There are more than 1,700 active and stored 757s and 767s globally. Although originally designed in the late 70s, early 80s, in terms of their useful utility and FC life remaining, the fleet types still have a lot to offer the passenger and freighter aircraft market.

757/767 MRO & engineering support

This global fleet and maintenance repair and overhaul (MRO) survey gives a current snapshot of the 757s' and 767s' age, utilisation, numbers, and global aftermarket technical support providers. The maintenance talking points for both the passenger and freighter types and their series engine are also detailed.

While in some regions 757 and 767 operators' in-house MRO capabilities may be declining due to their re-fleeting processes, some independent MRO providers still have the two types as their core business. With a noticeable peak in handover checks, storage work, and airframe conversion programmes taking place, there is plenty of 757 and 767 activity to be supported by the MROs.

Fleet overview

The 757 family entered service in January 1983, with production ceasing in 2004. The original 757-200 variant was followed by additional models, including: the 757-200PF (Production Freighter) in 1987; the 757-200M (Combi) in 1988; the 757-200SF (Special Freighter - passenger-to-freighter conversion variant) in 2001; and the 757-300 (stretched version) in 1999. The 757 was classed as a mid-sized narrowbody, and 1,050 were built.

The 767 family entered service in September 1982. The -300 series is still in production.

The 767-200 was followed by the -200ER (Extended Range) variant in 1986, the 767-300 (first stretched version) later in 1986, and then by the 767-300ER (Extended Range variant of the -300) in 1988. The 767-300PF entered service in 1995, the 767-400ER (further stretched version) in 2000, and the 767-300BCF (Boeing Converted Freighter) in 2008.

Classed as a mid- to large-sized widebody, about 1,085 aircraft have been produced with orders of over 70 767-300PF still to be fulfilled.

In total between the two models, 1,775 passenger and freighter aircraft are currently in service and stored *(see table, page 48)*.

There are 847 757-200 series aircraft comprising 372 active passenger (including one Combi), 264 active freighter, 207 stored passenger, and four stored freighter aircraft. For the 757-300 series type there are 55 active aircraft, all of which are passenger-configured.

There are 117 767-200 series aircraft, comprising 24 active passenger, 60 active freighter, and 33 stored passenger aircraft. For the 767-300 model there are 719 aircraft, comprising 486 active passenger, 138 active freighter, 93 stored passenger, and two stored freighters. The current count for the 767-400 is 37, all in passenger configuration.

757 fleet age and utilisation

The oldest 757-200 aircraft off the production line are now approaching 32-33 years of age, with the youngest now being 11-12 years of age.

The oldest in-service aircraft are currently working as freighters for European Air Transport (EAT), and are line number (L/N) nine and L/N 10. They have accumulated 34,400 flight cycles (FC) and 43,606 flight hours (FH), and 33,876FC/44,889 FH. Their current listed average annual utilisation is just over 1,000FC and 1,300FH, which covers their freighter and passenger service life.

The highest 757-200 utilisation aircraft in terms of FC is L/N 41 with 45,664FC at 31.5 years of age. This aircraft is stored by Delta Air Lines with an average annual utilisation of 1,454FC and 2,879 FH over the aircraft's life

The highest 757-200 utilisation aircraft in terms of FH is L/N 97 with 104,302FH at 30 years of age. It is stored with Bell Atlantic TriCon Leasing Corporation, with an average utilisation of 1,208FC and 3,511FH per year over its in-service life.

As the 757-300 entered service in 1999, the oldest aircraft are now only just over 17 years of age. The first -300 aircraft were delivered to Condor and are still in operation with its passenger service. The two oldest 757-300s are L/N 804 and L/N 810 have accumulated 17,761FC /48,722FH, and 18,338FC/51,286FH respectively.

Also with Condor is the highest 757-300 utilisation aircraft in terms of both FC and FH. The aircraft is L/N 839 with 19,111FC and 54,229FH at 17 years of age. This works out to be an average of 1,125FC and 3,190FH per year.

767 fleet age and utilisation

The oldest 767-200 aircraft off the production line are now approaching 33-34 years of age, with the youngest being 14-15 years of age.

