

While not widely used by airlines, all-inclusive widebody rotatable support packages offer numerous financial benefits for airlines. The number of suppliers offering these services is increasing in-line with the interest being shown by airlines.

Widebody rotatable support package suppliers survey

Providing an inventory of rotatables and line replaceable units (LRUs), managing their testing and repairs, maintaining a warehouse for their storage, and all the other associated logistics and support activities has traditionally been an activity performed in-house by most larger airlines. Smaller carriers have maintained ownership of their inventory and managed their logistics, and sub-contracted most of the repairs of components. It is only in the past 10 years, and mainly in Europe, that the sub-contracting of all activities relating to rotatable provisioning, repair and support has been practiced by airlines. This has evolved into all-inclusive rotatable and LRU component support packages for

airlines.

This was first mainly followed by smaller carriers with narrowbody fleets, but has become more widespread with widebodies. The market is led by several major players, such as AJ Walter, AvTrade, Lufthansa Technik and ST Aerospace. Complete rotatable provisioning and support was the main product of SAS Component, based in Denmark. The company was acquired by ST Aerospace, which also provided the same type of service from its base in Singapore. There are now a growing number of specialist providers that are offering these types of complete rotatable support packages. These include P3Aviation, KG Aircraft Rotables and Ansett Aircraft Spares & Services.

Airline outsourcing

The complete sub-contracting of rotatable provisioning and technical support makes the most economic sense for small fleets. The dynamics and statistics of component failure rates means the number of rotatables and the asset value invested per aircraft reduces as fleet size increases. Ownership of inventory thus makes sense for medium and large fleets.

Major, national and legacy airlines have also had their own test, repair, storage and logistics facilities and capabilities. These are in addition to other maintenance facilities and capabilities related to their full maintenance and engineering capability.



