

# ARCHIVED REPORT

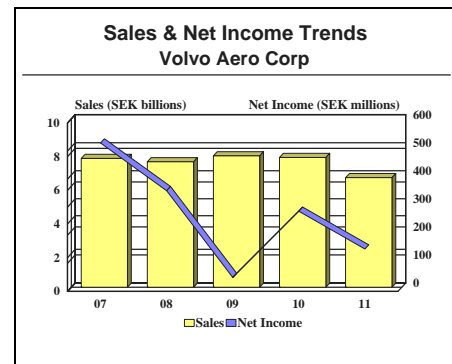
For data and forecasts on current programs please visit

[www.forecastinternational.com](http://www.forecastinternational.com) or call +1 203.426.0800

## Volvo Aero Corporation

### Outlook

- Volvo Aero has been acquired by GKN plc for approximately \$1 billion
- Company now operates as GKN Aerospace Engine Systems
- This report will be archived and its contents merged with the GKN report



### Headquarters

Volvo Aero Corporation  
461 81 Trollhättan, Sweden  
Telephone: + 46 520 94000  
Fax: + 46 8 555 05678

A subsidiary of AB Volvo, Volvo Aero Corporation was founded in the 1930s to supply aircraft engines to the Swedish Air Force. In the 1950s, the company leveraged partnerships with engine manufacturers to gain production expertise on the licensed manufacture of engines such as the Rolls-Royce Avon (the Swedish versions of which were called the RM5 and RM6) and the Pratt & Whitney JT8D (RM8). During this period, Volvo took full control of the firm and renamed it Volvo Flygmotor AB.

Building upon the skills gained in the production of military aircraft engines, the company turned its eyes

toward commercial aerospace markets in the 1970s. Beginning with overhaul services for the JT8 engine, the company expanded into subcomponent production for the major engine manufacturers, including GE, Pratt & Whitney, and Rolls-Royce. With its commercial operations growing, the company joined the European Space Program and began production of components for the engines used on Ariane launch vehicles.

With its activities now much broader and international in scope, the company changed its name in the early 1990s to the much easier to recognize Volvo Aero Corporation.

In October 2012, GKN plc completed its acquisition of Volvo Aero. The business is now called GKN Aerospace Engine Systems. The unit employs approximately 2,990 personnel.

### Structure and Personnel

Staffan Zackrisson  
President & CEO, Volvo Aero  
Joakim Andersson  
President, Volvo Aero Connecticut

Odd Tore Kurverud  
President, Volvo Aero Norge  
Torgny Stenholm  
President, Applied Composites AB (ACAB)

### Product Area

Volvo Aero Corporation is focused on the production of engines for Sweden's Gripen fighter, aircraft engine components for both civil and military applications, and

space propulsion subsystems. In addition, the company provides engine maintenance, repair and overhaul (MRO) services, leasing services, and parts distribution

## Volvo Aero Corporation

services around the world. The company manages its operations as follows:

1. Aircraft Engines
2. Engine Components
3. Space Propulsion Subsystems

**Aircraft Engines.** Volvo Aero has supplied engines for Swedish fighter aircraft since the early 1930s. The company license-produces variants from major manufacturers to fulfill its needs – for example, General Electric (RM12 engine on the Gripen aircraft), Pratt & Whitney (RM8 engine on the Viggen aircraft), and Rolls-Royce (RM6 engine on the Draken aircraft). The

company also provides MRO services for aircraft engines and industrial and marine gas turbines.

**Engine Components.** This operation produces fan cases, fan-compressor structures, compressor rotors, shafts, combustor structure, vanes, low-pressure turbine (LPT) cases, and turbine structures for commercial and military aircraft engines and aeroderivative gas turbines.

**Space Propulsion Subsystems.** Produces rocket nozzles, combustion chambers, rocket engine turbines, and green propulsion systems for space systems such as the Ariane.

