

The 737 Next Generation aircraft has been in service now for almost 18 years. Although it is about to be superseded in part by the 737MAX, the type is a very important player in the maintenance market for all avenues of aftermarket care. Aircraft Commerce lists a sample of the NG's major technical support providers.

737NG family MRO support survey

This global survey summarises major aftermarket and technical support providers for the 737-600/-700/-800/-900NG family, and associated CFM56-7 series engine. It lists some of the world's major providers and also the levels of technical support available for the aircraft, its engines and components.

Also listed are some smaller, more specialised service providers that support both the larger maintenance, repair and overhaul (MRO) and airline operations.

The six areas surveyed related to NG maintenance covering the main categories of technical support offered, as follows:

1. Engineering management and technical support (see table, page 48):
2. Line maintenance and in-service operational support (see table, page 50):
3. Base maintenance (see table, page 52):
4. Engine maintenance and spare engines support (see table, page 53):
5. Rotables and logistics (see table, page 54):
6. Heavy component maintenance (see table, page 56):

The tables show the range of services that support providers offer. There are many sub-categories for each of the six levels of technical support. The tables reveal how comprehensive each provider's support is, and in some cases the volume of support that can be provided.

Officially titled the 737 'Next Generation', but affectionately called 'New Gens', a large number of the fleet (over 12 years of age) are now entering their second cycle of structural checks and 'C' checks. In addition, the aircraft's natural progression from tier 1 to tier 2 operators is well under way. This mixed fleet of ages and positions in the market now provides MRO organisations with different opportunities to tap into the aftermarket and maintenance service.

737NG fleet overview

There are 5,370 'active' 737NGs in operation, comprising: 58 737-600s; 1,116 737-700s; 3,794 737-800s; and 402 737-900s. The -600 figure will not rise, because the series ceased production in 2006. There is a backlog of 1,314 aircraft for the other series, of which 1,100 are for the -800. To give an idea of Boeing's current production line capacity, 414 NGs have been delivered this year.

As well as the aircraft listed as 'active', there are 65 recorded as 'parked'. One of these is a 737-600, followed by 23 -700s, 37 -800s, and four -900s. The 55 aircraft listed as 'retired' comprise 10 -600s, 38 -700s, and six -800s.

Since the NG's first flight was in 1997, and it entered service in 1998, the oldest aircraft off the production line are now approaching 17-18 years of age.

The highest flight hour (FH) aircraft in service is manufacturer serial number (MSN) 27,980 and line number (L/N) 45. This is a 737-800 built in 1998 with more than 64,000FH and 21,100 flight cycles (FC). This aircraft is last recorded to be with Transaero Airlines.

The highest FC aircraft is MSN 28,613 and L/N 463, and is a 737-700 built in 1999 with more than 44,680FC and 51,097FH. This aircraft is listed as being with GOL Transportes Aereos.

Aircraft lessors own a large percentage of 737NGs. Some of the larger fleets are with companies like AerCap and GECAS. AerCap has had 283 NG deliveries in total, consisting of six -600s, 81 -700s and 196 -800s, while GECAS's total orders of NGs equate to 359 from first delivery, comprising seven -600s, 87 -700s, 261 -800s, and four -900ERs. GECAS still has 317 aircraft in active service today.

The NG fleet operates in large numbers across many continents. The

bigger sub-fleets are in Europe, North America and the Asia Pacific region.

To give an idea of the scale of the larger airline fleets, and the proportion owned by the operator, in the Asia Pacific Air China has 127 NGs; 20 -700s and 107 -800s. Of these, 60 are owned internally by Air China. China Southern has 157 NGs; 31 -700s and 126 -800s. 71 are owned by the airline. Lion Air (Indonesia) has 103 NGs, 32 -800s and 71 -900ERs, with 10 owned by Lion Air.

In North America Delta Air Lines has 129NGs, 10 -700s, 73 -800s and 46 -900ERs, of which 114 are owned by Delta Air Lines itself.

Southwest Airlines has 561 NGs (463 -700s, and 98 -800s), of which it owns 480. United Airlines has 308 NGs, and owns 203. The fleet comprises 40 -700s, 130 -800s, 12 -900s and 126 -900ERs.

Alaska Airlines has 118 NGs, and owns 108 of these. The fleet comprises 14 -700s, 61 -800s, 12 -900s, and 31 -900ERs. WestJet, Canada has 108NGs, and it owns 63. The fleet is split between 13 -600s, 59 -700s and 36 -800s.