The two oldest in service 767-200s at 33.5 years are currently operated by Vision Airlines with L/N seven, and Jet Asia Airways with L/N 10. Both aircraft are in passenger service, and have accumulated 19,064FC/78,186FH and 19,854FC/79,241FH respectively. This equates to an average annual utilisation of near 600FC and over 2,300FH.

The oldest freighter 767-200 aircraft is with ABX Air. This is L/N six at 40,108FC/84,062FH with an average annual utilisation of 1,183FC and 2,479FH.

The highest 767-200 FC utilisation aircraft is also with ABX Air. This is L/N 110 with 48,736FC at 31 years of age,

757 & 767 FLEET SUMMARY

Active passenger fleet

Type	Engines	Qty
757-200	PW2037	136
	PW2040	20
	RB211 535E4	215
	Total	**371**
757-200C	RB211 535E4	1
	Total	**1**
757-300	PW2043	16
	RB211-535E4	39
	Total	**55**
767-200	JT9 7R4D	2
	Total	**2**
767-200ER	CF6 80A	3
	CF6 80C2	8
	JT9 7R4D	8
	PW4052	1
	PW4056	2
	Total	**22**
767-300	CF6 80A	11
	CF6 80C2	36
	JT9 7R4D	6
	PW4056	4
	PW4060	4
	Total	**61**
767-300ER	CF6 80C2	265
	PW4052	11
	PW4056	3
	PW4060	102
	PW4062	27
	RB211 524H	17
	Total	**425**
767-400ER	CF6 80C2	37
	Total	**37**

Active freighter fleet

Type	Engines	Qty
757-200PF	PW2040	36
	RB211 535E4	43
	Total	**79**
757-200SF	PW2037	36
	PW2040	10
	RB211 535C	30
	RB211 535E4	109
	Total	**185**
767-200F	CF6 80A	48
	CF6 80C2	8
	JT9 7R4D	4
	Total	**60**
767-300F/Converted	CF6 80C2	133
	PW4060	5
	Total	**138**

Stored aircraft

Type	Engines	Qty
757-200	PW2037	112
	PW2040	7
	RB211 535E4	88
	Total	**207**
767-200	JT9 7R4D	2
	Total	**2**
767-200ER	CF6 80A	8
	CF6 80C2	14
	JT9 7R4D	7
	PW4056	1
	PW4060	1
	Total	**31**
767-300	CF6 80A	8
	JT9 7R4D	2
	Total	**10**
767-300ER	CF6 80C2	56
	PW4056	1
	PW4060	11
	PW4062	4
	RB211 524H	1
	Total	**83**
757-200F	RB211 535C	1
	RB211 535E4	1
	PW2037	1
	PW2040	1
	Total	**4**
767-300F/Converted	CF6 80C2	2
	Total	**2**

Notes:
1). Many stored 757-200s are pending passenger to freighter conversion.
2). Some minor series variations have been grouped under the master type for chart grouping purposes.
3). Information gathered from data available beginning of Jan 2016.

and with an average utilisation of 1,582FC and 2,072FH per year.

The highest 767-200 FH utilisation aircraft is L/N 217 with 108,520FH at 28 years of age. This is stored for KMW Leasing LLC with an average of 752FC and 3,918FH per year.

The oldest in-service 767-300 aircraft are now almost 30 years old. These are L/N 136 and L/N 158, flying as passenger aircraft for Hawaiian Airlines and SBA Airlines. Their current utilisation is 35,048FC/87,896FH for L/N 136, and 22,937FC/79,600FH for L/N 158. They average very different annual utilisations, with L/N 136 flying 1,200FC/3,000FH and L/N 158 flying 786FC/2,726FH a year.

The highest 767-300FC utilisation is L/N 439 with 46,545FC. At 24 years of age it is currently operated by Air Do and has averaged 1,972FC/2,325FH per year.

The highest 767-300FH utilisation aircraft is L/N 215 with 123,520FH. At 28 years of age, the aircraft is currently operated by Air Canada and has averaged 1,200FC/4,459FH per year.

