

The repair of rotatable components and systems requires extensive capabilities and tooling. Repair and overhaul of flight control, hydraulic, pneumatic and fuel systems and fuel and engine controls has consolidated to specialist providers. This survey lists these providers and their capabilities.

Flight control, hydraulic, pneumatic, fuel system and fuel & engine control global repair capability survey.

Maintenance, and the subdivision of components is complicated by the fact that they fall into three distinct categories: expendables, repairables and rotables. Rotables are further categorised according to whether they are line replaceable units, easily removed during maintenance or components requiring the downtime of an airframe check for removal, repair and installation.

Heavy components include wheels, brakes, auxiliary power units, landing gear and thrust reversers. A global survey by *Aircraft Commerce* listed providers of repair and overhaul for these components and for which aircraft types they have capability (see *Global heavy component repair & overhaul survey, Aircraft Commerce, April/May 2002, page 27*).

Avionic rotatable components are line replaceable. A global survey of the companies that provide inventories and repair management for these components will be published by *Aircraft Commerce* in issue 26 (December 2002/January 2003).

This survey lists agencies which have repair and overhaul capability of the major classes of rotatable components that are often removed during heavier airframe checks. These are flight controls (ATA Chapter 27), fuel system (ATA Chapter 28), hydraulic system (ATA Chapter 29), pneumatic system (ATA Chapter 29) and fuel and engine controls (ATA Chapter 73 & 76).

Other component classes also require repair capability, but these are either repaired as part of airframe checks and engine maintenance, or require less extensive repair capability.

Many companies provide repair capability for the piece parts of these systems, but less provide the repair

capability for the full systems. Removal from the aircraft for repair and overhaul is infrequent, and so few facilities are required.

Repair of these systems also requires extensive capability in terms of qualified staff, tooling and test equipment. The majority of global providers to airlines are large carriers outsourcing their own maintenance capabilities. SAS Component, for example, is a major component repair specialist offering services to large and small airlines around the world which do not have their own component repair capabilities.

Access to providers of repair facilities for these components is required for airlines sub-contracting their maintenance to third party providers, since few airframe maintenance facilities have the ability to repair these rotatables themselves. Many of the components listed here are removed for repair during base maintenance, and the repair and overhaul is subcontracted to specialist component repair facilities.

In addition to airline and specialist component repair agencies, manufacturers of these systems also provide repair for the systems they produce.

Airline facilities

Unsurprisingly the majority of airline facilities are European. These include Air France Industries, British Airways Engineering, Lufthansa Technik, Finnair, KLM Engineering & Maintenance, Iberia and SAS through SAS Component.

These airlines have traditionally provided full maintenance and repair capability for all maintenance elements for their own and customers' aircraft, and therefore offer extensive component repair capabilities for the aircraft for

which they have airframe capability.

Full capability for all these components for all jetliner aircraft types can be found among European airlines offering third-party maintenance. Lufthansa Technik has the largest capability, while most European airlines offer services related to the aircraft types they operate.

Airlines often find that their fleets are not large enough to justify full repair capability for all the aircraft types they operate. Alitalia, for example, does not have component repair capability for the A320s and A321s.

Delta, United and Air Canada are the only airlines that actively outsource their maintenance to other airlines on a large scale.

Airlines from the Asia Pacific and Australasia region that offer component repair are China Southern (Gameco), Japan Airlines, Singapore Airlines and Thai Airways (see table, page 35). Airlines from other parts of the world that offer component repair capabilities include VARIG and South African Airways.

Independent providers

The majority of independent providers are located in Europe and North America (see tables, pages 32 & 34). Companies are generally divided between a small number specialising in component repairs, with capability for most systems, and those specialising in just one or two ATA Chapters. An exception is Evergreen, which is an independent maintenance facility offering extensive airframe and component maintenance repair.