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EUROPEAN ROTABLE SUPPORT PROVIDERS SERVICES

Company	Package offered	Types supported	Stocks & location	Extras offered	Engine types supported	Additional services	Service levels	Main customers
Airbus	Fixed rate/PBH	A330 A340 A380 A350	Global	Engine LRUs, W&B, APU	All relevant to a/c types supported	Initial provisioning, AOG, Logistics, Warranty Mgt, Reliability stats.,	FHS: Off-shelf avail. FHS-TSP: A/C on-time avail. guarantee	Singapore Airlines The Czech Airforce Vietnam Airlines
AJ Walter	Fixed rate/PBH	A330 767 A340 potentially	Main: UK plus Europe, DXB, SIN, HKG & N.America	Engine LRUs, W&B, APU	All relevant to a/c types supported	Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats.	AOG: 8 hours Routine: 5-7 days 99-100%	
Austrian Technik		767, 777	VIE	W&B	None	24/7 Access, AOG, Comp Tracking, Warranty Mgt, Surplus Sales	AOG: 24 hours Routine: 5 days	Austrian Airlines
AvTrade	Fixed rate/PBH Rotable Lease	767, 777 747-400 A330/A310 A330/A340	LGW, CDG, DXB, SVO, YUL, SIN, PEK	Engine LRUs, W&B, APU,	JT9D-7R4, PW4000-94/-100 CF6-80C2, CFM56-5C, Trent 500/700	Initial Provisioning, Homebase Lease, Pool Stock, AOG, Global Logistics, Comp Tracking, Warranty Mgt	AOG: 4 hours Critical: 24 hours Routine: 5 days Gtee 100% parts	Virgin Atlantic, Monarch Airlines, + others
Casco		747-200 767/757 possible		W&B, APU	None	Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats	AOG: 4 hours 90%	
Finnair	Fixed rate/PBH	MD-11 A330 A340	Helsinki Frankfurt-Hahn	Engine LRUs, W&B, APU	CF6-80 CFM56-5	Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats	4 hours min. 90-96%	Finnair Aeroflot
Iberia	PBH	A330/A340 747-200/-300	MAD, BCN, PMI, HEL & IST	Engine LRUs, W&B, APU	Trent 500 CFM56-5Cs	Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats	4-72 hours 98%	
Lufthansa Technik	Total Component Support (TCS) package	A300/A310 A330/A340 A380/747 767/777 MD-11	Main: FRA, HAM, MUC, plus SFO, FLL, JFK, MXP, BLR, SZX	Engine LRUs, W&B, APU	CFM56-5C GE90 CF6-50E/-80C2/-80E1 PW4000-94/-100/-112 RR RB211 & Trent	Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats.	AOG: 1st avail flt Other: 2-7 days Routine: 10 days 90-95%	
Monarch Engineering		767	LTN, LGW, MAN	Engine LRUs	CF6-80	Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats		Monarch Airlines
P3 Aviation	Fixed rate	747-400 767 A330/340 possible	STN	Engine LRUs, W&B, APU	JT8D CFM56-3/-5/-7 RB211-524	Initial Provisioning, AOG, Logistics, Warranty Mgt,	1 hour min. at STN up to 100%	
Sabena Technics	Fixed rate/PBH	A300/A310, A330, 767	CDG, BRU, MIA	Engine LRUs, W&B, APU	CF6-80C2, PW4000-94/-100	Initial Provisioning, Homebase Leasing, 24/7 access, AOG, Logistics, Component Tracking, Reliability Stats, Warranty Mgt,	4 hours min 98%	Brussels Airlines
SR Technics	Fixed rate/PBH	A330-200/-300 A340-200/-300 767	ZRH & LHR + support of 65 customer stocks	Engine LRUs, W&B, APU	PW4168 CFM56-5C CF6	Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats	0.5-72 hours 85-100%	
TAP Mtce & Engineering	Fixed rate/PBH	A300/A310 A330/A340	W. Europe Brazil	Engine LRUs, W&B, APU	CF6-80C/-80E CFM56-5C PW4168A	Initial Provisioning AOG, Logistics, Warranty Mgt, Reliability Stats	AOG: 4 hours Replenishment: 72 hours 85-95%	TAP, FedEx SATA International, White Airways, French Air Force
Turkish Technik	PBH/PBC	A310 A330 A340	Istanbul	Engine LRUs, W&B, APUs	CFM56-5C2F/C4 CF6-80C2/E1	Engineering, AOG, Warranty, Logistics, Component Overhaul & Modification	AOG:4hrs Urgent:12hrs-3days Routine:7days 90-98%	Turkish Airlines, Ariana Afghan, Saga Airlines

Key:

-W&B: wheels & brakes

-IP: Initial provisioning

The trend over the past 15-20 years has been for an increasing number of airlines to sell and divest of some or all of their maintenance capabilities, and thus outsource the functions they no longer have in-house. An example is BA Engineering, which divested its landing gear shop to Hawker Pacific and engine shop to GE Engine Services.

Most airlines have been reluctant to outsource functions relating to rotatable component inventory and support. Some carriers have sold their test and repair facilities, however, but have retained ownership of their rotatable inventories and the associated logistics functions. The trend, however, is definitely one of a higher percentage of outsourced maintenance and engineering activities, rather than airlines considering the option of building or buying their own rotatable test and repair facilities. More airlines will certainly consider outsourcing rotatable repairs, and an increasing number are considering selling and leasing back their rotatable inventory.

Outsourced rotatable support

The concept of fully-outsourced rotatable provisioning and support is appreciated and practiced by only a few carriers. The number of airlines taking this option is growing, as is the number of companies that offer fully outsourced

rotatable support services.

The benefits to airlines of all-inclusive rotatable and LRU component support packages, besides the complete divestment of inventory and facilities, are the use of a one-stop shop and single provider, a predictable cost, transfer of risk to the provider, and service level guarantees. Some service providers add that airlines can benefit from the provider's economies of scale and so also have lower costs. John Avery, director of supply chain services at AJ Walter estimates that an airlines can reduce their costs by 15-25%, depending on their fleet size. Benefits can even extend to airlines generating cash where they sell and leaseback their inventories to providers.