## Facilities

Volvo Aero Corporation, 461 81 Trollhättan, Sweden. Telephone: + 46 520 94000. This was the headquarters for the company. *Acquired by GKN in 2012.*

Volvo Aero Norge AS, PO Box 1004, 3601 Kongsberg Norway. Telephone: + 47 32 728 400. Jointly owned by Volvo Aero Corp and Pratt & Whitney, Volvo Aero Norge manufactures shafts, vanes, LPT cases, fan and compressor structures, and turbine structures for jet engines. *Acquired by GKN in 2012.*

GKN Aerospace Applied Composites AB, Box 13070, S-580 13 Linköping, Sweden. Telephone: + 46 13 20 97 00. Develops and produces advanced composite products. *Acquired by GKN in 2012.*

Web site: <http://www.acab.se>

Volvo Aero Connecticut, 179 Louis St, Newington, CT 06111, USA. Telephone: + 1 (860) 667-8502. Formerly called Aero-Craft, this facility provides machining of large components such as fan cases for aircraft engines and gas turbines. *Acquired by GKN in 2012.*

Volvo Aero Services (Seattle) LLC, 18516 80th Ave S, Kent, Washington 98032, USA. Telephone: + 1 (425) 251-4660. To provide customers with better access to surplus spares, in 1999 Boeing granted Volvo Aero Services exclusive rights to market and sell Boeing commercial aircraft surplus inventory. *Sold to HIG Capital in 2010.*

Web site: <http://www.vas.aero>

## Corporate Overview

Founded as a manufacturer of aircraft engines for the Swedish Air Force, Volvo Aero has grown into a worldwide supplier of military and commercial engine parts such as fan cases, shafts, compressor rotors, and turbine cases. In addition, the firm makes rocket turbines and motor components, including combustion chambers and valves. Complementing its component production operations, the company offers engine maintenance, leasing, and parts distribution services.

### New Products and Services

**RM12 PBL.** In November 2010, Volvo Aero signed an agreement to provide maintenance, spare parts, and product support to Gripen military aircraft engines for five years in Sweden, Hungary, and the Czech Republic. According to the company, the agreement is unique for its type as Volvo Aero guarantees constant availability. The RM12 Performance-Based Logistics (PBL) agreement is expected to be worth approximately

SEK1.2 billion over a five-year period (two years with an option for three years).

**Vulcain 2 Nozzle.** In June 2009, Volvo Aero designed a new nozzle for the Ariane rocket's Vulcain 2 engine in its patented "sandwich" technology. The new sandwich nozzle will be significantly less expensive to manufacture and, at the same time, more robust, and will deliver higher performance, allowing the Ariane 5's payload to increase by 100 kilograms.

**Clean Sky.** In January 2009, Volvo Aero announced it would be participating in the European Union's Clean Sky program. The project is part of the EU's research efforts to develop aircraft engines that utilize less fuel and thereby generate fewer emissions than existing engines. The primary objective of Clean Sky is to develop and test new engine and component technologies so they are sufficiently "mature" to be tested in commercial aircraft engines. Volvo Aero will participate in subprojects regarding propfan engines that

## Volvo Aero Corporation

could reduce fuel consumption by 15 to 20 percent. Volvo Aero will invest nearly SEK100 million in Clean Sky. The EU will contribute an equal amount. The project is also receiving national Swedish funding from Vinnova through the National Swedish Aeronautics Demonstrator program (FLUD). Clean Sky is expected to be completed in 2014.

### Plant Expansion/Organization Update

**Layoffs.** In January 2009, Volvo Aero announced the impending layoffs of 250 blue collar and 100 white collar employees. In June a further cut of 200 positions was announced. The company cited a forecast decline in business as the reason behind the job cuts.

**Aero-Craft Changes Name.** In September 2007, Volvo Aero's wholly owned subsidiary Aero-Craft (Newington, Connecticut, USA) changed its name to Volvo Aero Connecticut. The name change occurred in conjunction with the inauguration of a major expansion of the production facilities in Newington. Aero-Craft produces components for commercial and military aircraft engines, including fan cases, the largest components that house the front section of the aircraft engine. Volvo Aero Connecticut has some 60 employees. The expansion provides the conditions for continued growth, and in the future the number of employees will increase to about 90. Volvo Aero acquired the company in December 2004.

**Production Investments.** In March 2007, a new multi-task cell was inaugurated at Volvo Aero in Trollhättan, Sweden. The cell is part of a major investment in production at Volvo Aero totaling about SEK1.5 billion. The multi-task cell comprises five identical machines linked in a Flexible Manufacturing System that handles all material, tools, and information management. The cell is the first step in a five-year process to expand and advance Volvo Aero's manufacturing structure.