In South America, GOL Airlines in Brazil has 121 NGs: 26 -700s and 95 -800s. In Australasia, Qantas has 67 NGs, all -800s, and owns only 27.

Competing with Qantas in the local domestic market is Virgin Australia, which has 79 NGs, two -700s and 77 -800s. Five are owned by the airline.

In Europe Turkish Airlines has 79 NGs: three -700s, 61 -800s, and 15-900ERs. It owns 47 of these. Ireland's Ryanair has 321 NGs: one -700 and 320 -800s. It owns 271.

In the Middle East, the groupings are generally smaller. A larger NG operator is flydubai with 50 737-800s. In Africa, the fleet sizes step down again with Ethiopian Airlines as one of the larger operators with 21 737NGs. Of these, eight are owned. The fleet includes seven -700s

ENGINEERING MANAGEMENT & TECHNICAL SUPPORT

Maintenance Provider	Outsourced engineering service	MTCE programme manage	MTCE records manage	Documents & manuals manage	Design organisation approval	Reliability stats	ADs, SBs & EOs manage
Air France Industries/KLME&M		Y	Y	Y	Y (partly via AF)	Y	Y
AJ Walter Aviation	Y			Y			Y
IAI Bedek Aviation Group	Y	Y	Y	Y	Y		Y
CommercialJet	Y		Y	Y			
*Czech Airlines Technic		Y	Y	Y	Y	Y	Y
*Delta Tech Ops	Y	Y	Y	Y	Y	Y	Y
*FL Technics		Y	Y	Y	Y		Y
Lufthansa Technik	Y	Y	Y	Y	Y	Y	Y
Monarch Aircraft Engineering	Y	Y	Y	Y	Y	Y	Y
myTechnic	Y		Y	Y		Y	Y
*Sabena Technics	Y	Y	Y	Y	Y	Y	Y
*SR Technics	Y	Y	Y	Y	Y	Y	Y
*ST Aerospace	Y	Y	Y	Y	Y	Y	Y
*Storm Aviation			Y				
TAP M&E		Y	Y		Y	Y	Y
*Turkish Technic	Y	Y	Y	Y	Y	Y	Y
United Technical Operations		Y	Y	Y	Y	Y	Y

Maintenance Provider	Check planning & job card creation	Engine trend monitor	Flight data monitor	Handle aircraft accept & return	Airworthiness review capabilities	Approvals held
Air France Industries/KLME&M	Y	Y	Y	Y	Y	EASA/FAA/+30 others
AJ Walter Aviation		Y		Y		Various
IAI Bedek Aviation Group	Y	Y	Y	Y	Y	CAAI/EASA/FAA+others
CommercialJet	Y					EASA/FAA+12 others
*Czech Airlines Technic	Y				Y	EASA/FAA+8 others
*Delta Tech Ops	Y	Y	Y	Y	Y	EASA/FAA+ Extensive list
*FL Technics	Y	Y	Y	Y	Y	EASA/FAA+ over 10 others
Lufthansa Technik	Y	Y	Y	Y	Y	EASA/FAA+ Extensive list
Monarch Aircraft Engineering	Y	Y		Y	Y	EASA/FAA+ 3 others
myTechnic	Y			Y	Y	EASA/FAA/Turkish CAA /others
*Sabena Technis	Y			Y	Y	EASA/FAA
*SR Technics	Y	Y	Y	Y	Y	EASA/FAA+ Extensive list
*ST Aerospace	Y	Y	Y	Y	Y	23 civil aviation authorities
*Storm Aviation				Y		EASA/FAA+others
TAP M&E	Y		Y	Y	Y	ANAC/FAA/EASA/CANADA (Accept letter)+others
*Turkish Technic	Y	Y	Y	Y		EASA/FAA+ Extensive list
United Technical Operations	Y	Y	Y	Y	Y	FAA/EASA/CAAC +others

*Based on Aircraft Commerce research, not survey response

and 14 -800s.

Boeing Business Jets (BBJs) are not counted in the same figures above. Although similar in type, the aircraft itself is maintained via a separate maintenance planning document (MPD).

