

# 777-200/-300 technical support providers

There are over 700 777 aircraft in operation with the PW4000-112, GE90 or Trent 800 engine. A global survey of six major levels of support identifies the major service providers at each level of technical support. Support levels and market shares in different parts of the world is surveyed.

This survey summarises the major aftermarket and technical support providers for the Boeing 777 aircraft. It is grouped into seven sections covering the categories of technical support offered by each provider.

- Engineering Management and Technical Support (see table, page 26).
- Line maintenance and in-service operational support (see table, page 27).
- Base Maintenance Support (see table, page 27).
- Engine Maintenance (see table, page 28).
- Spare Engine Support (see table, page 28).
- Rotables and Logistics (see table, page 30).

- Heavy Component Maintenance (see table, page 30).

Many of the technical support providers that are listed in most, if not all, of the six sections can be termed as 'one-stop-shop' service providers for the 777. This means that they provide most of the technical support services that a third-party customer would require.

The tables summarise the range of services that these facilities offer.

As the tables show, the maintenance, repair and overhaul (MRO) and other technical support facilities are able to offer a complete range of line and base maintenance services, as well as engine and heavy component maintenance for the 777.

The major maintenance providers include: Ameco Beijing, Austrian Technik, Delta TechOps, El Al Tech, Evergreen

Aviation Technologies Corp. (EGAT), Hong Kong Aircraft Engineering Company (HAECO), Japan Airlines International (JAL), Lufthansa Technik AG (LHT), Malaysian Airlines, SIA Engineering Company (SIAEC), Thai Airways International (Thai), Triad International Maintenance Corporation (TIMCO), United Services, Gameco and VEM Maintenance and Engineering (VEM).

Due to the financial, personnel and time and tooling costs of certain specialist jobs, none of the facilities are able to offer every single listed capability, but some come close.

With the development of the 777-200LR and Freighter, the number of 777s is growing. By 2015, there are expected to be over 1,080 777s in operation, so the maintenance market will need to grow by nearly 50%. This is especially true as many 777s will need more in-depth heavy maintenance over the coming years as the maintenance requirements of older aircraft increase.

Many of these additional deliveries are to existing operators, so maintenance arrangements may therefore already be in place. There are also smaller operators which need MROs to offer capability. In addition, there are also 777s on order with new customers such as Turkmenistan Airlines and Arik Air that will need maintenance programmes and technical support in the future. Such operators with small fleets will need extensive third-party support, and providers and facilities will be increasingly in demand.

## Engine & APU market

When looking at the maintenance of the engines of the 777, there are only a few providers that offer various levels of engineering and engine shop support on all three engines. These include Evergreen Aviation Technologies Corp (EDAT); HAECO, including Hong Kong Aero Engine Services Limited (HAESL); and SIAEC, including Eagle Services Asia (ESA) and Singapore Aero Engine Services Limited (SAESL). There are additional facilities that can offer maintenance for two of the three engine types.

The ACAS database, produced by

*SIAEC provides one of the most comprehensive levels of technical & maintenance support for the 777 available in the world. This is partly explained by SIA having the largest global fleet, with 77 aircraft.*