The 767-400ER entered service in 2000, with the older aircraft now being 16 years of age. The average utilisation for the fleet of 37 is 731FC/4,163FH per year. *(see table, this page).*

Fleet locations

The 757 and 767 fleet operate in large numbers. The bigger sub-fleets are in Europe, North America and Asia.

In terms of active and stored fleets in the US by operator (not owner), American Airlines has 110 757-200ERs and 55 767-300ERs, Delta Air Lines has 166 757-200s (leased and stored), 16 757-300s, 81 767-300s, and 21 767-400ERs, Fedex has 102 757-200s and 30 767-300s, and UPS has 75 757-200s and 59 767-300s.

In Europe many 757s are working as freighters. DHL/EAT has a combined fleet of 34 757-200s, with two more ex-Thomas Cook aircraft lined up for conversion. DHL Air also has four 767-300s in service. Other larger operators are Condor, which has 13 757-300s and 15 767-300s, and Icelandair which has 24 757-200s and one stored 767-300. Operators that are winding this fleet type down are British Airways, which has 20 767-300ERs (eight stored), and Thomas Cook, which has 14 757-200s (two stored).

Fleets in the Australasia region are in decline as local airlines re-fleet to other Boeing and Airbus types. Qantas now has only four 767-300s, all of which are stored, while Air New Zealand has five

757 & 767 AVERAGE AGE AND UTILISATION DETAILS

Type	Quantity	Average age	Highest FC aircraft	Highest FH aircraft	Average annual utilisation
Active passenger fleet					
757-200	371	19.8	45,041	92,954	1,043FC & 3,063FH
757-200 combi	1	22.5	21,332	58,256	776FC & 2,119FH
757-300	55	14.2	19,111	54,229	1,042FC & 3,200FH
767-200	2	31.6	35,968	79,143	891FC & 1,945FH
767-200ER	22	24.8	27,099	102,711	627FC & 2,831FH
767-300	61	22.5	46,545	87,896	1,164FC & 2,096FH
767-300ER	425	17.0	39,113	123,520	N/A
767-400ER	37	14.7	12,924	67,302	731FC & 4,163FH
Active freighter fleet					
757-200PF	79	22.5	32,090	92,954	523FC & 891FH
757-200SF	185	24.8	44,790	90,294	971FC & 2,171FH*
767-200F	60	30.8	48,736	89,015	112FC & 2,212FH*
767-300F	138	12.0	29,620	105,587	N/A
Stored aircraft					
757-200	207	24.0	45,664	104,302	1,086FC & 2,840FH
767-200	2	30.0	37,713	45,244	1,230FC & 1,425FH
767-200ER	31	26.4	29,325	108,520	679FC & 3,236FH
767-300	10	25.9	34,746	78,941	1,112FC & 2,249FH
767-300ER	83	22.3	33,764	112,623	792FC & 3,556FH
757-200F	4	26.4	37,212	87,554	1,051FC & 2,192FH*
767-300F	2	17.0	15,470	65,950	N/A

Notes:
1). N/A = not available due to missing data for large number of younger aircraft.
2). * = average utilisation figures for some freighters affected by time spent as passenger aircraft.
3). Information gathered from data available beginning of Jan 2016.

767-300ERs left.

Larger fleets in Asia are with Japan Airlines (JAL), which has 42 767-300s; and All Nippon Airways (ANA), which has 40 767-300s. ANA also owns 11 more, which are operated by other carriers.

In the Middle East and Africa the groupings are smaller. Ethiopian, for example, has seven 757-200s and seven 767-300s. In South America LAN Airlines and its affiliate operators have 27 767-300 passenger and freighter aircraft.

The global dispersion of the fleet type will determine where supporting MROs will be based. While MROs linked with major airlines will have multiple bases and bays to work the types, many standalone third-party MROs provide aircraft maintenance support as well, which are listed *(see table, page 52)*.

MRO base maintenance

Engineering management

The aircraft maintenance programme or maintenance planning document (MPD) has been relatively consistent over the past five years for the 757 and 767. The last major changes were in May 2010 for the 757, and April 2012 for the 767, when the Boeing Integrated Structural Inspection Programme (ISIP) and the MPD 'letter checks' disappeared. Letter checks were replaced by FC, FH and calendar time intervals for each task, and the ISIP tasks by an integrated corrosion prevention programme.