The replacement 737 MAX family has had more than 2,900 orders to date. The first aircraft is in its final assembly stages. This leaves a large impending changeover of ownership and/or operator of the NG fleet if most of the MAX aircraft are used to replace them.

737 MRO market

As it is primarily a short-haul aircraft, the 737NG's maintenance requirements are usually met locally, at a regional level. It is unusual to ferry the aircraft for maintenance to beyond the aircraft's normal region, but this can be negotiated by MROs in the bidding process.

Summers can be light for work in third-party MROs around the world, since local fleets will be in service during the peak holiday period. Other countries

in their winter downturn can be a source of supplemental maintenance work, however. Most technical support for the NGs will always be located in the regions where most of the aircraft operate.

Because there is such a large fleet of NG aircraft covering an 18-year age span, there will be a mix of ages of aircraft in major airlines cycling through the standard 'C' checks with neatly spaced 6-, 8- and 12-year structural inspections. More third-party MROs will see end-of-lease work and into-service

LINE AND LIGHT MAINTENANCE SUPPORT

Maintenance Provider	Maint ops ctrl for line	Off-site & off-line AOG	Line checks	A checks	LRU changes	Engine changes	Ldg gear changes	APU changes	Dispatch reliability stats	Aviation authority approvals
Air France Industries/										
KLM E&M	Y	Y	Y	Y	Y	Y	Y	Y	Y	EASA/FAA/+30 others
IAI/Bedek Aviation Group	Y	Y	Y	Y	Y	Y	Y	Y	Y	CAA/EASA/FAA+others
CommercialJet		Y	Y	Y	Y	Y	Y	Y	Y	EASA/FAA/+12 others
*Czech Airlines Technic	Y		Y	Y		Y		Y		EASA/FAA+8 others
*Delta Tech Ops	Y	Y	Y	Y	Y	Y	Y	Y	Y	Extensive list
*Ethiopian MRO			Y							EASA/FAA/ETCAA
*FL Technics	Y	Y	Y	Y	Y					EASA/FAA+over 10 others
Lufthansa Technik	Y	Y	Y	Y	Y	Y	Y	Y	Y	EASA/FAA+extensive list
Monarch Aircraft Engineering		Y	Y	Y		Y	Y	Y	Y	EASA/FAA+3 others
myTechnic	Y	Y	Y	Y	Y	Y	Y	Y	Y	EASA/FAA/Turkish CAA & several others
*Sabena Technics			Y	Y	Y	Y	Y			EASA/FAA
*SR Technics	Y	Y	Y	Y	Y	Y	Y	Y	Y	EASA/FAA+Extensive list
*ST Aerospace	Y	Y	Y	Y	Y	Y	Y	Y	Y	23 civil aviation authorities
*Storm Aviation		Y	Y	Y		Y				FAA/EASA/UA/BDCA+more
TAP M&E		Y	Y	Y	Y	Y	Y	Y	Y	ANAC/FAA/EASA/CANADA (Accept letter)+others
*Thai Technical			Y	Y	Y		Y			EASA/FAA+Extensive list
*Turkish Technic			Y	Y	Y	Y		Y		EASA/FAA+Extensive list
United Technical Operations	Y	Y	Y	Y	Y	Y	Y	Y	Y	FAA/EASA/CAAC+others

*Based on *Aircraft Commerce* research, not survey response

checks being performed. Although this type of maintenance will also be readily carried out at major airline and OEM supported facilities, many lessors and operators prefer to put the aircraft into a less busy hangar slot. If it overruns due to end-of-lease complications, it will not affect the critical 'in-service' line of aircraft on base checks.

Remzi Saltoglu, commercial director at myTechnic MRO Services in Istanbul, explains: "As the first batch of production has reached its maturity we will now see more 737NGs in third-party hangars like myTechnic. From the market and trading standpoint, the 737NG is now more into the used Tier 2 airlines, so there will be more activities for 'C' checks when the transitions take place. This will be in the form of redundant maintenance inputs, such as re-delivery checks, re-paints, and cabin re-configurations that will coincide with the due maintenance.

"For instance, the airline SunExpress (Turkey), which has a fleet of more than 60 NGs, is redelivering eight of them, starting later this year, for myTechnic to complete. There is movement," continues Saltoglu. "Normally Turkish Airlines, as the shareholder for SunExpress with the Lufthansa Group, would undertake the maintenance. Since we had more flexibility and availability, SunExpress

came to us. Confirming eight aircraft back-to-back to be done in four months is an important programme to capture in the third-party MRO market, especially where more work could follow."