## 777-200/-300 ENGINEERING MANAGEMENT &amp; TECHNICAL SUPPORT

	Outsourced engineering service	Maint records service	DOC & manuals manage	Maint prog manage	Reliability stats	AD/SB orders manage	Check planning	Config & IPC manage	Total tech support
Abu Dhabi Aircraft Technologies		Y	Y	Y	Y	Y	Y		Y
Air France Industries / KLM	Y	Y	Y	Y	Y	Y	Y	Y	Y
Alitalia Servizi Engineering & Maintenance				Y	Y	Y	Y		
Ameco Beijing	Y	Y	Y	Y	Y	Y	Y	Y	Y
Aveos (Air Canada Technical Services)					Y				
Delta TechOps	Y	Y	Y	Y	Y	Y	Y	Y	Y
El Al Tech	engine	Y	Y	Y	Y	Y	Y	Y	Y
Emirates				Y	Y	Y	Y	Y	
Evergreen Aviation Technologies	Y	Y	Y	Y	Y	Y	Y	Y	Y
GAMECO			Y	Y		Y	Y		
HAECO incl. HAESL & SAESL	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lufthansa TechnikAG	Y	Y	Y	Y	Y	Y	Y	Y	Y
Malaysia Airlines	Y	Y	Y	Y	Y	Y	Y	Y	Y
SIA Engineering Company	Y	Y	Y	Y	Y	Y	Y	Y	Y
Thai Airways International	Y	Y	Y	Y	Y	Y	Y	Y	Y
TIMCO (Greenbro)	Y	Y	Y	Y		Y	Y	Y	Y
United Services	Y	Y	Y	Y	Y	Y	Y	Y	Y
VEM Maintenance & Engineering	Y	Y	Y	Y	Y	Y	Y	Y	Y

Flight Global, assesses the contracts of various maintenance facilities and airlines, from which the market share can be worked out. This data is for the period up to the summer 2008.

Engine maintenance contracts that are performed in-house represent 17% of the market. This figure does not, however, include the in-house work done by airlines that also offer third-party engine work. These are carriers such as Air France, United, KLM and JAL. Therefore, the figure will be much higher and closer to 30-35%. Unknown contracts equate to just over 10%. Of the engine manufacturers, Rolls Royce (RR) has the highest percentage of contracts, with 27% being issued to RR and its joint ventures (JVs).

GE Engine Services and its facilities around the world have taken nearly 20% of the market, leaving Pratt and Whitney (PW) with less than 5%. Airlines that operate PW4000-powered 777s are more likely to maintain engines in-house. What is clear, though, is that RR keeps a tight control of engine maintenance, with only its own joint ventures and Trent 800 operators doing work on the engines.

Over 50% of 777 APUs are overhauled by the original equipment manufacturer (OEM), Honeywell. The second place for market share is in-house engineering with 17%. Other airline engineering departments account for nearly 11% and unknown contracts or those up for tender amount to 7%.

## Base maintenance market

The market shares for C checks and heavy maintenance visits are similar. In both cases the highest percentage of

contracts (nearly 46% and 36% respectively) goes to in-house airline engineering departments. As also mentioned for the engines, this does not include those in-house airline engineering facilities that also offer third-party capability. Such facilities are Air France Industries and SIAEC, which have nearly 13% and 12% respectively of the C check and heavy maintenance market.

British Airways Maintenance Cardiff (BAMC) is one exception. Due to the large BA fleet of 42 aircraft, BAMC has nearly 9% of the global market, and so ends up having its own entry in the ACAS market share data. BA does not offer third-party maintenance at Cardiff. Therefore, in-house engineering's market share for C checks stands at over 51% and for heavy checks it is nearly 42%.

Engineering companies that are independent of an airline only seem to get less than 2.5% of the market each for the C checks. But they do better on the heavy checks, with Ameco and ST Aviation Services Pte Ltd (SASCO) getting nearly 10% and 6% respectively.

## Asia Pacific

The majority of 777s are operated by airlines in the Asia Pacific area, which accounts for over 40% of the global fleet. In addition, 128 new 777s will be delivered over the coming years to the region. This represents 35% of forthcoming deliveries.

This is then echoed in the range of service providers in the same area. Some of the major providers include: Ameco Beijing, HAECO, SIAEC, TAECO and Gameco.

The technical providers in the Asia

Pacific area are mostly attached in some way to an airline, in much the same way as the rest of the world. But they also stand independently in their branding and position in the market place.

This is true of Gameco and HAECO which are historically the maintainers of China Southern and Cathay Pacific aircraft respectively. Ameco Beijing, on the other hand, is a joint venture between LHT and Air China. LHT's market share should only grow over the coming years.