A recent minor change is the 2014 revision of the 767-300 MPD, which responded to the industry's requests for clarification of the flight-length sensitive (FLS) supplemental inspections tasks for passenger-to-freighter converted aircraft.

FLS tasks require accumulated FC and FH information to determine the inspection implementation intervals that may deviate from the base 50,000FC and 120,000FH initial trigger point.

Bill Tarpley, president of Creative Conversion Management LLC, explains: "Boeing has addressed the inter-mix of passenger versus freighter life for FLS tasks. As most freighters fly about 50% of their original OEM predicted annual utilisation rate, yet are exposed to different stress loadings, operators wanted to know how conversion to freighter would affect FLS tasks. It was also important to add any adjustments to account for the aircraft being in passenger configuration first."

"The main area of concern was the landing gear," continues Tarpley. "For example, on the 767 the landing gear on a freighter has a lower threshold for MPD FLS inspections than the passenger aircraft. When you hit 40,000FC on a freighter, detailed structural inspections are required, but it is at 50,000FC, which is at the aircraft's limit of validity (LOV) for a passenger aircraft. These extended life inspections had to be adjusted (beyond LOV limits) for aircraft that had spent half their life in passenger service."

The LOV represents operational FC and FH limits that the MPD is designed to support, based on fatigue testing evidence obtained through in-service inspections and teardown evaluations.

767BCF supplemental inspection thresholds are now calculated based on the summation of fatigue damage accrued as a passenger aircraft, and then as a freighter, and are identified by the term 'combined threshold'. Others are calculated from the date of modification and are identified as 'mod date' sensitive.

The combined threshold inspections are around the fuselage skin, stringers and fasteners at specific areas of the aircraft. Some 'mod date' sensitive structural inspections relate to the main cargo door cut-out reinforcement and skin fasteners in specific areas.

These changes currently mainly affect the pre-planning of maintenance as few aircraft have reached, or are reaching the limit to have undertaken the tasks.

Design/modifications

Additional services offered by MROs can be in the form of obtaining design approvals, including drawing completion and parts sourcing or fabrication. For the

SAMPLE OF 757/767 GLOBAL AIRCRAFT BASE MAINTENANCE SUPPORT BY REGION

Maintenance Provider	757 airframe	767 airframe	Interior refurb	Strip & paint	Line maint	Engine O/Haul	Ldg gear	Comp. support	Pax to cargo	Aviation authority approvals
North America										
AAR Corp	Y	Y	Y	Y	Y		Y	Y		EASA/FAA+Extensive list
Commercial Jet	Y	Y	Y	Y	Y				Y (757)	EASA/FAA+12 others
Delta TechOps	Y	Y	Y	Y	Y	CF6-80A/-80C2 PW2000/4000	Y	Y		EASA/FAA+Extensive list
KF Aerospace	Y	Y	Y		Y					EASA/FAA
HAECO Americas	Y			Y	Y				Y	EASA/FAA/TCCA
United Technical Ops			Y		Y	PW2000 PW4056/4060	757 only	Y		FAA/EASA/CAAC/GCAA/other
Central/South America										
Aeroman	Y			Y	Y					EASA/FAA+extensive list
AeroMexico TechOps	Y	Y	Y		Y					FAA
Coopesa RL	Y		Y	Y	Y					EASA/FAA+extensive list
TAM MRO		Y			767(GE)			Y		Not listed
Africa/Middle East										
Egyptair M&E				Y						EASA
Ethiopian MRO		Y	Y	Y	Y	PW2000/4000 Modular maint	Partial	Y		EASA/FAA/ETCAA
Asia/Pacific										
A/C Main. Services Aust.					Y					CASA/PENDING FAA/EASA
Air New Zealand		Y			Y			757/767 Pool		EASA/FAA/NZCAA/CASA
AMECO Bejing		Y	Y	Y	Y	RB211-535E4 PW4000	Y 767			EASA/FAA/CAAC+11 others
HAECO Xiamen	Y	Y			Y			Y	Y (757)	EASA/FAA+extensive list
myTechnic	-200	Pending	Y	Y	757-200	CF6-80 series				EASA/FAA/Turkish CAA+other
Qantas E&M		Y	Y	Y	Y	CF6-80C2 RB211-524		Y		Not listed
Thai Technical					Y	CF6-80 support				EASA/FAA+Extensive list
ST Aerospace									Y (757)	23 civil aviation auth
Europe										
Cardiff Aviation	Y		Y	Y						EASA/Nigerian/Bermuda
IAI Bedek Aviation Group	Y	Y	Y	Y	Y			Partial	Y (767)	CAAI/EASA/FAA+others
FL Technics	Pending				Y					EASA/FAA+over 10 others
HAITEC	Y	Y	Y	Limited	Y					EASA/FAA+Extensive list
Lufthansa Technik	Shannon	Shannon		Y	Y	CF6-80C2 RB211-535 PW4000	Y (UK)	Y		EASA/FAA+Extensive list
Monarch A/C Engineering	Y	Y	Y		Y			Y		EASA/FAA+3 others
TAP M&E		Y	Y	Y			Y (767)	Y		ANAC/FAA/EASA+others
Turkish Technic					Y					EASA/FAA+Extensive list