"Over the past 10 years the NGs were mainly operated by legacy airlines and low-cost operators. The aircraft was out of reach for mid-size charter companies," adds Saltoglu. "Because the fleet is ageing for areas like Turkey, some aircraft will have now exceeded their limit of registration, which is 15 years of age. For instance, a 737NG built in 2000 cannot be registered in Turkey any more, so it has lost some of its economic value there. More 737NGs will move on as a result, and will be flown by charter operators because they will now have the chance to reach that airplane type."

Engineering management

Outside of the physical engineering function of carrying out maintenance checks, engineering management functions are also required to maintain an aircraft's continued airworthiness.

Many of the large independent MRO providers and larger airline maintenance and engineering departments offer engineering management services. These are tasks that were traditionally kept in-

house, but increasingly have been subcontracted as independent companies begin to specialise in this area.

With an aircraft type as heavily owned by leasing companies and banks as the NG, the background handling of airline engineering management services can be complicated if aircraft frequently change operators. The services needed include: design organisation approval; maintenance records management (also known as technical records management); documents and manuals management; maintenance programme management; reliability statistics monitoring; monitoring of airworthiness directives (ADs) and service bulletins (SBs); check planning and job card management; aircraft acceptance and return services; and continued airworthiness capabilities.

The providers surveyed and researched that provide most of these services are listed (*see table, page 48*). As expected, the greater the link with an airline or OEM, or the greater the size of the sometimes 'grouped' MROs, then the greater the range of services offered. Also, those MROs that can manage aircraft maintenance programmes for continued airworthiness will want to carry out all aspects of record-keeping and document control to support the primary function.

MRO support can often be

BASE MAINTENANCE SUPPORT

Maintenance Provider	C checks	D & heavy checks + mods	Interior refurb	Strip & paint	Training approval held	Workshop capabilities	No of base check bays	No of mechs	No of shifts	Annual base check capacity	Aviation authority approvals
Aeroman	Y			Y		Y	18				EASA/FAA+ Extensive list
Air France Industries/ KLM E&M	Y	Y	Y	Y	Y	Extensive	14		3		EASA/FAA+ 30 others
CommercialJet	Y	Y	Y	Y		Extensive	16	600	2		EASA/FAA+12 others
*Cardiff Aviation	Y		Y	Under development	Composite material training	Y					EASA/Nigerian/Bermudan
*Czech Airlines Technic	Y	Y	Y	Drawing creation		Y	6				EASA/FAA+8 others
*Delta Tech Ops	Y	Y	Y	Y	Y	Extensive		400+ mechs a/c maint			FAA/EASA
*Ethiopian MRO	Y	Y		Y	Y	Y		1,800 total staff			FAA/EASA/ETCAA
IAI Bedek Aviation Group	Y	Y	Y	Y	Y	Y	20	2,643	2+3rd as req.	120	CAA/EASA/FAA+ others
*FL Technics	Y	Y	Y	Y	Y	Y					EASA/FAA+ over 10 others
Lufthansa Technik	Y	Y	Y	Y	Y	Extensive	19		3		EASA/FAA+ Extensive list
Monarch Aircraft Engineering	Y	Y	Y	Y	Y	Y					EASA/FAA+3 others
myTechnic	Y	Y	Y	Y	Y	Wheels & brakes Emergency equip Battery Hydrostatic Electrical equip	12	300	1+1	100	EASA/FAA/Turkish CAA & several others
*Sabena Technics	Y	Y	Y	Y	Y	Y					EASA/FAA
*SR Technics	Y	Y	Y	Y	Y	Extensive					EASA/FAA+ Extensive list
*ST Aerospace	Y	Y	Y	Y	Y	Y	13				23 Civil aviation authorities
*Storm Aviation				Tech assistance	Y						FAA/EASA/UAE/BDCA+ more.
TAP M&E	Y	Y	Y	Y	Y	Passenger seats composites, structures galley & interiors	12 over multiple bases	1,055	2	1,207,000MH	ANAC/FAA/EASA/CANADA (Accept letter)+ others
*Thai Technical	Y	Y	Y			Y					EASA/FAA+ Extensive list
*Turkish Technic	Y	Y	Y	Y	NDT	Y					EASA/FAA+ Extensive list
United Technical Operations	Y	Y	Y		Y	Extensive	4 facilities 14 bays	4,000+	24/7	Variable by check & a/ctype	FAA/EASA/CAAC+ others

*Based on *Aircraft Commerce* research, not survey response

supplemented by joint ventures between different airlines' technical departments, such as Air France Industries and KLM Engineering and Maintenance. As shown (see table, page 48), where one company does not have the requested technical support, in this case design organisation approval, the other may have it.