LHT also has a joint venture with Philippine Airlines, called Lufthansa Technik Philippines, which traditionally overhauls the aircraft from Philippine Airlines. This airline is due to take delivery of six 777-300ERs by 2011, which are likely to be maintained by Lufthansa Technik Philippines.

Over 20% of the global C check contracts, according to ACAS, go to facilities in the Asia Pacific area. This figure excludes many of the airlines, such as those from Japan and China, that have in-house engineering and maintenance departments. SIAEC alone accounts for nearly 12% of the C check and heavy check contract market share.

Singapore Airlines (SIA) has the largest 777 fleet, with 77 aircraft. Through supporting SIA, SIA Engineering Company (SIAEC) has built up a comprehensive technical support and maintenance capability at all levels, which it also offers to other operators.

SIAEC is capable of handling at least four 777 base checks at any one time within its hangars. It also has tarmac space for line and light maintenance.

In addition, SIAEC is adding a sixth hangar to further improve its market presence.

## 777-200/-300 LINE &amp; LIGHT MAINTENANCE SUPPORT

	Maint operations control	AOG support	Line checks	A checks	Engine QEC changes	Engine changes	Landing gear changes	APU changes	Thrust reverser changes
Abu Dhabi Aircraft Technologies		Y	Y	Y					
AeroMexico- Aeroviasde MexicoSA de CV	Y	Y	Y	Y	Y	Y	Y	Y	Y
Air France Industries / KLM	Y	Y	Y	Y	Y	Y	Y	Y	Y
Alitalia Servizi Engineering & Maintenance		Y	Y	Y					
Ameco Beijing	Y	Y	Y	Y	Y	Y	Y	Y	Y
Austrian Technik	Y	Y	Y	Y	Y	Y	Y	Y	Y
Delta TechOps	Y	Y	Y	Y	Y	Y		Y	Y
El Al Tech	Y	Y	Y	Y	Y	Y	Y	Y	Y
Emirates Engineering	Y	Y	Y	Y	Y	Y	Y	Y	Y
Europe Aviation		Y	Y						
Evergreen Aviation Technologies	Y	Y	Y	Y	Y	Y	Y	Y	Y
HAECO - incl. HAESL & SAESL	Y	Y	Y	Y	Y	Y	Y	Y	Y
Japan Airlines International	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lufthansa Technik AG	Y	Y	Y	Y	Y	Y	Y	Y	Y
Malaysia Airlines	Y	Y	Y	Y	Y	Y	Y	Y	Y
Monarch Aircraft Engineering	Y	Y	Y		Y	Y	Y	Y	Y
SIA Engineering Company	Y	Y	Y	Y	Y	Y	Y	Y	Y
ST Aviation Services Pte. Ltd. (SASCO)	Y	Y	Y	Y	Y	Y	Y	Y	Y
ST Mobile Aerospace (MAE)	Y		Y	Y	Y	Y	Y	Y	Y
Thai Airways International	Y	Y	Y	Y	Y	Y	Y	Y	Y
United Services	Y	Y	Y	Y	Y	Y	Y	Y	Y
VEM Maintenance & Engineering		Y		Y	Y	Y	Y	Y	Y
Victorville Aerospace LLC		Y		Y	Y	Y	Y	Y	Y

When looking at the market share for heavy checks in the general Asia Pacific area, the share of global business is well over 35%. This again excludes many of those checks that are completed in-house, although the figures reaffirm that heavy checks are more likely to be outsourced than C checks.

Engine shops in the Asia Pacific region include: GE Engine Services (Japan and Malaysia), HAECO (through associates HAESL), ESA, and SAESL; and the major airlines' engine shops such as Evergreen Aviation Technologies, JAL, Malaysian Airlines and THAI.

SIAEC is able to offer technical support and shop visit maintenance for the PW4000, GE90 and Trent 800 through ESA and SAESL, with ESA providing support for the PW4000 and GE90, and SAESL for the Trent 800.