Complete outsourcing requires several elements. The first relates to determining the sufficient quantity of rotatable and LRU stock required to maintain a reliable operation across the airline's route network. This has traditionally been initially done for an airline by the relevant aircraft manufacturer as an initial provisioning (IP) estimate. The quantities used are later modified once the airline has sufficient component removal and reliability data. Many of the specialist providers now offer an IP service.

Once the quantity of rotatables required to maintain a reliable operation has been determined, there is the issue of

provisioning. One option is where the airline leases all the required stock. This can be through a sale and leaseback transaction with a specialist rotatable supplier, and results in a fixed cost per month irrespective of aircraft utilisation.

Another option is for the airline to lease an amount of critical or high failure rate items from a specialist provider. These are kept at its homebase. This will be paid for at a fixed rate per month. The balance of parts, which are lower failure rate and less critical items, are then accessed via a pool of stock held by the provider, and transported to the airline when required. This is often paid for at a fixed rate per flight hour (FH).

The second main element is the repair and management of rotatables. Following failure on the aircraft and removal, rotatables have to be transported to test and repair facilities, and so also require customs clearance. This is often to other countries. Some providers offer a PBH repair service for airlines that want to maintain ownership of their stocks and perform their logistics services in-house.

Repaired parts also require certification documents and, again, often customs clearance. Parts also need to be stored in the relevant locations ready for when they are required. They then also have to be transported.

The entire repair and management process is complex, and so parts have to



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NORTH AMERICAN & REST OF WORLD ROTABLE SUPPORT PROVIDERS SERVICES

Company	Package offered	Types supported	Stocks & location	Extras offered	Engine types supported	Additional services	Service levels	Main customers
AAR	Fixed rate/PBH	All Airbus & Boeing types. Can incl A350, 747-8 & 787 in future.	N. America & HKG	Engine LRUs, W&B, APU	PW4000 CF6-80C2 RB211 Trent & GE90 if req.	Initial Provisioning AOG, Logistics, Warranty Mgt, Reliability Stats.	AOG: up to 6 hours 92-98%	FedEx, UPS American Airlines
Ansett	Fixed rate/PBH	747 767 A330/A340	Australia, LAX, UK	Engine LRUs, W&B, APU All only partially		Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats	AOG: from 3 hours	Over400 airlines
Delta TechOps	Fixed rate/PBH	767 MD-11 A330 from 2010	ATL, LAX, New York, London	Engine LRUs, W&B, APU	PW4000 CF6-80	Initial provisioning, AOG, Logistics Warranty Mgt, Reliability Stats.	AOG: 4 hours Others: from 48 hours 95-98%	Delta ABX Air, AeroMexico, Hawaiian Airlines, Star Air Iceland Air, World Airways
Goodrich	Fixed rate/PBH	All current widebodies	Global incl. ATL, London, DXB, SIN, Chula Vista, Foley,	Engine LRUs, W&B, APU	All relevant engines	Initial Provisioning, AOG, Logistics, Warranty Mgt, Reliability Stats	4 hours-5 days 95-100%	Hundreds of operators
ST Aerospace	Fixed rate/PBH	767 A330/A340	Global	Engine LRUs, W&B, APU	All engines relevant to aircraft types	Initial Provisioning AOG, Logistics, Warranty Mgt, Reliability Stats		SAS, Martinair plus others
Triumph Group	Fixed rate/PBH	A300/A310/ A330/A340 747/767 DC-10/MD-11	US, UK Thailand	Engine LRUs, APU	All engines relevant to aircraft types	AOG, Logistics, Warranty Mgt, Surplus Sales		

be tracked, and this can be done using various IT systems. Airlines are also required to maintain removal interval and reliability statistics for every rotatable item. Regular reassessment of the amount of rotatable items kept also has to be made, and stock added to or disposed of. There are thus several repair and management functions that are required for a complete repair and management service. These can also be provided by specialist providers, and paid for in a fixed rate or power-by-the-hour (PBH) contracts for the repair and all management activities.