There are more than 350 737NG operators worldwide, and most operate fleets of 20 aircraft or smaller. These operators are likely to need outsourced engineering and technical management support from the larger grouped MROs with multiple bases, and a substantial workforce which supports it.

Line maintenance

Large airlines can perform most or all of their own line maintenance at their home bases and outstations, as well as provide line maintenance to many smaller airlines. There are also specialist line maintenance organisations that perform

line turnarounds and aircraft-on-ground (AOG) support.

Line functions can vary from basic aircraft handling during turnaround or overnight stays, to minor scheduled work like 'A' checks or component changes. Any defect noted on an aircraft that is on line will change its condition to AOG. AOG services are considered part of line maintenance services, and can extend to 'away-from-base' aircraft retrievals and/or repairs.

Most of the providers listed (see table, page 50) offer most or all of the different levels of line maintenance support. For example, United Technical Operations and SR Technics will have access to the consumables and tooling needed for larger events, like engine changes.

For smaller, but yet still global, operators like Storm Aviation, the opening in the market comes in handling more of the extended network line coverage for airlines, as well as focusing on the behind-the-scenes dealings with

the consultancy needs for aircraft during pre-purchase and lease returns.

The Aviation Authority approval list shown will need to be cross-checked to observe any difference between approvals for base maintenance versus those restricted to line capabilities.

Base maintenance

NG maintenance providers in general will have followed on with their hangar capabilities from the 737 Classics as a natural progression. Although differences in the licence types for working on the aircraft and tooling are bespoke to each 737 family, the physical familiarity between the two types cannot be ignored.

The NG's MPD, however, is different to its classic predecessor's and arranges maintenance checks based on FH, FC, and calendar-driven inspection tasks. The larger structural inputs are at six, eight and 12 years, with gear overhauls required every 10 years. As the aircraft

ENGINE MAINTENANCE AND SPARE ENGINE SUPPORT

Maintenance Provider	Engine maint mgt	Scheduled on-wing eng maint	Un-scheduled on-wing maint	Eng shop visits	Parts repair scheme	Total care packages	Level of test cell capabilities	AOG services	Short & long term leases	Engine pooling
AirFrance Industries/ KLM E&M	Y	Y	Y	Y	Y	Y	Full	Y	Y	Y
*Aeroturbine	Y			Y		Y	Full	Y	Y	Y
AJ Walter Aviation	Y									
AJ Walter Engine Division								Y	Y	Y
IAI Bedek Aviation Group	Y	Y	Y	Y	Y	Y	Full	Y	Y	Y
*Chromalloy	Y				Y					
Commercialjet		Y	Y							
*Czech Airlines Technic	Y	Y	Y							
*Delta Tech Ops	Y	Y	Y	Y	Y		Up to 100,000 pounds thrust	Y	Y	Y
*Ethiopian MRO		Y	Y	Y			Full			
*FL Technics	Y	Y	Y					Y	Y	
*GE Engine Services	Y	Y	Y	Y	Y	Y	Full	Y	Y	Y
Lufthansa Technik	Y	Y	Y	Y	Y	Y	Full	Y	Y	Y
myTechnic		Y		Pending						
*SAFRA - Snecma	Y	Y	Y	Y	Y	Y	Full	Y	Y	Y
*SR Technics	Y	Y	Y	Y	Y	Y		Y	Y	Upon req.
*ST Aerospace	Y	Y	Y	Y	Y	Y	Full	Y	Y	Y
TAP M&E		Y	Y							
		HPT top case repair								
*Turkish Technic		Y	Y	Via affiliates	Y		Y	Y	Sales only	
United Technical Operations	Y	Y	Y							
*Willis Lease Finance								Y	Y	Y

*Based on *Aircraft Commerce* research, not survey response

move between operators, end-of-lease conditions can mean that the required further clearance of FH, FC and calendar tasks can become out of sync with actual aircraft age.