**Bromma Facility Closed.** In November 2006, Volvo Aero announced that it would close down its Volvo Aero Engine Services in Bromma, Sweden, due to lack of work. According to the company, the volume of JT8D and JT9D engines overhauled in Bromma had declined sharply. These are older generation engines with high fuel consumption that the airlines are trying to successively phase out. The shutdown of the VAES business did not affect the MRO business at Volvo Aero Corporation in Trollhättan, where MRO services are provided for the JT8D-Basic, PW100, TFE731, and LM1600 commercial engines, and the DR990 gas turbine. Work at Bromma was phased out over the course of 2007.

### Mergers/Acquisitions/Divestitures

**GKN Acquires Volvo Aero.** In October 2012, GKN completed the acquisition of Volvo Aero, the aero-engine division of AB Volvo. The deal was valued at \$1 billion. According to GKN, the combination of GKN Aerospace and Volvo Aero creates a world leader in both aerostructures and aero-engine components. The new business is to be called GKN Aerospace Engine Systems and combines GKN Aerospace's composite leadership with Volvo Aero's strong metallic technology to provide a unique offering to customers who are focused on lightweight, high-performance engine solutions.

**Volvo Aero Up for Sale.** In November 2011, AB Volvo began divesting Volvo Aero so the parent company could focus on its core business of heavy commercial vehicles. According to Volvo CEO Olof Persson, "We are currently conducting talks with a number of potential buyers, but these are still at an early stage and no definite decisions have been made."

**Aero Norge Now Wholly Owned.** In March 2011, Volvo Aero bought Pratt & Whitney's 22 percent stake in Volvo Aero Norge, becoming the sole owner of the company. Volvo Aero Norge manufactures components for commercial and military aero engines. Based in Kongsberg, Norway, the company has about 520 employees. Terms were not announced.

**U.S. Aero Services Unit Sold.** In October 2010, Volvo Aero completed the sale of its U.S. subsidiary Volvo Aero Services to an affiliate of the global private investment firm H.I.G. Capital. The new name of the company is VAS Aero Services; Claes Malmros remained as president of the company. Volvo Aero Services was sold in keeping with the company's strategy to focus on Volvo Aero's core business of developing and manufacturing aero-engine components. The maintenance of engine and gas turbine operations based in Trollhättan was not part of the transaction. Terms were not disclosed.

**Applied Composites Acquired.** In December 2007, Volvo Aero acquired the composite company Applied Composites AB in Linköping, Sweden. The aim of the acquisition is to use ACAB and its technology to develop and manufacture aircraft engine components in composite materials, which are significantly lighter than the comparable parts in metal, according to the company. ACAB employs 70 people and had estimated sales of SEK110 million in 2007. Terms of the deal were not disclosed.

### Teaming/Competition/Joint Ventures

**Korean Air.** In October 2011, Volvo Aero subsidiary Applied Composites AB and Korean Air signed an agreement to work together on radomes, wing

## Volvo Aero Corporation

structures, and other components in composite material. The cooperation agreement also covers a number of other components made from composites, such as radar absorbing structures.

**Lufthansa Technik.** In June 2010, Lufthansa Technik AG and Volvo Aero signed a cooperation agreement for engine parts repair. The two companies will jointly develop new methods for repairing structural parts of large commercial aircraft engines within the capability of Lufthansa Technik. Additionally, the partners will cooperate in certification processes and marketing & sales activities.

**Pratt & Whitney.** In November 2008, Pratt & Whitney and Volvo Aero Norge signed an agreement to manufacture diffuser case components for the F135 engine powering the F-35 Joint Strike Fighter. This agreement, combined with previous agreements signed with the company, has a potential value of more than \$700 million in production over the life of the program. The diffuser case regulates the speed of airflow in the engine, allowing the combustor to work effectively.

In June 2011, Volvo Aero signed an agreement with Pratt & Whitney expanding its participation in P&W's PurePower PW1100G engine. Volvo Aero will develop and manufacture two important components for the new PW1100G engine designed for the A320neo family, an updated version of the Airbus A320. Under this latest agreement, Volvo Aero will be responsible for design and manufacture of the turbine exhaust case and intermediate case.

Earlier, in 2008, Volvo Aero entered into an agreement with Pratt & Whitney to join P&W's geared turbofan engine program. Under this arrangement, Volvo Aero will be responsible for three major components of engines for both the Mitsubishi Regional Jet and the Bombardier CSeries aircraft. For Volvo Aero, the agreement is expected to result in sales of SEK50 billion over 40 years, its largest involvement ever in a

commercial engine program. This builds on a 2006 agreement between the two contractors to demonstrate new technology for the geared turbofan engine. Since then, Volvo Aero has worked to develop advanced lightweight technologies for the geared turbofan engine concept. According to the agreement, Volvo Aero will participate as a partner in design, development, production, and aftermarket support, with overall responsibility for the intermediate case and turbine exhaust case as well as production of the LPT shaft.

