 573 engines had been produced as of December 2019, excluding testing and development engines.

Application. Heavy commercial transport aircraft.

Price Range. Estimated at \$18.5 million for the GP7200.



Engine Alliance LLC GP7000

Source: Engine Alliance

Engine Alliance GP7000**Contractors****Prime**

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|----------------------------|---|
| Engine Alliance LLC | http://www.enginealliance.com , 400 Main St, M/S 181-48, East Hartford, CT 06108 United States, Email: engalliance@pw.utc.com , Prime |
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Subcontractor

| | |
|---|---|
| Arconic Inc | http://www.arconic.com , 201 Isabella St, Pittsburgh, PA 15212 United States, Tel: + 1 (412) 553-4545, Fax: + 1 (412) 553-4498 (Titanium Disc Forgings) |
| ELDEC France | http://www.craneae.com/AboutUs/ELDEC.aspx , 18 Rue du 35eme Regiment d'Aviation, Activillage Hall 30, Bron, France, Tel: + 33 78 261010, Fax: + 33 72 377230 (Proximity Switch) |
| GE Aviation | http://www.geaviation.com , 1 Neumann Way, Cincinnati, OH 45215-6301 United States, Tel: + 1 (513) 243-2000 (Single Annular Combustor; High-Pressure Turbine; FADEC) |
| MTU Aero Engines GmbH | http://www.mtu.de , Dachauer Strasse 665, Munich, Germany, Tel: + 49 89 1489 0, Fax: + 49 89 1489 5500, Email: info@mtu.de (Low-Pressure Turbine/Turbine Center Frame) |
| Parker Aerospace, Stratoflex Products Division | http://www.parker.com , 700 Fourth St, Mansfield, TX 76063 United States, Tel: + 1 (817) 738-6543, Email: spdmktg@parker.com (Hose) |
| Pratt & Whitney | http://www.pratt-whitney.com , 400 Main St, East Hartford, CT 06108 United States, Tel: + 1 (860) 565-4321, Email: info@pw.utc.com (Fan Module; Gearbox) |
| Safran Aero Boosters | http://www.safran-aero-boosters.com , Route de Liers 121, Herstal (Milmort), Belgium, Tel: + 32 4 278 81 11, Fax: + 32 4 278 52 07, Email: info@techspace-aero.be (Low Pressure Compressor) |
| Safran Aircraft Engines | http://www.safran-aircraft-engines.com , Route Henri Auguste Desbruères, BP 81, Evry, France, Tel: + 33 1 69 879 92 60, Fax: + 33 1 69 87 89 28 (High-Pressure Compressor) |

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

Technical Data

Design Features. The design of the GP7200 borrows heavily from the GE90 and PW4000 engines. The fan module features 24 116-inch wide-chord hollow fan blades. A five-stage, low-pressure compressor is based on the unit in the PW4090. The nine-stage HP section was scaled from the GE90-115B. The single-stage

annular combustor was scaled from the CF6-80C. The two-stage HP turbine came from the GE90-115B. The six-stage LP turbine section was derived from the PW4168. The GP7200 is equipped with a Full Authority Digital Engine Control (FADEC) system.

Engine Alliance GP7000**Specifications
(GP7270)**

| | <u>Metric Units</u> | <u>U.S. Units</u> |
|--------------------------------|---------------------|-------------------|
| General | | |
| Length, overall | 475 cm | 187 in |
| Diameter, max | 316 cm | 124 in |
| Weight | 6,078 kg | 13,400 lb |
| Fan diameter | 296 cm | 116 in |
| Noise (under Stage 4) | 17.6 dB | 17.6 dB |
| Power | | |
| Takeoff thrust (a) | 311 kN | 70,000 lbst |
| Pressure ratio | 36+ | 36+ |
| Bypass pressure ratio (cruise) | 8.8 | 8.8 |

(a) (SLS, ISA) flat rated to 86°F/30°C.

Variants/Upgrades

GP7270/E. Base variant.

GP7272/E. Higher thrust version of GP7200. Takeoff thrust increased to 72,000 lbst (320.3 kN). The E-rated version allows operation with the same thrust at higher

ambient temperature environments. Certificated in July 2014.

GP7277. Higher thrust variant once planned for use on the now-shelved A380F freighter model.