Notes:

Based on Aircraft Commerce research of capability listings - please contact the MRO for further information. Some larger scale MROs have facilities in more than one country.

more mature 757/767 aircraft this can be a crucial service to modernise the cabin interiors and avionics equipment.

The US-based MRO AAR provides engineering and design support by developing solutions for structural and systems modifications. AAR has a global team of nearly 2,000 aviation maintenance technicians (AMTs). AAR's 1MRO network includes six facilities in the US, and provides five million man-hours (MH) of airframe maintenance and overhaul services annually.

"While each new modification is unique, it helps to be familiar with the aircraft type being modified," explains Ron Eaton, vice president, at AAR Engineering Services. "Understanding drawing systems, the OEM's structural design philosophy, systems and electrical architecture, and knowing where potential areas of concern may lie can all reduce the elapsed time and MH needed to complete an engineering package.

"First we define what the customer wants the post-modification configuration to be," continues Eaton. "We need to know the number and type of seats, in-flight entertainment (IFE) (if any), and any changes to the galley, lavatory and décor (including curtains, carpet, seat covers, and decorative laminates). This drives the integrator's requirements for creating modification engineering (drawings and installation documents) and substantiation reports. This typically includes structures, systems and electrical provisioning of the aircraft to facilitate installation of the new interior components, with any detailed parts design to support these provisions. Once the engineering is complete, parts can be sourced and assembled in a modification kit. Throughout this process, we coordinate fully with the regulatory authority (such as the FAA or EASA), which is responsible for certifying the modification, to ensure full buy-in and timely review and approval of our data, all to ensure we meet the customer's schedule expectations."

There are 636 757-200s in operation. The oldest aircraft are 33 years old, and with production ceasing in 2005 the youngest is more than 10 years old. The 757-200's MPD has a six-year base check cycle, so many aircraft have completed four or more cycles.

Repairs

MROs and engineering support providers providing expertise for the 757 and 767 are developing skills to deliver designated engineering representative (DER) form 8110-3s repairs as alternatives to OEM repairs. A company like Precision Aircraft Solutions that has developed its own supplemental type certificate (STC) for freighter conversions, already has the finite modelling and data sets needed for the aircraft structural analysis.

"We can take on a larger role in managing the structural health of the aircraft going forward," Brian McCarthy, vice president of sales at Precision Aircraft Solutions. "We offer a much lower cost solution to managing the future structural health of the aircraft. Even though we are heavily centred on the conversion, we have such a substantial data set that we are able to manage the entire aircraft on a structural level for repair assessment management and resolution of issues.

"As an alternative to OEM responses," continues McCarthy, "the use of our 120,000 node finite element model data set used for the structural health analysis of the freighter conversion process gives us the structural and stress documentation we need to analyse other damage and fatigue tolerance issues in the converted area of the aircraft or elsewhere. We can often produce the repair at a lower cost than the OEM."

However, Boeing still wants to be involved in certain areas of the aircraft, such as scribe lines. Alternate MRO repair providers complete the engineering data analysis and mapping before submitting it to the OEM for disposition. Handling scribe line damage evaluation and repair is still a very sensitive area.