**Rolls-Royce.** In July 2008, Volvo Aero and Rolls-Royce entered into a risk-and-revenue-sharing agreement for the Trent XWB engine for the Airbus A350 XWB aircraft, under which Volvo Aero will develop and manufacture the intermediate compressor case, a key engine component. Volvo Aero estimates the value of the contract to be SEK40 billion over 40 years.

**Snecma.** In June 2009, Snecma and Volvo Aero agreed on the basic principles of a five-year partnership between the two companies in the field of space propulsion. The agreement involves series production of 37 nozzles and the same number of turbines, which will be manufactured by Volvo Aero in Trollhättan through mid-2014.

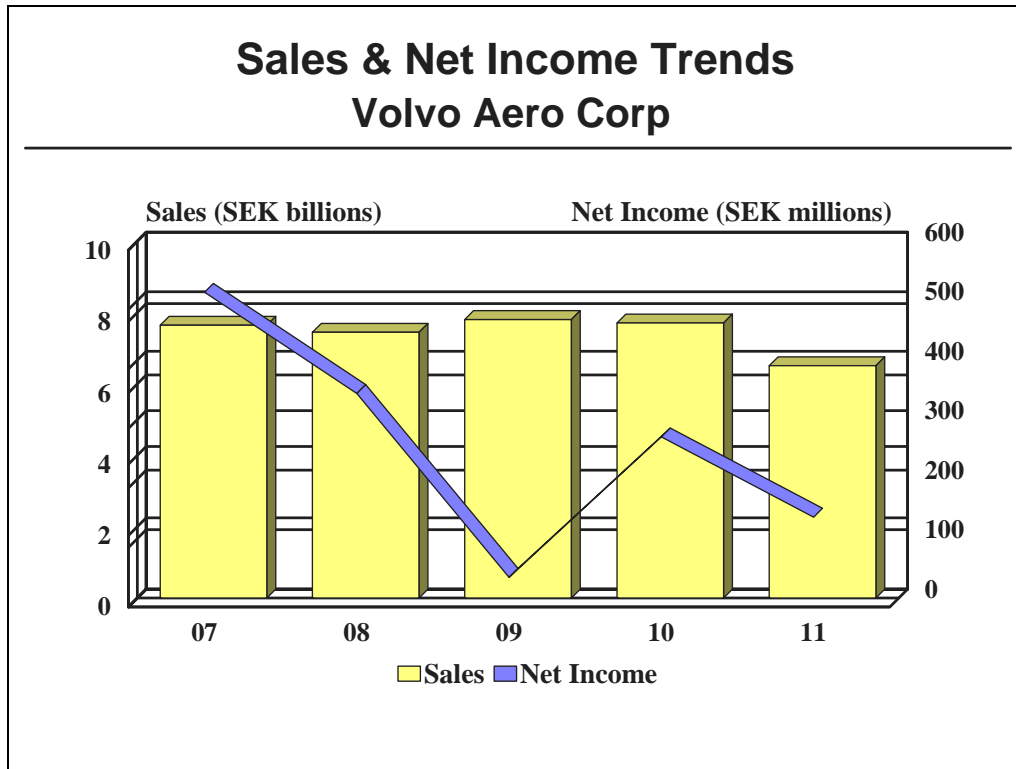
In June 2005, Volvo Aero and Snecma signed a partnership agreement for development of the TPX turbopump. Volvo Aero will be responsible for development of the turbine, and Snecma, the turbopump integrator, will handle development and testing of the pump. TPX is a continuation of the successful TP2 program and will make it possible to evaluate and demonstrate the new blisk technology in full scale. *Blisk* is an acronym for blade integrated disk, meaning the turbine rotor is manufactured as a single piece, instead of mounting individual blades on the disk. This design results in reduced costs, shorter lead times, and enhanced reliability.