North American specialists are AAR, Aero Controls, Aeropol Aviation, Aerotron, AIRINC, Alameda Aerospace

NORTH AMERICAN AIRLINE & THIRD PARTY MRO PROVIDERS OF ROTABLE REPAIR & OVERHAUL CAPABILITIES

Provider	Flight controls ATA 27	Hydraulic system ATA 29	Pneumatic system ATA 36	Fuel system ATA 28	Fuel & engine controls ATA 73 & 76
AAR	Most commercial types	Most commercial types	Most commercial types	Most commercial types	
Aero Controls	727, 737, 747, DC-10	727, 737, 747, DC-9 DC-10, MD-80	727, 737, 747 DC-10, MD-80	727, 737, 747	N/A
Aeropol Aviation	707, 727, 737, 757, 767 A300/310, A320, L-1011	707, 727, 737, 757, 767 A300/310, A320, L-1011	707, 727, 737, 757, 767 A300/310, A320, L-1011	707, 727, 737, 757, 767 A300/310, A320, L-1011	N/A
Aerotron	N/A	717, 727, 737, 757, 767 777, A320/33/340, DC-10	717, 727, 737, 757, 767 777, A320/33/340, DC-10	727, 737, 757, 767, DC-10, MD-11/80, A320	N/A
AIRINC	All Airbus, All Boeing All MDC	All Boeing, DC-8/9/10 MD-80, A300, L-1011	All Boeing, DC-8/9/10 MD-80, A300, L-1011	All Boeing, DC-8/9/10 MD-80/90, L-1011	707, 727, 737, 747, 767 DC-8
Alameda Aerospace	727, 737, DC-9, MD-80 DC-10, MD-11	727, 737, 747, 757, 767 DC-9/-10, MD-80/-11	727, 737, 747, 757, 767 DC-9/-10, MD-80/-11	N/A	N/A
Amtec	N/A	N/A	N/A	727, 737, DC-9, MD-80	N/A
Atlas Aero	All Airbus, All Boeing All MDC	All Airbus, All Boeing All MDC, L-1011	All Airbus, All Boeing All MDC, L-1011	All Airbus, All Boeing All MDC, L-1011	N/A
Delta Airlines	727, 737, 757, 767, 777 MD-88/90, MD-11	737, 757, 767, 777 MD-80/90, MD-11	737, 757, 767 MD-88/90, MD-11	727, 737, 757, 767 MD-88	
Evergreen	727, 737, 747, 757, DC-8 DC-9, MD-80/90, A300	727, 737, 747, 757, DC-8 DC-9, MD-80/90, A300	727, 737, 747, 757, DC-8 DC-9, MD-80/90, A300	727, 737, 747, 757, DC-8 DC-9, MD-80/90, A300	JT8D, JT9D
Honeywell	727, 737, 747, 757 DC-9, MD-80/90	767, 777, DC-9, MD-11	717, 727, 737, 747, 757 767, 777, A300/310/330	N/A	737, 747, 767, 777 A300/310/330, MD-11
IDC Aerospace	All Airbus, All Boeing	All Airbus	N/A	All Airbus, All Boeing	All Airbus, All Boeing
Genesis Aviation	727, 737, 747, 757, 767 DC-8/9/10	727, 737, 747, 757, 767 DC-8/9/10	727, 737, 747, 757, 767 DC-8/9/10	N/A	N/A
Global Aerospace	All Airbus, All Boeing DC-8/9/10, MD-80/11	All Airbus, All Boeing DC-8/9/10, MD-80/11	All Airbus, All Boeing DC-8/9/10, MD-80/11	N/A	N/A
Pacific Hydraulic	All Boeing except 777 All MDC	All Boeing except 777 All MDC	N/A	N/A	N/A
TRW Aeronautical US Canada	All Airbus, 747, 767 DC-10, L-1011	All Airbus	N/A	All Airbus, 747	CFM56, RB211, RR Tay RR Trent, V.2500
TX pneumatic systems	N/A	N/A	Most commercial types	Most commercial types	Most commercial types
United Services	737-300, 747, 757 767, 777, A320	737-300, 747-400, 757 767, 777, A320	737-300, 747, 757 767, 777, A320	737-300, 747, 757 767, 777, A320	737-300, 747, 757 767, 777, A320