This alternative repair path to OEM repair schemes when handled correctly will not hurt the future history or transition of the aircraft. This is unlike the current industry problem with many old legacy airlines 757 and 767 repairs schemes. "Many old repairs do not meet today's standards," explains McCarthy. "This will be the main issue on hundreds of aircraft that will have to be re-assessed because EASA will not accept some of the historical standards that were used to develop repairs."

Airframe ADs

The main 767 airworthiness directive (AD) with a large financial/downtime impact is AD 2014-22-09. This AD requires a repeat inspection for corrosion, via a Boeing alert service bulletin (ASB) 767-27A0229, of the fixed ring gear and reaction ring splines of the rotary actuator assembly for each support position for the trailing edge flap. The AD is to detect and correct flap rotary actuator gear disengagement from its mating reaction ring, which could lead to disengagement when flaps are extended.

Although the AD was effective from December 17th, 2014, many operators have been completing it at their next 18-month check input from the AD release date of November 2014. "The MROs are inspecting eight flap actuators on each aircraft with a 50% failure rate," Tarpley explains. "Now there is a parts shortage. Boeing will not ship you a part unless you are in work, so although the AD is not grounding the aircraft, it does delay their release from C checks."

Inspection MH are estimated at 60 work hours equalling over $5,000 on a labour rate of $85 per MH, plus the parts costs. The main issue is the potential overrun while in heavy maintenance.

For the 757, AD 2015-19-04 is one of the latest airframe-related releases that became effective in October 2015. While only minor by MH content, it requires the planning department to modify inspection programmes as a result of reports of latently failed fuel shut-off valves being discovered during fuel filter replacement. This could cause an inability to shut off fuel to the engine and APU.

The AD must be completed within 30 days of the effective date by revising the maintenance or inspection programme to add airworthiness limitations Nos. 28-AWL-ENG and 28-AWL-APU. The actions specified by the task need to be carried out within 10 days of the initial compliance time for accomplishing the maintenance or inspection programme revision. This means a daily operational and indicator check for the engine fuel shut off valve, and the same on the APU fuel shut-off valve every 10 days.

Engine ADs

ADs that require early removal have the biggest impact on engines. Removals that can be delayed until the next overhaul will be absorbed into the scheduled maintenance workscope.

AD 2015-22-03 for the PW4000 can be performed out at overhaul. Released last year, it forces removal of the low pressure turbine (LPT) stage four airseal part number (P/N) 51N038 at THE next shop visit. The customer list price in 2016 for the seal is about $98,000.

"Most operators are aware of the main ADs affecting CF6-80C2s," explains Martin Matthews, programme manager at AerFin Limited. "The most recent AD 2014-21-01 impacts the fuel manifolds and forces the removal of certain P/Ns and AD 2012-03-12 for incorrect #3 bearing packing, due to incorrect sized cooling holes. The engine has to be removed before the next flight if it has been operated with incorrect #3 bearing packing above 5,500FC to comply with the AD."

For the 757's RB211-535E4, a new AD is 2015-17-21 with an effective date of December 2nd, 2015. The AD is for the removal of the high pressure turbine (HPT) disk P/N UL27681 or UL39767. The compliance time ranges from 19,500

There are 745 active passenger- and freighter-configured 767-200s, -300s and -400s. These range from newly delivered to 34 year-old aircraft. Older aircraft have begun to be replaced by 787s, A330-200s and A350s. A large number will have to remain in operation until sufficient replacement aircraft have been delivered.

engine flight cycles (EFC), 14,900EFC, or in some cases within 25EFC after the effective date of the AD. This AD requires reducing the cyclic life limits for certain HPT disks, removing those disks that have exceeded the new life limit, and replacing them with serviceable parts. This AD was prompted by Rolls-Royce (RR) updating the life limits for certain HPT disks.