Finally, providers can offer all-inclusive rotatable and LRU support packages. These include all IP, inventory provisioning, repair and management activities from a single supplier at a single and predictable rate. The whole service can be in a cost per FH, or the leasing of inventory at a fixed monthly rate, and the remaining part of the service at a fixed rate per FH.

Specialist providers

European independents

As described, the provision of complete rotatable support packages is still practiced by a limited number of airlines, and the majority of these use the service for narrowbody aircraft. "It is an activity that is only just really becoming to be accepted and considered by a relatively

large number of airlines," explains Jamie Brooks, marketing manager at UK specialist AvTrade. "This has already become relatively widespread with narrowbodies, but interest from widebody operators is a more recent development. We provide a PBH support package to Virgin Atlantic for its 747-400 and A340-300s/-600s, and the same for various other airlines on the 767 this way." AvTrade also supports the 777, A300-600, A310 and A330 with PBH contracts (see table, page 25), including all inventory leasing, rotatable repair and management, and all related logistics services. Brooks estimates that AvTrade can support at least 50 of each type of aircraft if required by airlines. It has stocks located at London Gatwick, Paris, Dubai, Moscow, Montreal, Singapore and Beijing. The company can support airlines in all global areas, except South America.

Another major provider is UK-based AJ Walter. The company has been a long-term provider for narrowbody aircraft, but also offers full rotatable support for the A330 and 767, and may soon also support the A340 (see table, page 25). "We have up to \$300 million of rotatable stock, and about \$50 million of this relates to widebodies," says John Avery, director of supply chain services at AJ Walter. It has main stocks located in the UK, Central Europe, North America, Dubai, Singapore and Hong Kong. It supports airlines in Europe, America, and

the Asia Pacific; where it is seeing strong growth.

Most providers are based in Europe, although the larger companies offer a more global service. Lufthansa Technik, for example, offers its Total Component Support (TCS) package, which it has provided since 1992. This includes rotatable stocks in numerous locations. It supports all current Airbus and Boeing widebodies, and all expand its portfolio to include the 747-8 and 787 (see table, page 25). Lufthansa Technik supports 50 each of the A300 and A310, 200 each of the A330 and A340, up to 40 A380s, up to 80 747-400s, 30 767s, 60 777s and 20 MD-11s.

Lufthansa Technik's network is truly global, and it supports airlines in North America, Europe, China and India. It has three stock locations in Germany; at Hamburg, Frankfurt and Munich. Others include San Francisco, Fort Lauderdale, New York JFK, Milan, Bangalore and Shenzhen.

SR Technics provides all-inclusive rotatable and LRU component and logistics support for several widebodies on fixed rate and PBH contracts. It has about \$850 million of inventory to support narrowbodies and widebodies, and the widebodies it supports are the A330-200/-300, A340-200/-300 and 767 (see table, page 25). It has stocks located in Zurich, London Heathrow, and has 65 consignment stocks based at its customers' main bases.

Other independent suppliers include P3Aviation and CASCO. P3Aviation, based at London Stansted, offers fixed rate contracts to support various narrowbodies, as well as the 747-400 and 767 (see table, page 25). "We can also support the A330 and A340 on a case-by-case basis, and may support the 777 in the future," says Peter Taege, engineering director at P3Aviation. "We can probably support up to 20 aircraft, and have all our pool stocks based at Stansted (STN). We can support airlines in all global regions."

CASCO, located close to London Gatwick, has inventory to provide flying hour contracts for the 747-300 and 767, as well as supporting the 757. CASCO says it can support customers on a global basis.

Sabena Technics, now with various maintenance facilities and operations in Belgium and France, is another completely independent provider of PBH rotatable support contracts. It has stock for the A300-600, A310, A330 and 767 (see table, page 25). It can only, however, support up to a total of 20 of these aircraft. Stocks are located in Paris, Brussels and Miami. Its main customer is Brussels Airlines. Its main areas of support are Europe, the Americas, the

Middle East and Africa.