The service providers (*see table, page 52*) for base maintenance support show a varying number of base check bays available for the NG. TAP Maintenance and Engineering has the capacity of 1.2 million man-hours a year, while Israel Aerospace Industries (IAI)/Bedek has capacity for 120 base checks. Varying check sizes, supplementing the work force with contracted labour when required, and dreaded check overruns all mean that a facility's annual capacity fluctuates.

Lufthansa Technik's extensive offering of all services concerning the 737NG covers five sites across Europe under the Lufthansa Technik name: Lufthansa Technik Shannon (six); Lufthansa Technik Sofia (five); Lufthansa Technik Budapest (four bays); Lufthansa Technik Malta (four); and Lufthansa Technik Berlin-Schoenefeld (four). This size of operation has all facilities working with up to three shifts, including at weekends.

To give a breakdown of the manpower to deliver maintenance from a

large MRO provider, IAI/Bedek Aviation Group, has 20 bays at its facilities and 1,517 mechanics in a total workforce of 2,643. This comprises 129 engineers (supported by IAI H/Q engineering division), 85 Logistics, 81 quality assurance, 1,062 production and 160 management personnel.

To provide a full 'one-stop' support package, base maintenance providers must be capable of more than just the scheduled maintenance. IAI/Bedek offers, for example, under one roof components, landing gears, APUs and CFM56-7 engine maintenance capabilities for NGs in support of its annual 120 base checks.

'Workshop capabilities', sometimes referred to as 'back shops', are what maintenance support providers need for their daily scheduled maintenance hangar inputs. These can include workshops for welding, sand blasting, fibreglass repairs, and tooling calibration. On a bigger, more involved scale, it can include any support shop needed for any part that may be removed from the aircraft for service, repair or overhaul in accordance with the individual item's component maintenance manual (CMM), rather than the aircraft manufacturer's AMM.

This could include air conditioning and pressurisation workshops to clean, test, repair and overhaul heat exchangers, re-heaters, and condensers, or emergency equipment workshops for the repair and overhaul of escape slides and rafts. All the MROs performing C checks have some form of workshop capability. Only the extent of the services will vary.

Having painting capabilities for MROs can be a decisive factor in winning maintenance work. Full paint with a chemical strip on an NG is possible within seven days, and will also include fuselage inspection. If the aircraft is on a base check undergoing maintenance, the owners will not want to have to ferry it post-check to be painted. Most of the companies investigated for the base maintenance support chart, have the capability to strip and paint an aircraft.

Additional base maintenance MRO revenue from the next phase of selected 737NGs' life is passenger-to-freighter conversion (*See 737NG P-to-F conversion programmes Aircraft Commerce issue April/May 2015, page 74*).

Aeronautical Engineers Inc (AEI) is developing the 737-800 P-to-F conversion

ROTABLES AND LOGISTICS

Maintenance Provider	Rotable inventory initial provisioning estimates	Rotable leasing/exchange	Consumables inventory	Repair & document mgt	AOG support	Fixed cost per FH full rotatable support contracts	Aviation authority approvals
Air France Industries/KLM E&M	Y	Y	Y	Y	Y	Y	EASA/FAA+30 others
AJWalter Engine Division	Y	Y	Y	Y	Y	Y	Various
IAI Bedek Aviation Group	Y	Y	Y	Y	Y	Y	CAAI/EASA/FAA+others
CommercialJet			Y		Y		EASA/FAA+12 others
*Czech Airlines Technic		Y	On AOG basis		Y		EASA/FAA+8 others
*Delta Tech Ops	Y	Y	Y	Y	Y		Extensive list
*FL Technics		Y	Y	Y	Y	Y	EASA/FAA+over 10 others
*KGAR		Y	Y	Y	Y	Y	EASA and/or FAA release certs
Lufthansa Technik	Y	Y	Y	Y	Y	Y	EASA/FAA+Extensive list
*Sabena Technis		Y	Y	Y	Y		EASA/FAA
*SR Technics	Y	Y	Y	Y	Y	Y	EASA/FAA+Extensive list
*ST Aerospace	Y	Y	Y	Y	Y	Y	23 Civil aviation authorities
TAP M&E		Y		Y			ANAC/FAA/EASA/CANADA (Accept letter)+others
*Turkish Technic		Y	Y		Y		EASA/FAA+Extensive list
United Technical Operations	Y	Loans only	Y-own fleet	Y-own fleet	Y-own fleet		FAA/EASA/CAAC+others

*Based on *Aircraft Commerce* research, not survey response

that is scheduled for first aircraft completion in the second half of 2017 for GECAS, which has ordered 10 firm conversions and 10 options. The first is scheduled for 2016, and will achieve FAA supplemental type certification (STC) in 2017. ACG has also committed to 15 firm conversions, and 15 options.