## Financial Results/Corporate Statistics

For 2011, Volvo Aero reported net sales of SEK6.5 billion, down 15 percent from the SEK7.7 billion reported in 2010. Operating income for the year fell to SEK151 million, compared to SEK286 million in 2010. The 2011 drop in income was attributed to a decline in sales in the aftermarket business. Latest year statistics, restated to the company's current presentation, are provided below. U.S. dollar figures, in millions, translated as of December 31, 2011, at the rate of USD1 = SEK6.89585.

Y/E December 31 (SEK millions)	2007	2008	2009	2010	2011	2011 USD
Net Sales	7,646	7,625	7,803	7,708	6,509	944
Operating Income	529	359	50	286	151	22

Volvo Aero Corporation



### Strategic Outlook

With the current economy being what it is, Volvo's late 2011 announcement of its plans to sell Volvo Aero comes as no surprise. Volvo's primary focus has always been commercial vehicles and, with a nascent upswing emerging in aerospace markets, the company felt it would be a good time to sell.

Volvo Aero is not a major manufacturer of whole systems; it has instead focused on supplying subcomponents to engine and airframe producers. As such, the company is considered a major provider, with components on about 80 percent of large commercial aircraft.

The company achieved this presence through close cooperation with industrial partners. This effort was fully realized in early 2006 when Volvo Aero increased its participation with General Electric on the new GENx aircraft engine. Volvo Aero is now responsible for the design and manufacture of, and product support for, five components – the low-pressure booster spool, the fan hub frame, the turbine rear frame, the fan module, and components in the high-pressure turbine.

The result is that the GENx will be the largest single program in the history of Volvo Aero. All told, the GENx program alone will, over its lifetime, generate sales of more than \$4 billion for Volvo Aero.

The selection of the JSF to fulfill Norway's fighter requirement was welcome news for Volvo Aero. The company produces components for the F135 engine used on the fighter and recently signed a new contract with Pratt & Whitney for production of the engine diffuser case.

GKN Aerospace came away with the prize in late 2012 when it completed its purchase of the firm. Other suitors likely included Germany's MTU Aero Engines, France's Snecma, and possibly Italy's Avio. The three main aero-engine manufacturers – General Electric, Rolls-Royce, and Pratt & Whitney – did not bid, seeing Volvo Aero as more of a small manufacturer to partner with rather than acquire outright.

Volvo Aero now operates the Engine Systems arm of GKN Aerospace.

### Prime Award Summary

Information unavailable.

## Volvo Aero Corporation

## Program Activity

**Business Interests.** A representative listing of key aerospace and defense programs currently underway at Volvo Aero is presented below. For in-depth information on or analysis of specific aerospace and defense programs or equipment, please refer to the applicable Forecast International binder (for example, *Civil Aircraft, Military Aircraft, Military Vehicles, Warships, Missiles, Electronic Systems, and Aviation Gas Turbines*). The following are the company's business interests:

- Aircraft Engines
- Engine Components
- Space Propulsion Subsystems

### Aircraft Programs

---

#### Saab JAS 39

The Gripen is a single-engine, all-weather, multirole combat aircraft. Volvo Aero produces the aircraft's RM12 engine.

### Aviation Gas Turbine Programs

---

#### CFM International CFM56

The CFM56 is a two-spool, axial-flow, high-bypass-ratio, subsonic aviation turbofan engine designed for commercial and military transport aircraft. Volvo Aero produces low-pressure turbine cases and shafts for this engine.

#### Engine Alliance GP7000

This is an advanced high-bypass-ratio turbofan engine in the 68,000- to 81,500-lb (302.4- to 362.5-kN) range. Applications are very large commercial aircraft, such as the Airbus A380. Volvo Aero has signed a contract with General Electric/Pratt & Whitney Engine Alliance-participant MTU Aero Engines to provide LPT cases.

#### General Electric CF6-80C2/E1

This is a two-spool, axial-flow, high-bypass-ratio turbofan engine designed for commercial and military transport aircraft. Volvo Aero produces the engine's forward compressor housing.

#### General Electric F110/F118

The F110 and F118 are two-shaft, axial-flow, augmented, military turbofan engines designed for medium and heavy fighter/attack aircraft. Volvo Aero provides the LPT case.

#### General Electric F404/F414

The F404 is an advanced-technology, two-shaft, axial-flow, augmented and non-augmented military turbofan

engine in the 16,000- to 17,700-lb class. The F414 is in the 22,000-lb class. The engines are used on high-performance single- and twin-engine fighter/attack aircraft. Volvo Aero and GE agreed in 2000 to allow Volvo to become a component supplier for the F414. The agreement covers Volvo's production of structural and rotating parts in the engine's fan and compressor sections. The Volvo RM12 engine is a derivative of the F404.