European airlines

The major airline-related providers in Europe include Austrian Technik, Finnair Technical Services, Iberia, Monarch Engineering, TAP Maintenance & Engineering, Turkish Technik, and Air France Industries and KLM Maintenance & Engineering.

Austrian Technik supports the 767 and 777 for Austrian Airlines's fleet of 16 aircraft with its stocks at Vienna, but can support other carriers in Europe if required.

Finnair Technical Services supports Finnair's fleet of MD-11s, A330s and A340s, and offers fixed rate and PBH contracts to airlines (see table, page 25). It can support up to 20 aircraft, and airlines in Europe, Russia and North America. It has a main stock at Helsinki, and an on-site stock at Frankfurt Hahn.

Iberia Maintenance supports Iberia's large fleet at Madrid, and provides PBH rotatable support contracts for the A330, A340, and 747-200/-300 (see table, page 25); as well as numerous narrowbody types. It has enough stock currently to support about 60 A330/A340s and a small number of 747 Classics. It can

support airlines around the world and has stocks located Madrid, Barcelona, Palma de Mallorca, Helsinki and Istanbul.

Monarch Engineering based at London Luton supports Monarch Airlines, and has 767 stock available at Luton, London Gatwick and Manchester to support airlines with PBH contracts.

TAP Maintenance & Engineering supports TAP in Lisbon; the airline operating the A310, A330 and A340. TAP Maintenance & Engineering can consequently provide PBH contracts to support these aircraft, and the A300-600. In addition to TAP's fleet, it can support up to another seven A310s, two A340s and several A300-600s/A310s with rotables during airframe checks. It can support airlines in West Europe and Brazil, and its stocks are located mainly in Lisbon.

Turkish Technic can offer contracts to support up to 23 A310s, A330s and A340-200/-300s; the aircraft being operated by Turkish Airlines (THY). It is able to support airlines in Europe, the Middle East, Africa and the Asia Pacific. This is from its homebase stock located in Istanbul, where it holds 6,500 items. Its customers include THY, Ariana Afghan and Saga Airlines.

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Other suppliers

Other major providers outside of West Europe include AAR, Ansett Aircraft Spares and Services, Delta TechOps and Goodrich; all with bases in the US. Some of these also have bases and substantial inventories located in other global regions. Ansett, for example, has stocks located in the UK. Another large provider in this market is ST Aerospace, which has an extensive operation and stocks at several global locations, including Copenhagen and Singapore.

AAR is one of the leading parts providers in the US, and consequently offers fixed price or PBH contracts. Moreover, AAR is also in the position to assess an airline's inventory requirements and buy any surplus stock. It can also form sale and leaseback contracts with airlines, and provide all-inclusive logistics and repair contracts. It can also provide repair PBH contracts for carriers that want to retain ownership of stock and perform the related logistics in-house.

AAR is able to support all current Airbus and Boeing widebodies, as well as the A350, 747-8 and 787 in the future (see table, page 28). This is in addition to 250 regional jets and fleet of 737s that it supports. It has close to \$100 million of pool stocks, and currently supports FedEx, UPS and American Airlines on

component repair and logistics contracts for the A300-600 and 767. Most of its inventory is located in the US, but it has a small pool stock in Hong Kong. In addition to the US, it has offices across the globe in Tokyo, Singapore, Paris, London, Rio de Janeiro, Australia and Dubai. It also has repair shops in Amsterdam, the Netherlands; and several in the US.

Ansett Aircraft Spares & Services originated as an outlet to dispose of surplus inventory for Ansett Airlines, which ceased operations. Ansett Aircraft Spares & Services has evolved to the point where it is a stockist for 747-400, 767, A300 and A340 rotables. It also provides PBH contracts for the 767. "We do few contracts for widebodies, but have enough inventory to do more contracts if we were asked," says Greg Quinlan, president and chief executive officer at Ansett Aircraft Spares & Services. "We have significant inventory for the 747-400. Our main distribution centres are Melbourne Australia, Weybridge in the UK and Los Angeles. Consequently our main areas of support are in the UK, the US and Australia. From the UK we can serve the whole of Europe, the Middle East and Africa. Los Angeles can support the whole of the Americas, and the Melbourne hub can support New Zealand, the south west Pacific Islands

and Indonesia. We also have service centres in France, Germany, Beijing, Shanghai and Singapore to serve customers."