Besides the in-house market share of 10% of global engine overhaul contracts, the next biggest provider is Singapore-based SAESL. SAESL has taken 14% of the contracts available globally, and is a joint venture between HAESL, RR and SIAEC. HAESL itself is a joint venture between HAECO and RR, and is based in Hong Kong. In addition, HAECO also owns TAECO in Xiamen, China, and has taken over a GE facility at the same Chinese location. This means that, looking at ACAS's data, HAECO and its associated companies in the Asia Pacific have nearly 18% (worth over 250 engines) of the global market for engine overhaul, and show every sign of growing. Through its various companies,

## 777-200/-300 BASE MAINTENANCE SUPPORT

	C checks	IL & D checks	Composites	Strip/paint	Interior refurb
Abu Dhabi Aircraft Technologies	Y	Y	Y		
AeroMexico			Partial		Y
Air France Industries / KLM	Y	Y	Y	Y	Y
Alitalia Servizi Engineering & Maintenance	Y		Y	Y	
Ameco Beijing	Y	Y	Y	Y	Y
American Airlines	Y	Y	Y		Y
Austrian Technik	Y		Y		Y
Aveos (Air Canada Technical Services)	Y		Y	Y	
Delta TechOps	Y		Y	Y	Y
Egyptair Maintenance & Engineering	Y	Y	Y		
El Al Tech	Y	Y	Y		Y
Emirates	Y	Y	Y		
Evergreen Aviation Technologies	Y	Y	Y	Y	Y
Lufthansa Technik AG	HAECO	HAECO	Y	Y	Y
Malaysia Airlines	Y	Y	Y	Y	Y
Marshall Aerospace	Y	Y	Y	Y	Y
SIA Engineering Company	Y	Y	Y	Y	Y
ST Aviation Services Pte. Ltd. (SASCO)	Y	Y	Y	Y	Y
ST Mobile Aerospace (MAE)	Y	Y	Y	Y	Y
TAECO	Y	Y	Y	Y	Y
Thai Airways International	Y	Y	Y	Y	Y
TIMCO (Greenbro)			Y		Y
United Services	Y		Y		
VEM Maintenance & Engineering	Y	Y	Y	Y	Y
Victorville Aerospace LLC	Y	Y	Y	Y	Y

## 777-200/-300 ENGINE MAINTENANCE - GE90, PW4000-112 &amp; TRENT 800

	GE90	PW4000-112	Trent 800	Engine health monitor	Engine maint manage	On-wing engine maint	Engine shop visits	Parts repair schemes
AeroMexico	Y			Y	Y	Y		
Air France Industries/KLM	Y			Y	Y	Y	Y	Y
Alitalia Servizi	Y		Y			Y		
Engineering & Maintenance								
Austrian Technik	Y	Y	Y	Y	Y	Y		
Delta TechOps	Y		Y	Y	Y	Y		
Emirates			Y	Y	Y	Y	Y	
Evergreen Aviation Technologies	Y	Y	Y	Y	Y	Y	GE90	GE90
GAMECO	Y	Y		Y	Y	Y		Y
GE Engine Services	Y			Y	Y	Y	Y	Y
HAECO - incl. HAESL & SAESL	Y	Y	Y	Y	Y	Y	GE&Trent	GE & Trent
Japan Airlines International	Y	Y		Y	Y	Y	Y	Y
Lufthansa Technik AG		Y		Y	Y	Y	Y	Y
Malaysian Airlines			Y	Y	Y	Y		
Pratt & Whitney		Y		Y	Y	Y	Y	Y
Rolls Royce			Y	Y	Y	Y	Y	Y
SIA Engineering Company	Y	Y	Y	Y	Y	Y	Y	Y
TAESL			Y	Y	Y	Y	Y	Y
Thai Airways International			Y	Y	Y	Y	Y	Y
United Services		Y		Y	Y	Y	Y	Y
VEM Maintenance & Engineering	Y			Y	Y	Y		