For CommercialJet, an MRO based in Florida specialising in aircraft heavy maintenance and modification services, and an authorised conversion facility for AEI, this means the 737NG P-to-F programme provides extensive, consistent, and predictable maintenance inputs. Any additional C check or heavy scheduled maintenance carried out at the same time as the STC will provide additional revenue.

To sum up base maintenance for the NGs, Saltoglu notes: “In general the 737NG is a maintainable aircraft, easy to access with no major problems like the wing corrosion of Airbuses. The 737NGs do, however, have had their own problems lately. For example, we observed cracks in the keel beam during a recent ‘C’ check programme. This is a problematic area, and we had to spend 200-300MH per aircraft on the structural defect. Other than that, the availability of labour and accessibility of the aircraft, along with good responses from Boeing for repair schemes, are very positive for the ease of 737NG maintenance.”

What could also be key for an MRO’s capabilities are the approvals it holds from airworthiness authorities. The longer the list of approvals, the more work they will be able to capture.

Engine support

Engine maintenance and spare engine support is where engine OEMs offer services in addition to independent MROs and airlines.

The CFM56-7B is the exclusive engine for the 737NG family. It also powers the BBJ variants.

While engine maintenance services handle the scheduled and unscheduled inspection, repair and overhaul of the -7 engines, the core of spare engine support is providing spare engines for airlines whose main powerplants are removed for shop visits or have been damaged.

The list of engine maintenance and spare engine support providers (*see table, page 53*) shows they type of services offered for the CFM56-7B.

One company shown, AJW Engine Division, which is a multi-faceted organisation in the supply, exchange, repair and lease of commercial aircraft spare parts, has full AOG 24/7 support capabilities with engine leasing available. It also has consumable inventories to support the parts requirements of both line and heavy maintenance. All repair management and documentation is available with AJW Group’s 145 repair capability, using OEM-contracted services. This ensures high reliability, with cost-effective solutions. Full power-by-the-hour (PBH) line replaceable (LRU) support is also offered on both air transport association (ATA) Chapter and specific part number.

The sister company AJW Aviation handles the aircraft engine maintenance

management, together with the aircraft’s needs, so it will be more represented among the engineering management and technical providers (*see table, page 53*).

Engine maintenance and spare engine support could be split into two tables. This would show that major aircraft MROs can include engine overhaul and spare engine capability, while the engine lessors independent of the OEMs will focus on spare engine support and leasing only. Engines maintenance would be outsourced and ‘managed’, rather than performed in house.

Rotables and logistics

The extent of the line replaceable units (LRUs), rotatable components, and general consumables inventory needed to support MRO functions can be viewed in two ways: first, the resultant need to have in-house rotatable and logistics services to support an airline’s own operation; and second, an extra means of revenue to be leased out and exchanged (*see table, this page*). United Technical Operations’ support for consumables inventory, AOG support and repair management is reserved for its own fleet.

To cover the vast array of parts needed for the day-to-day operation of the NG fleet, and their maintenance visits, some outsourcing is needed to open up the market to independent suppliers.

There is no talk of concern on the point of parts availability in the 737NG MRO market. “Parts availability and support is very positive for the NG,” adds Saltoglu. “The first 737-700s have