Delta TechOps is one of a small number of providers in the US that provides customers with fixed rate and PBH rotatable support contracts. The concept of all-inclusive rotatable support contracts is relatively new and little used in North America. Delta TechOps, supporting Delta Airlines, provides this service for the 767 and MD-11, and is adding the A330 to its capability in 2010 (see table, page 28). It currently supports more than 100 767s and 15 MD-11s, and can support airlines across the world. It has stocks located in Atlanta, New York, Los Angeles and London. Its customers include ABX Air, Aeromexico, Hawaiian Airlines, Iceland Air, World Airways and Star Air.

Goodrich has several divisions, one offering PBH all-inclusive rotatable and LRU services. It has various ways of structuring contracts, and these include fixed rate repair, fixed rate repair and pool access, component repair and rotables support, and a complete all-inclusive service. It can support all current widebodies. It provides support across the globe, and has stocks located in Atlanta, London, Dubai, Singapore, California, Alabama, Toulouse France,

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All-inclusive rotatable support contracts give airlines the chance to completely divest of rotatable inventories, and source support at predictable rates while maintaining high levels of operational reliability.

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ST Aerospace supports 767s, A330s and A340s. Its customers in SAS and Martinair.

In addition to independent MROs and airline maintenance and engineering departments, airlines can go to the aircraft manufacturers for rotatable support. Airbus can support any widebody customer if required. This will start with an initial provisioning service to estimate stock requirements. It can then provide pool access and an on-site stock, as well as PBH repair and management. Airbus also offers a completely tailored programme. Naturally it can support its widebody types, and will also offer the same service for the A350 when it enters service. One particular area is the A380, which has several customers with relatively small fleets. It has not been asked to support the A300 or A310 this way, however. One particular contract it has is supporting Singapore Airlines's (SIA) 26 A330s and its 19 A380s (*see table, page 28*). "We are planning to support up to 120 widebodies this way over the next five years, and can support any number required in theory if we were asked to," says Richard Nevill, head of service solutions at Airbus. "We support customers in the Asia Pacific, Europe and South America, but have our own pool stocks in all global areas. Our stores are located at Washington DC, Hamburg, Frankfurt, Dubai, Singapore and Beijing. There are also a number of smaller outstations."

The Triumph Group provides fixed rate and PBH all-inclusive rotatable

support contracts in conjunction with its specific repair and overhaul services it offers on a wide variety of rotatable components. This includes APUs, engine accessories, airframe rotatables, thrust reversers and other parts. Customers are offered tailored programmes.

Triumph can provide rotatable support programmes in a number of different styles, and complements these with component repairs. Triumph is also able to provide field service support and engineering support.

Triumph has stocks located in the US, the UK and in Thailand. Moreover, it is able to position equipment at any of its 50 plus locations worldwide. It supports most current Airbus widebodies, the 747, 767, DC-10/MD-10 and MD-11 (*see table, page 28*).

Service levels

The common feature of all rotatable support contracts is that they split the inventory used by an airline between a core of homebase stock located at the airline's base, and a pool at the provider's base that the airline has access to. While the core of homebase stock is minimised to lower lease rates for these items, it means airlines do not have all parts at their base following failures. Rotatable providers thus have to provide levels of guarantee to their customers. These include a minimum and maximum amount of time it will supply a part when requested by the airline.

These minimum and maximum lengths of time depend on the level of urgency, and usually differ accordingly.

An example is AvTrade's three-tier approach. "We guarantee a maximum despatch time of four hours from our stores in the case of an aircraft-on-ground (AOG) situation, where the failure of the part results in a no-go situation," says Brooks. "The total time it takes to arrive where the customer requires it of course depends on the aircraft's location. We do, of course, have a 24-hour, 7-day a week AOG help desk to service all AOG situations from around the world.