#### General Electric GE90

The GE90 is a high-bypass-ratio turbofan engine designed for very large commercial and military transport aircraft. In 2001, Volvo Aero bought a 1 percent risk share of the GE90-115 program from Snecma. Volvo is producing some high-pressure compressor blades and outsourcing a few other, smaller parts jobs. In 2005, Volvo Aero signed a long-term agreement with GE to produce LPT cases and fan hub frames at its Trollhättan plant, as well as turbine rear frames in Kongsberg.

#### General Electric GENx

The GENx is a two-spool, high-bypass-ratio, advanced-technology turbofan engine designed for large commercial aircraft. Manufacturing partners include Avio Group (12 percent) – engine accessory gearboxes and LPT casing and components; Techspace Aero (3 percent) – LP compressor (booster) stators; Volvo Aero (6 percent) – fan hub frame, turbine rear frame, booster spool; Mitsubishi Heavy Industries/IHI (15 percent) – LPT rotating components and module assembly, compressor airfoils, mid-fan shaft, and combustor casing; FADEC International – engine controls; and Parker Hannifin – hydraulic components, engine fuel nozzles, liquid cooling pumps/reservoirs.

In January 2006, Volvo Aero agreed to increase its participation in GE's new engine, the GENx. Volvo Aero has been a risk- and revenue-sharing participant in the GENx engine since 2004. Under the previous agreement, Volvo Aero took responsibility for the design and manufacture of, and product support for, three components – the low-pressure booster spool, the fan hub frame, and the turbine rear frame. Under the new agreement, Volvo Aero will increase its participation with responsibility for additional components in the fan module and high-pressure turbine. The agreement is expected to generate SEK6 billion (\$818 million) in sales over the life of the GENx engine program, with a total investment by Volvo Aero of more than SEK230 million (\$31 million). In total, Volvo Aero will manufacture five different components in the GENx engine, which will generate

## Volvo Aero Corporation

sales of more than SEK30 billion (\$4 billion) for Volvo Aero.

### Honeywell TFE731

The TFE731 is a two-shaft, axial-centrifugal-flow geared aviation turbofan engine. In 1980, Volvo Aero signed an agreement with Garrett (now Honeywell) regarding development of the TFE731-5; it took a 5.6 percent share of the TFE731-5 program. It contributes a stationary compressor, combustion chamber, and turbine parts.

### Honeywell TPE331

The TPE331 is a single-shaft, centrifugal-flow turboprop engine series designed for twin-engine business, short-range regional, and utility aircraft. In January 1980, Garrett (now Honeywell) and Volvo Aero signed an agreement to collaborate on development and production of the TPE331-14 (as well as the TFE731-5). In the TPE331 program, Volvo Aero took a 15 percent share, producing such components as the compressor structures and combustor modules.

### International Aero Engines V2500

The V2500 is a two-spool, axial-flow, advanced-technology, high-bypass-ratio turbofan engine designed for large commercial and transport aircraft. Volvo Aero produces engine cases for the V2500.

### Pratt & Whitney F135

The F135 is a twin-spool, low-bypass-ratio, augmented military turbofan engine designed for Lockheed Martin's F-35 Joint Strike Fighter. Volvo Aero produces the intermediate case as well as the low-pressure shaft for Pratt & Whitney's F135.

### Pratt & Whitney PW2000

The PW2000 is a two-shaft, axial-flow, high-bypass-ratio turbofan engine used on the C-17 and other large commercial and military transports. Volvo Aero produces the engine case.

### Pratt & Whitney PW4000

The PW4000 is a two-spool, high-bypass-ratio, advanced-technology turbofan engine designed for heavy commercial transports and possible military variants thereof. Volvo Aero produces the engine case.

### Rolls-Royce BR700

The BR700 is a two-shaft, high-bypass-ratio turbofan engine designed for business jets and regional jetliners. Volvo Aero serves as a development partner, designing and supplying the intermediate compressor case for the BR715 variant. That component represents approximately 4.5 percent of the production content of the BR715.

### Rolls-Royce RB211/Trent

These are three-spool, high-bypass-ratio turbofan engines designed for large commercial transport aircraft. Volvo Aero provides the intermediate pressure compressor (IPC).