Operators can manage the RB211's ADs with no impact on operations. One area of interest is the borescope inspection and the 360-degree inspection of the second and third stages of the high pressure compressor (HPC) rotor path liners. Matthews explains: "The aircraft maintenance manual (AMM) says that this must be performed only if the engine has experienced a stall or a surge. There is a problem if the lease contract requests a full gas path BSI. With a 360-degree inspection, there is a very real risk of making the engine unserviceable. So the lessor and the lessee have to understand what they want from a returned engine, and the level of BSI to be carried out."

There have been no recent major ADs for PW2000 engines. The latest AD 2014-05-32 has instructions for the repetitive fluorescent penetrant inspection (FPI) of the diffuser-to-HPT case flange.

Rotables & logistics

For large-scale global MRO providers, the 757/767 is still an important fleet type for rotable and logistics support. MRO component support networks, like AAR's Component Services, enable operators to limit investment in surplus inventory.

"Supporting 767 and 757 families is a core part of our business strategy," notes Scott Ingold, general manager of AAR Aircraft Component Services in New York. "These fleet types represent over 1,500 aircraft that are still in active service worldwide. That is enough to gain efficiencies and keep consistent volumes.

"Many of our customers have these models mixed into their fleets, so we offer a value-added service by supporting them," continues Ingold. "Many of these fleets are less attractive for the OEMs to continue full part/repair support, and represent more risk for excessive inventory, so they are good opportunities to use surplus parts, DER repairs, and in some cases parts manufacturer approval (PMA) with the OEM's support. This allows customers more flexibility, while the OEM can manage its risk and chase higher-margin work. The OEMs depend on independent MROs, like AAR, to help them with these custom solutions.

"The goal of AAR and our airline partners is twofold: to keep these components on wing longer, and use special repairs to address their weakest aspects," adds Ingold. "The components on the 757/767 fleets, since they have been in the field longer, are more susceptible to already having minor and major reworks, such as blending of corrosion and installing bushings. Both indicate that these units are nearing their dimensional limits. At this point, some of the major cost drivers begin to scrap out, so the cost of repair skyrockets, and support is reduced, since these items are rarely still being manufactured. This calls for new and innovative repairs, and re-engineering some of the parts that are not operating to desired specification."

Landing gear support

As the original 757/767 fleet ages, many landing gear overhauls will be due for the maintenance schedulers. While some of the world's MROs can cover specific gear types, larger dedicated overhaul facilities can cater for a greater number of throughputs, so they can offer more competitive TAT times and prices.

"Up to a certain point, sourcing parts and components for older aircraft, like the 757/767, actually gets easier due to growing parts supply as a result of aircraft being parted out," explains Peter Loeb, vice president for international sales, at AAR Landing Gear Services. "This allows us to source components that need to be replaced during the landing gear overhaul at a significantly lower price than new parts. Not only is AAR able to provide support on the 'older' aircraft types, but we are able to do so at a very competitive price.

"AAR Landing Gear Services has invested in various exchange gears for a multitude of aircraft types," continues Loeb. "This extensive pool of exchange gears then allows us to minimise the downtime of our customer's aircraft during a landing gear overhaul."

Based in Miami, AAR Landing Gear Services is the largest independent landing gear overhaul facility in North America, a logistical entry point for two major aviation markets. This location also provides landing gear AOG support.

Loeb explains: "AAR Landing Gear Services deploys AOG support teams (Tiger Teams ®) of highly specialised and trained technicians to support our global customers for any landing gear-related issue, including: an on-wing landing gear inspection; change of components on wing, such as bushings, non-destructive testing, seal replacement; or implementation of SBs on-wing."

Aftermarket freighters

FC life remaining

There have been 50 757-200 PtF freighter conversions with Precision Aircraft Solutions, ST Aero, and Aeroturbine's combined activities (including one to a Combi) over the past three years. Of these aircraft, 38 went to the US, seven to China, two to India, and one each to the UK, Germany and Canada. Precisions' 757-200 conversion count alone approached 18 in 2015.

757 maintenance and engineering support is still a core business for many airlines and independent MROs.

As the world's airlines replace ageing fleets, the 757-200 and older 767-300s are prime candidates for conversion due to their abnormally low FC in terms of useful utility and remaining life.

McCarthy notes: "Due to the low FC average usage of the 757-200 fleet, an aircraft at 25 years, which has only 20,000-25,000FC on it at conversion, can fly for another 15 years or more, and still not reach its current LOV of 50,000FC."