"We then guarantee to ship a part in a maximum of 24 hours in the case of critical situation, and a five-day maximum period for shipping a component for the routine replenishment of parts," continues Brooks. These service levels vary with each provider, although there are similarities. The service levels for each are listed (*see tables, pages 25 & 28*).

The second element of a service level guarantee is a guarantee by the provider for the percentage of occasions it will have the part available when requested by a customer. Typical rates of availability guaranteed in a contract are 98% and 99%, but some providers offer a 100% availability guarantee. "We have a 100% guarantee in our contracts, and if we do not have the part ourselves we will buy, borrow, loan or exchange the part we need," says Brooks.

Additional services

Besides supplying, repairing and managing the main inventory of airframe rotatables, airlines also need the same type of service for engine LRUs and accessory rotatable components, wheels and brakes, and auxiliary power units (APUs) to complete all rotatable requirements.

Engine LRUs form a substantial portion of total rotatable inventory for a fleet of aircraft. These can often be supplied, repaired and managed by the engine original equipment manufacturer (OEM), but some providers also have extensive coverage. Airbus can supply LRUs relating to any engine type powering its widebodies (*see table, page 25*). AvTrade in the UK also has an extensive capability that includes the JT9D-7R4, PW4000-94/-100, CF6-80C2, CFM56-5C, Trent 500 and Trent 700.

Lufthansa Technik also provides parts for a wide range of engine types that include the CFM56-5C, GE90, the CF6-50/-80C2/-80E1, all three PW4000 types, the RB211 and Trent. The engine types supported by each provider are listed (see tables, pages 25 & 28).

A spare wheels and brakes provision, and repair and management service for the relevant aircraft types is relatively simple to offer, and is offered by all providers. Spare APU supply and repair is more expensive to offer, and a smaller number of providers offer this (see tables, pages 25 & 28).

Besides the supply, repair and management of parts, there are a whole range of management activities. These include an IP service, 24 hour/7 days per week access to pool stock, a 24 hour per day/365 day per year aircraft-on-ground (AOG) support service, a global or continental export and logistics service, a component tracking and reliability statistics service, a warranty management service, and the sale of surplus inventory.

IP is one of the more specialist services. It is offered by Airbus and many of the other providers (see tables, pages 25 & 28). This is then effectively

continued throughout the life of the contract by the continual monitoring of removal and reliability statistics to assess the amount of inventory required. Stock identified as surplus can then be sold, resulting in a reduction in cost for the airline customer.

Continual assessment of inventory requirements requires the monitoring of component reliability, and the tracking of components. Reliability data has to be kept and reported by airlines, but some providers also offer this service. This is performed with the aid of MRO IT systems, of which there are several types on the market.

In the case of new or young rotatable stock, parts are under warranty for a period. Parts that fail while under warranty can be transported, inspected and repaired for free. Airlines can also be compensated for the costs of having to supply a replacement part and the labour for removing and replacing the part. Since there are several thousand rotatable items on the aircraft with their own warranty period and OEMs, that repair the parts when they fail, accurate monitoring of failed items and the correct claiming of warranties requires the same level of IT system used to track component reliability data.

Component tracking, reliability data recording and reporting and warranty management are some of the more sophisticated levels of service provided.

Summary

All-inclusive rotatable support packages are one of the few elements of maintenance that many airlines have yet to take advantage of. The advantages to airlines are clear. The ability to divest of inventories and the associated infrastructure is attractive to many airlines, considering the cash that this can generate. Airlines can also avoid all the other infrastructure requirements, and have fewer staff. In return they can have predictable costs and service guarantees. The trend is clearly towards further outsourcing, and while some airlines may wish to maintain ownership of some or all of their rotatable inventories, none are likely to consider building their own warehousing and repair facilities.

Most of the specialist providers in this market support small numbers of widebodies compared to narrowbodies. Most providers are able to respond to higher demand from airlines, and the interest in all-inclusive rotatable support packages from airlines is still limited. The case is different for narrowbodies, but airlines' attitudes are changing. **AC**

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