## 777-200/-300 SPARE ENGINE SUPPORT - GE90, PW4000-112 &amp; TRENT 800

	On-wing support	AOG services	Short-term leases	Med/long-term leases	Engine pooling
Air France Industries / KLM	Y	Y			Y
Delta TechOps	Y	Y	Y	Y	
El Al Tech	Y	Y	Y	Y	Y
Evergreen Aviation Technologies	Y	Y	Y	Y	Y
GAMECO	Y	Y	Y	Y	
GE Engine Services	Y	Y	Y	Y	Y
HAECO -incl. HAESL & SAESL	Y	Y			
Japan Airlines International	Y	Y	Y	Y	
Kuwait Airways Corporation					Y
Lufthansa Techniks AG	Y	Y	Y	Y	Y
Pratt & Whitney	Y	Y	Y	Y	Y
Rolls Royce	Y	Y	Y	Y	Y
SIA Engineering Company	Y	Y			
Southern California Aviation	Y	Y	Y	Y	Y
Spirit Aerosystems(Europe)	Y	Y			
Thai Airways International	Y	Y			
United Services	Y	Y		Y	Y

HAECO is able to provide most technical services on all three engines of the 777, apart from leasing aspects. This has been further developed by forming a JV with two of the OEMs, and benefiting from the back-up this brings.

Other than the base maintenance and engine overhaul, many of the facilities also offer day-to-day line maintenance and technical support, the main one being

SIAEC. It has its main engineering base at Singapore and there is presence at more than 40 airports spread across Singapore, Hong Kong, Indonesia, Philippines, Australia and the US.

### North & South America

The second largest geographical area for 777 operators is North America,

which accounts for 20% of the global fleet. South America has the smallest share with less than 1%, but its maintenance requirements are well catered for. The North American fleet size is not echoed in the facilities available. Many heavy checks are completed in Europe or Asia Pacific.

There are few large technical service providers in America, but there are many smaller companies that offer more specialist, local services. These include Goodrich, Southern Californian Aerospace, TIMCO and Victorville Aerospace LLC, which offer some aspects of component, line maintenance and technical support.

Two major providers are the engineering and maintenance departments of Delta TechOps (Delta Air Lines) and United Services (United Airlines). Between them they have nearly 8% of the global C check market. Neither perform heavy checks. Instead United sends its aircraft to Ameco for heavy checks, and Delta sends its aircraft to Air France Industries. HAECO has a contract for Continental's 777-200ER aircraft.

Other major American providers are Aveos (formally Air Canada Technical Services) and ST Mobile (MAE). Additionally, VEM Maintenance and Engineering in Brazil offers most services on the 777 airframe and some GE90 engine shop capability. Also in South America is AeroMexico, which offers 777 line maintenance and technical support, along with some GE90 capabilities.

As far as engine overhaul providers go in America, United Services and PW's

## 777-200/-300 ROTABLES &amp; LOGISTICS

	Rotable inventory leasing	Rotable inventory pooling	Repair & doc manage	AOG support	PBH rotables support
AAR Corp.	Y	Y	Y	Y	Y
Abu Dhabi Aircraft Technologies	Y	Y	Y	Y	Y
Air France / KLM	Y	Y	Y	Y	Y
Alitalia Servizi		Y		Y	Y
Engineering and Maintenance					
Ameco Beijing	Y	Y	Y	Y	
Aveos (Air Canada Technical Services)	Y	Y	Y	Y	Y
Delta TechOps	Y	Y	Y	Y	Y
Emirates	Y	Y	Y	Y	
Evergreen Aviation Technologies	Y	Y	Y	Y	Y
GE Engine Services	Y	Y	Y	Y	Y
Goodrich	Y	Y	Y	Y	Y
Lufthansa Technik AG	Y	Y	Y	Y	Y
SIA Engineering Company	Y	Y	Y	Y	Y
Thai Airways International	Y	Y	Y	Y	
United Services	Y	Y	Y	Y	Y
VEM Maintenance & Engineering	Y		Y	Y	Y