EUROPEAN AIRLINE & THIRD PARTY MRO PROVIDERS OF ROTABLE REPAIR & OVERHAUL CAPABILITIES

Provider	Flight controls ATA 27	Hydraulic system ATA 29	Pneumatic system ATA 36	Fuel system ATA 28	Fuel & engine controls ATA 73 & 76
AEM	N/A	707, 717, 727, 737, 757 All Airbus DC-8/9/10, MD-80	707, 717, 727, 737, 757 All Airbus DC-8/9/10, MD-80	707, 717, 727, 737 757, A300, All Airbus DC-8/9/10, MD-80	707, 717, 727, 737, 757 All Airbus DC-8/9/10, MD-80
Air France Industries	737, 747, 777 A320, A330, A340	737, 747, 777 A320, A330, A340	737, 747, 777 A320, A330, A340	737, 747, 777 A320, A330, A340	737, 747, 777 A320, A330, A340
Alitalia	A320, MD-80, MD-11 DC-10	A320, MD-80, MD-11 DC-10	A320, MD-80, MD-11 DC-10	A320, MD-80, MD-11 DC-10	A320, MD-80, MD-11 DC-10
Braathens	737 classic some 737NG	737 classic some 737NG	737 classic some 737NG	737 classic some 737NG	N/A
British Airways Engineering	737 classic, 747, 757 767, 777, A320	737 classic, 747, 757 767, 777, A320	737 classic, 747, 757 767, 777, A320	737 classic, 747, 757 767, 777, A320	737 classic, 747, 757 767, 777, A320
Finnair	DC-9, DC-10, MD-80 MD-11, A320	DC-9, DC-10, MD-80 MD-11, A320	DC-9, DC-10, MD-80 MD-11, A320	DC-9, DC-10, MD-80 MD-11, A320	DC-9, DC-10, MD-80 MD-11, A320
FLS Aerospace	All Boeing except 777 A320, A300, A320, A330, A340	All Boeing except 777 A320, A330, A340	All Boeing except 777 A300, A320, A330, A340	All Boeing except 777 A320, DC-8	All Boeing except 777 A320, A330, A340, DC-8
Iberia	A300, A320, A340, 727 747, 757, MD-80	A300, A320, A340, 727 747, MD-80	A300, A320, A340, 727 747, 757, MD-80	A300, A320, A340, 727 747, 757, MD-80	747, 757, DC-9, MD-80 A300, A320, A340
Kearsley Airways	N/A	737, 757, 767 A300, A310, A320 DC-8, DC-9, DC-10, L-1011	N/A	A300, A310, A320 All Boeing & MDC	N/A
KLM Engineering & Maintenance	737, 747, 767	737, 747, 767 DC-10, MD-11	737, 747, 767 DC-10, MD-11	737, 747, 767 DC-10, MD-11	CF6 related for A310 747, 767, DC-10, MD-11
Lufthansa Technik	All Airbus, 737, 747, 757 767, 777, DC-10, MD-11	All Airbus, 737, 747, 757 767, 777, DC-10, MD-11	All Airbus, 737, 747, 757 767, 777, DC-10, MD-11	All Airbus, 737, 747, 757 767, 777, DC-10, MD-11	All Airbus, 737, 747, 757 767, 777, DC-10, MD-11
Sabena Technics	707, 727, 737 classic 767, A300, A320, A330/340	727, 737, 747, A310 A320, A330, A340	727, 737, 747, A310 A320, A330, A340	A310, A320, A330 A340	727, 737, 747, A310 A320, A330, A340
SAS Component	767, DC-9, MD80/90	737, 767, A300 A310, DC-9, MD-80 MD-90		737, 767, A300 A310, DC-9, MD-80 MD-90	DC-9, MD-80
SR Technics	A310, A320, A330/340 MD-80, MD-11, DC-10	A310, A320, A330/340 MD-80, MD-11, DC-10	A310, A320, A330/340 MD-80, MD-11, DC-10	A310, A320, A330/340 MD-80, MD-11, DC-10	JT8D, CFM56 PW4000
TAP	707, 727, 737, A310 A320, A340, L-1011	707, 727, 737, A310 A320, A340, L-1011	707, 727, 737, A310 A320, A340, L-1011	707, 727, 737, A310 A320, A340, L-1011	707, 727, 737, A310 A320, A340, L-1011
Trinity Aerospace	All 737 models	N/A	N/A	N/A	N/ATR
TRW Aeronautical United Kingdom France	All Airbus, 747, 767 DC-10, L-1011	All Airbus	N/A	All Airbus, 747	CFM56, RB211, RR Tay RR Trent, V.2500