HEAVY COMPONENT MAINTENANCE

Maintenance Provider	Wheels, inspection & repair	Tyre retreading	APU test & shop visit	Thrust reverser shop visit	Landing gear overhaul	Landing gear exchange/ lease	Aviation authority approvals
Air France Industries/KLM E&M	Y		Y	Y		Y	EASA/FAA/+30 others
AJWalter Aviation	Y	Y	Y	Y	Y	Y	Various
IAI Bedek Aviation Group	Y		Y		Y	Y	CAA/EASA/FAA+others
*Czech Airlines Technic	Y				Y	Y	EASA/FAA+8 others
*Delta Tech Ops	Y		Y	Y	Y	Y	Extensive list
*FL Technics			Management		Management		EASA/FAA+over 10 others
*KGAR					Management		EASA and/or FAA release cert
Lufthansa Technik	Y	Y	Y	Y	Y	Y	EASA/FAA+ Extensive list
myTechnic	Y						EASA/FAA/Turkish CAA +several others
*Sabena Technis	Y			Y			EASA/FAA
*SR Technics	Y		Y	Y			EASA/FAA+ Extensive list
*ST Aerospace	Y				Y	Y	23 Civil aviation authorities
TAP M&E	Y		Y	Y	Y	Y	ANAC/FAA/EASA/CANADA (Accept letter)+ others
Thai Technical	Y						EASA/FAA+ Extensive list
*Turkish Technic	Y		Y	Via affiliate	Y	Y	EASA/FAA+ Extensive list
United Technical Operations				Not on NG	Y	Possible	FAA/EASA/CAAC+others
World Aero	Y	Y					EASA/TCCA

*Based on *Aircraft Commerce* research, not survey response

recently begun to be broken up for parts. The type was previously too valuable to be dismantled. The -700 with its lower configuration of passenger seats, however, is not the most favoured family member, so more aircraft will be dismantled, and component availability will increase, thereby allowing the component price to fall.”

KGAR (KG Aircraft Rotables), with warehouse and distribution centres for NG aircraft components in the UK and USA, is an independent specialist in the supply and repair of rotatable components, including component leasing and PBH support for the NG and other aircraft.

Managing the repairs, overhaul and modification of a variety of rotatable components will be another function of the larger MROs. Key items like flight controls and engine inlets are stocked with FAA/CAA dual release.

Heavy components

Heavy component maintenance can include items such as wheels (including tyres), brakes, landing gears, thrust reversers and APUs.

The MROs that have the back shop support services (and space) to handle these heavy components will tend to be those that are supported by, or are part of, airlines and OEMs. If not, then only a couple of types of landing gears may be overhauled, to limit the infrastructure needed, or ‘management’ of the overhaul

may be offered as the parts go off base.

Outsourcing more specific requirements like wheels, brakes and landing gears can allow independent support shops to step into the market as standalone service providers to cover areas that the major MROs do not.

World Aero is an independent EASA-, TCCA-, and imminently FAA-approved wheels and brakes specialist support shop that provides NG component repair, overhaul, parts, sales, part exchanges and inventory management.

World Aero works primarily with 737NG wheels and brakes, mainly due to the huge numbers of aircraft in service. More than 70% of World Aero’s business is for the 737NG. Many of these NGs are with smaller airlines operating a fleet of 10-20 aircraft, which is an ideal size to deal with since it provides good regular throughput and often offers opportunities to provide additional services.

As considerable numbers of the worldwide 737NG fleet are retrofitted with modern carbon wheels and brakes, market values of surplus steel brakes and accompanying wheels have dropped. The price of brake piece parts is rising every year, so on some steel brake platforms the cost of a quality overhaul is approaching the market value of the brakes. This presents new challenges for MROs.

Despite the carbon retrofits, many large operators are still operating on steel brakes due to the logistical problems of rolling out a retrofit across a large fleet,

as well as more deep-rooted commercial reasons, which outweigh the benefits of the modest weight saving that carbon brakes provide on a short-haul aircraft.

As the NG wheels and brakes age, additional inspection requirements have been introduced. These must be carried out by specialist personnel and equipment. This has led to an increasing number of jobs going to companies like World Aero from less capable MROs, which do not want to invest in specialist tasks. With just over 16 years in the business, World Aero understands that one of the keys to success is investment in the correct tooling and equipment. One such investment for UTC Aerospace Services 737NG carbon brakes has already seen orders from a major national carrier.

Although the OEMs are active in NG wheel and brake support, there is greater opportunity for independent MROs such as World Aero as the aircraft moves more to Tier 2 operators. Being flexible and not tied to an OEM allows World Aero to offer support for the three OEM products (Honeywell, UTC Aerospace and Messer-Bugatti-Dowty) in repair, overhaul, sale, and exchange of wheels and brakes. For smaller operators, World Aero’s tyre programme offers an elegant solution to managing tyre costs and logistics. [AC](#)

To download 100s of articles like this, visit:
www.aircraft-commerce.com