Tarpley adds: "767-300s are being converted that have only accumulated 16,000-21,000FC. We expect they will be flown another 20 years, since they only fly 600-700FC per year, and accumulate only another 14,000FC in their operational life. So like the 757, they will not approach the LOV of 50,000FC. As other manufacturers have a much shorter LOV design limit, it is an advantage for the 757/767."

The retiring passenger 757-200s have reached a critical phase in their life cycle at a time when key elements for conversion line up. Market value is at its lowest, the aircraft have low FC, the global economy has picked up, and airlines are re-fleeting both in the passenger and freighter markets.

"Once the airline and passenger market loses interest in the fleet type, the aircraft really tumbles in value," adds McCarthy. "The economics of any freighter have to line up with cargo economics. This means flying for a dollar per pound (0.45Kg) of cargo. Some operators may get 60 or 80 cents per pound in South America, but there may be directional imbalance issues where cargo moves one way but not the other. What a conversion programme really needs to begin with is cheap feedstock."

There is a formula to evaluate the potential life remaining in terms of FC. McCarthy explains: "If an aircraft has a cycle accumulation of 20,000FC, then we use its age on conversion, how many sectors a day it will fly, and how many days a week, to show how long it will take it to reach its LOV 50,000FC limit. This says that the aircraft could be flown for 40 years or more."

If the same aircraft is converted at 22,000FC, and flown 2FC a day, five days a week, it will take 54 years to reach the LOV; at 4FC a day it will take 27.

If an operator lets the aircraft slide into the higher 30,000-35,000FC range, it will use the remaining life up or part it out. Operators need to decide whether to sell the aircraft, part it out, or extend the leases and take the FC beyond the zone of conversion. This means that the value of the aircraft and the FCs have to be within a zone to make conversion economically viable. A 757-200 needs to be in a zero FC to 30,000FC range and have a value of $5.0-8.0 million to be in the economic zone of conversion.

"Precision is sub-contracting its conversion programme to MROs around the world with five to six modification lines," says McCarthy. "This includes HAECO Xiamen, HAECO Americas (Greensborough, North Carolina), Flightstar (Jacksonville, Florida), as well as bases in China.

"Since 90% of the aircraft we convert get a heavy check at the same time, they tend to roll out of the hangar zero timed," continues McCarthy. "This means they are painted and converted, and have had avionics upgrades, airframe checks, engine checks, APU and landing gear inspections cleared, all equating to 30,000-35,000MH. The TAT is 90-100 days, depending on avionic issues.

McCarthy adds: "FedEx has just converted 119 757-200s, which were built around 1991. They spent millions of dollars to make sure they are very strong, with brand new engine life limited part stacks, enhanced avionic suites, and flightdeck flat panel displays. The FCs were low enough that with utilisation they can be flown for 15-25 years."

Future competition

The current growing Boeing freighter fleet will face competition from the A320 /A321 conversion programmes.

"An incredible quantity of 757s and 767s is being converted, and they all are getting homes," says McCarthy. "If, in a few years' time, you ask these operators to take on a more expensive aircraft that hauls the same amount of cargo, it will be very hard to get them to re-fleet again.

"It will be several years before the values of A320s, A321s, or the 737-800, start to fall below $10 million," continues McCarthy. "When you add the aircraft value, conversion costs, and maintenance work, outlay could be up to $14-15 million. The aircraft need to cost $5-6 million to start making economic sense. These new programmes could languish, especially if certification for some mods will still take another 36-40 months."

STC management

There is room in the market to assist the OEMs in handling these highly modified aircraft, since these are OEM-licensed programmes on aircraft that are predicted to fly beyond 30 years old.

"We take a very proactive role in the health of the structure of the aircraft," McCarthy notes. "Today's convertors need to have a strong technical organisation to manage the continued airworthiness of the aircraft and the STC. You have to work at an OEM level. Engineering tools can develop the necessary data sets necessary; those tools were not available 20-30 years ago."

Precision sees itself converting 757-200s up to 2022, with a peak over the next 36 months, then a fall-off until there will be only a few low FC airframes remaining. AC