### Rolls-Royce Spey/Tay

These are two-spool, low-bypass-ratio, axial-flow, augmented/non-augmented turbofan engines designed for large corporate aircraft, military transports, and attack/fighter aircraft. In 1989, Volvo and Rolls-Royce agreed to collaborate on the Tay program. Volvo took a 3.2 percent share in the Tay 610/611, 620, and 650 programs. It manufactures the combustors and HP/IP compressor casings.

### VITAL

In February 2005, Volvo Aero announced it would be playing a major role in the European Union's VITAL (Environmentally Friendly Aero Engine) development project. The project will deliver the technological breakthroughs required for the industry to meet the goals for lower fuel consumption and noise set by the European aerospace industry. These goals, to be achieved by the year 2020, include a 50 percent reduction in noise and carbon dioxide emissions, and an 80 percent reduction in nitrogen oxides. VITAL is a four-year program with 53 partners and a total budget of EUR90 million (\$117 million), including EUR50 million (\$65 million) in funding from the EU. Volvo Aero is investing about SEK85 million (\$12 million) in the project. Volvo Aero is leading a subproject within VITAL with 14 European partners that involves development and testing of load-bearing structures in the engine. Volvo Aero will produce a fan frame in polymer composite material and test it in a full-scale fan rig. Volvo successfully tested its compressor technology under the VITAL program in December 2008.

### Volvo/GE RM12

The Volvo RM12 is an advanced-technology, two-shaft, low-bypass-ratio, augmented turbofan aircraft engine. The RM12 is a derivative of GE's F404 engine; its only application is the Saab Gripen fighter aircraft. An estimated 337 RM12 turbofans have been built.

### Industrial & Marine Turbine Programs

#### GE LM1600

The LM1600 is a simple-cycle, dual-rotor, axial-flow, aeroderivative industrial/marine gas turbine. Applications include electrical generation such as cogeneration, and various mechanical load drives,

## Volvo Aero Corporation

including use as a compressor drive for pipeline, platform, and process operations. Volvo Aero produces turbine stator components for this engine.

### **GE LM2500**

The LM2500 is a twin-spool, axial-flow, aeroderivative industrial gas generator/gas turbine. Applications include utility and industrial electric power generation, including combined-cycle and cogeneration installations; various mechanical load drives; and marine propulsion. In October 2005, Volvo Aero and GE signed an agreement whereby Volvo Aero would increase its stake in the LM2500 industrial gas turbine. The total turnover for the additional agreement is estimated to be SEK1 billion for Volvo Aero. The new contract applies to Stages 10-13 of the high-pressure compressor (HPC) spool for the same gas turbine. With the latest addition, Volvo Aero will be responsible for substantially all of the disks and spools in the HPC section (i.e., Stages 1-16). Volvo Aero has been a risk-sharing partner in the LM2500 program since 1997. GE and Volvo Aero had signed an LM2500 contract in 2004 as well.

### **GE LMS100**

The LMS100 is GE Energy's 50-Hz/60-Hz intercooled 100-MW aeroderivative gas turbine for electrical generation duty. Volvo Aero is designing and manufacturing the PT case and compressor rear frame, and is manufacturing the IPT frame.

### **Rolls-Royce Industrial Trent**

The industrial and marine Trent is a three-shaft, axial-flow, aeroderivative industrial and marine gas turbine machine. The twin-shaft Marine Trent MT30 became available in 2004. Volvo Aero provides the IPC.

## **Space System Programs**

---

### **Ariane 5**

The Ariane 5 is a European heavy-lift expendable launch vehicle. The Vulcain and Vulcain 2 rocket engines are the main stage engines on the Ariane 5. Volvo Aero supplies several of the engines' key parts such as the hydrogen turbines and oxygen turbines, as well as the hydrogen-cooled nozzle. Volvo Aero also provides the hydrogen turbine and oxygen turbine for the Vinci upper-stage engine on the Ariane 5.

### **GSLV**

The Geosynchronous Satellite Launch Vehicle is a modular Indian booster designed to place payloads in geosynchronous transfer orbit and low-Earth orbit. Volvo Aero provides the LE-7A rocket engine nozzles for these boosters.

### **H-2A**

The H-2A is a two-stage, heavy-lift expendable launch vehicle. Volvo Aero provides the LE-7A rocket engine nozzles for this launcher.

\* \* \*