## 777-200/-300 HEAVY COMPONENT MAINTENANCE

	Wheels tyres & brakes	APU test & repair	Thrust reversers	Landing gear	Landing gear exchanges
AAR Corp.	Y			Y	
Air France Industries/ KLM	Y	Y	Y	Y	Y
American Airlines	Y	Y	Y		
Boeing Maintenance Services			Y	Y	Y
Aveos (Air Canada Technical Services)	Y	Y		Y	
Delta TechOps	Y				
Eads Revima / Revima APU		Y		Y	Y
El Al Tech	Y	Partly	Partly		
Emirates	Y	Y	light	Y	
Evergreen Aviation Technologies	Y		Y		
Goodrich	Y		Y	Y	
HAECO - incl. HAESL & SAESL	Y		Y	Y	Y
Hawker Pacific	Y			Y	
Lufthansa Technik AG	Y		Y	Y	Y
Messier Services Asia & France	Y			Y	Y
SIA Engineering Company	Y	Y	Y	Y	Y
Thai Airways International	Y	Y	Y	Y	Y
United Services	Y	Y	Y	Y	Y
VEM Maintenance & Engineering	Y		Y	Y	Y
Victorville Aerospace LLC	Y		Y	Y	Y

Cheshire Engine Centre deal with the PW4000-112. The Trent 800 is maintained by Texas Aero Engine Service LLC (TAESL), RR's joint venture with American Airlines. In addition, on-wing engine maintenance and management are offered by Delta Tech Ops for the GE90 and Trent 800.

## Europe

The geographical area with the third largest fleet is Europe, which has the second largest maintenance market for the 777. Europe has 17% of the global fleet, but 20% for both the C check and heavy check market. This includes BA's market share but excludes general in-

house data (as mentioned previously).

The major third-party players in the European maintenance market are Air France Industries/KLM, Lufthansa Technik and Austrian Technik. At the time of writing, it is hard to tell if Alitalia's engineering companies will remain with the major European providers. Within Europe, there are large maintenance companies which have a small amount of capability on the 777, but have not yet gained full capability, such as SR Technics at its Zurich facility. Europe Aviation in France has developed line maintenance capabilities on the 777, which will be available from the end of 2008.

The smaller, more specialist companies within Europe include EADS Revima, which offers heavy component maintenance, and Shannon Aerospace. Europe also has many of the large rotatable inventory and logistics companies, such as AJ Walter, CASCO and Avtrade.

The engines for the 777 are well supported in Europe, according to ACAS data. GE Engine Services' European facilities handle nearly 16% of the global market share of all 777 engines. Rolls-Royce Aero Repair and Overhaul deals with 4% of the global market, and Lufthansa Technik completes all levels of maintenance on the PW4000-112.

## Middle East and Africa

The contribution of the Middle East and Africa is nearly 16% of the global fleet, but most (nearly 14%) comes from the Middle Eastern airlines. There are many maintenance facilities in the location, but this is not reflected in the number of contracts completed, according to ACAS. The main third-party provider is ADAT in Abu Dhabi, and other facilities are those of the region's 777 operators, such as Egyptair and Emirates.

ADAT, the former GAMCO, has put major investment into its facility to assist its MRO contract with Etihad. It has built a dedicated hanger for Etihad's 777s, A340s and A320s, which was opened in the summer of 2008. Investment has paid off over the past few years, and more is due to be made over the next four years.

Global market share for the 777's heavy maintenance is low at about 1.5%, but that could grow with the investment put into ADAT. The figure is the same for C Check maintenance, but again this must grow as 110 new aircraft are due to be delivered to the area over the coming few years. Of these, nearly 100 are for Middle Eastern carriers. [AC](#)

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