Program Review

Background. When Boeing decided to launch a new-derivative 747 rather than an all-new-design aircraft, it approached the big three engine makers with requirements for an aircraft that would provide a 10 percent reduction in operating costs from the 747-400 design. This requirement, of course, had a lot to do with engine performance. At first, derivatives of current engines were considered for the aircraft, which early on was determined to require four engines of about 75,000 lbst.

Pratt & Whitney, Rolls-Royce, and General Electric were far from recouping the costs of the engines they had developed for the Boeing 777 and Airbus A330 programs, and did not want to incur additional debt to develop an all-new engine. GE and Pratt & Whitney formed the joint Engine Alliance, indicating that this new entity would develop an engine for two new growth 747 variants.

The GE-P&W Engine Alliance formally unveiled details of the then-GP7176 at the 1996 Farnborough Air Show as it signed a Memorandum of Understanding with Boeing. The MoU identified specific engine characteristics and requirements for the 747-500X/600X and established a development schedule to deliver a completely service-ready airplane/engine combination by the year 2000. The Alliance also made it clear that the GP7000 would be made available to power any other aircraft requiring an engine of its power class.

Boeing later dropped the 747-500/600 development project, and Engine Alliance focused instead on developing an engine for the Airbus A380.

Engine Alliance is owned equally by Pratt & Whitney and General Electric. GE and P&W share all associated development costs and revenues on an equal basis.

Engine design and development work is handled by dedicated teams under co-general managers (one from GE, the other from P&W) at their respective parent companies. The Alliance has its own marketing staff, with the GP7000 engine being sold separately from other GE and Pratt programs.

Final assembly of the Alliance's GP7000 engines occurs at Pratt's Middletown (Connecticut) facility; core assembly takes place at GE's facility in Durham, North Carolina.

While GE and Pratt are equal partners in the alliance, they have reduced their exposure by bringing in other firms as revenue-sharing partners. MTU of Germany holds about 22.5 percent of the program – 10 percent through GE and 12 percent through Pratt. Safran has a 10 percent share of the project (through GE).

GP7000 Applications. The only aircraft program to select the GP7000 engine to date is the Airbus A380. The A380, which has a typical seating arrangement of 525 passengers in a typical three-class layout, is

Engine Alliance GP7000

equipped with four GP7270 engines or four Trent 900 engines. Airbus launched a dedicated freighter, the A380F, powered by the GP7277, but it abandoned

development of the aircraft in the wake of order cancellations from UPS and Federal Express.

Timetable

| <u>Month</u> | <u>Year</u> | <u>Major Development</u> |
|--------------|-------------|--|
| May | 1995 | GE-P&W Engine Alliance formed to develop 747-X engine |
| Sep | 1996 | Details of GP7176 revealed |
| May | 1998 | Alliance signs MoU with Airbus to develop engine for A3XX |
| Mar | 2000 | First core tested |
| Apr | 2003 | Scale model of fan, other components (compressor, five-stage turbine) tested |
| Dec | 2003 | Snecma delivers high-pressure compressor to GE for integrated ground testing |
| Mar | 2004 | Full engine testing of GP7200 |
| Dec | 2004 | GP7200 first flight on 747 testbed |
| Sep | 2005 | First engines delivered to Airbus |
| Dec | 2005 | GP7200 receives FAA certification |
| Aug | 2006 | First flight of GP7200-powered A380 |
| Apr | 2007 | EASA certification of GP7200 |
| Dec | 2007 | Joint EASA/FAA certification of GP7200-powered A380 |
| Aug | 2008 | Service entry on Emirates Airline A380 |
| Nov | 2009 | Service entry on Air France A380 |
| Jan | 2010 | GP7200 fleet reaches 100,000-flight-hour mark |
| Dec | 2010 | 100th GP7200 delivered to Airbus |
| Nov | 2013 | GP7200 fleet reaches 2-million-flight-hour mark |
| | 2018 | Airbus delivers last GP7200-powered A380 remaining in backlog |

Forecast Rationale

By the end of 2018, Airbus no longer had any orders for an A380 powered by the GP7200 in its backlog. All A380s currently scheduled for future delivery feature the Trent 900.

In February 2019, Airbus announced that Emirates was canceling most of its remaining orders for the A380 and would take only 14 more aircraft. The decision sounded the death knell for the program, which has long suffered

from a lack of orders. Production of the A380 will end in 2021.

We assume that production of complete GP7200 engines for the A380 program wrapped up in 2018 and that the Engine Alliance joint venture will now focus on maintenance and support for the in-service fleet of engines.

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