ASIA PACIFIC & AUSTRALASIA AIRLINE & THIRD PARTY MRO PROVIDERS OF ROTABLE REPAIR & OVERHAUL CAPABILITIES

Provider	Flight controls ATA 27	Hydraulic system ATA 29	Pneumatic system ATA 36	Fuel system ATA 28	Fuel & engine controls ATA 73 & 76
GAMECO	737, 757, 767	737, 757, 767, 777, A320	737, 757, 767, 777, A320	737, 757	737, 757
HAECO	747, 777, L-1011, DC-10 MD-11, All Airbus	747, 777, L-1011, DC-10 MD-11, All Airbus	747, 777, L-1011, DC-10 MD-11, All Airbus	747, 777, L-1011, DC-10 MD-11, All Airbus	747, 777, L-1011, DC-10 MD-11, All Airbus
Japan Airlines	737, 747, 767, 777 DC-10, MD-11	737, 747, 767, 777 DC-10, MD-11	737, 747, 767, 777 DC-10, MD-11	737, 747, 767, 777 DC-10, MD-11	CFM56, JT9D-7R4E, CF6-80 JT9D series, PW4000-112
SIA Engineering	737, 747, 767, 777 All Airbus	737, 747, 767, 777 All Airbus	737, 747, 767, 777 All Airbus	737, 747, 767, 777 All Airbus	737, 747, 767, 777 All Airbus
Singapore Technologies	707, 727, 737, 747, 757 767, A300, A310, A320 DC-9, DC-10, MD-11	All Boeing, A320, A300 A310, DC-8, DC-9 DC-10, MD-11	All Boeing, A320, A300 A310, DC-8, DC-9 DC-10, MD-11	707, 727, 737, 747, 757 767, A300, A310, A320 DC-9, DC-10, MD-11	JT8D-200, CFM56-3
Thai Airways	737, 747, 777 A300, A310, A330	737, 747, 777 A300, A310, A330	737, 747, 777 A300, A310, A330	737, 747, 777 A300, A310, A330	737, 747, 777 A300, A310, A330
TRW Aeronautical Singapore Sydney Xiamen	All Airbus, 747, 767 DC-10, L-1011	All Airbus	N/A	All Airbus, 747	CFM56, RB211, RR Tay RR Trent, V.2500

REST OF WORLD AIRLINE & THIRD PARTY MRO PROVIDERS OF ROTABLE REPAIR & OVERHAUL CAPABILITIES

Provider	Flight controls ATA 27	Hydraulic system ATA 29	Pneumatic system ATA 36	Fuel system ATA 28	Fuel & engine controls ATA 73 & 76
GAMCO	A320, A330, A340, 767	767, A320, A330, A340 L-1011	767, A320, A340 L-1011	767, A320, A340, L-1011	N/A
IAI/Bedek Aviation	All Boeing except 777 A320, DC-9, DC-10	All Boeing except 777 A320, DC-9, DC-10	All Boeing except 777 A320, DC-9, DC-10	All Boeing except 777 A320, DC-9, DC-10	All Boeing except 777 A320, DC-9, DC-10
South African Airways	737, 747, A300, A320	737, 747, A300, A320	737, 747, A300, A320	737, 747, A300, A320	737, 747, A300, A320
VARIG Engineering & Maintenance	727, 737, 747, 767 DC-10, MD-11	727, 737, 747, 767 DC-10, MD-11	727, 737, 747, 767 DC-10, MD-11	727, 737, 747, 767 DC-10, MD-11	727, 737, 747, 767 DC-10, MD-11

Atlas Aer, Global Aerospace, Pacific Hydraulic and TX pneumatic systems.

Europe has only a few specialist component repair providers. These include AEM and Kearsley Airways. FLS Aerospace is similar to Evergreen in the US, in that FLS Aerospace offers both airframe and component maintenance services.

Independents in other parts of the world are HAECO, Singapore Technologies Aerospace, GAMCO and IAI/Bedek Aviation.

In addition to independents, the major component manufacturers which

offer component repairs are Honeywell, with numerous global facilities, and TRW Aeronautical. Honeywell is a manufacturer of various aircraft systems, and consequently offers repair for flight controls, engine and fuel controls, hydraulics and pneumatics. TRW Aeronautical is a specialist fuel and engine control manufacturer. It manufactures engine control components for the Rolls-Royce engines, the V.2500 and CFM56-3. As a consequence it offers repair services for engine and fuel controls for these engines, and has numerous facilities located in the United

Kingdom, France, Canada, the US, Australia, Singapore and China.

Repair of fuel and engine controls is related to engine maintenance, and so most facilities that offer engine and fuel control repairs are those with engine maintenance capability. Besides TRW Aeronautical, the largest providers in North America are AIRINC, Honeywell and United Services. Similar to component repair providers, European airlines which offer extensive maintenance services have repair capability for fuel and engine controls. The case is similar for Asia Pacific airlines. 