

The airframe maintenance market has suffered from oversupply for the past five to eight years. Fleet growth is expected to increase demand for airframe checks by as much as 20% over the next five years, in phase with fleet growth. The largest gains will be in the market for modern types.

Great expectations for the airframe check market

The third party maintenance market has been under pressure for the past five to eight years with capacity greater than demand. The global fleet has continued to grow over this period, despite the economic downturn, and will continue to grow. Will a larger global fleet lead to a higher demand for maintenance?

Maintenance market

The third party maintenance market has suffered from overcapacity. This was exacerbated by 11th September, which was followed by the parking of large numbers of maintenance-intensive aircraft.

A lot of capacity has also been added in the past five years, with several East European providers, such as CSA and Lufthansa Malev, offering facilities for types like the 737. Facilities which relied on older types and did not evolve to accommodate modern aircraft have found demand for their services shrinking.

The third party maintenance market has become polarised to a degree, with those offering capabilities for modern types, like the 737NG, A320 and A330/340, taking advantage of the global fleet modernisation. FLS Aerospace, for example, moved from supporting the DC-10-30 and 747-200 to the A330/340, A320, 767 and 737. Its London Stansted facility is almost completely utilised for its total maintenance care contract with easyJet. This contrasts with maintenance providers that relied on DC-9 and 727 business, and did not acquire capabilities for new types.

Global demand for base maintenance is expected to climb again as fleets grow.

Fleet growth

The past five to eight years have seen both a high level of fleet replacement among the world's airlines, and large numbers of new aircraft deliveries.

Deliveries will fall to about 570 in 2003, a drop from 850 aircraft in 2000 and 2001.

The active global jetliner fleet, of aircraft the size of the 717 and larger, comprised 11,300 units at the end of 1996. This had grown to about 13,225 at the end of 2002, an increase of 17%. The fleet is forecast to reach about 15,800 units by the end of 2008.

This larger fleet will stimulate demand for base maintenance, that is C and heavier checks.

While the fleet will grow, there are several factors which affect the overall demand for base maintenance. These include the downtime to complete checks, man-hours (MH) consumed in the checks, intervals between checks, aircraft utilisation, and past and future delivery schedules of aircraft. Delivery schedules and check intervals cause peaks and troughs in demand for base maintenance.

Modern aircraft

The rationale behind replacing older aircraft with modern types is lower operating costs. This includes an expected improvement in maintenance efficiency. Elements of maintenance efficiency are increased intervals between C and heavy checks, and lower MH consumption. Longer check intervals and reduced labour consumption of modern aircraft are expected to offset, to some degree, the larger number of aircraft requiring maintenance.

Aircraft types that have been retired in large numbers have high maintenance requirements. These are mature aircraft types, such as the 747-100/-200, L-1011, 727, 737-200 and DC-9. Aircraft that have been delivered in large numbers in recent years, and are not yet mature in maintenance terms, are the 747-400, 777, A330/340, 737NG and A320 family. The ratio of mature to young aircraft will change at a fast high rate.

Delivery schedules

The delivery of large numbers of new aircraft in the past four to six years means there are many new generation aircraft in their first heavy maintenance cycle. Aircraft deliveries peaked in the late 1990s, 2000 and 2001, and so will result in a peak of heavy maintenance visits between 2005 and 2010, seven to 10 years after delivery.

The reduced number of aircraft deliveries in 2002 and onwards will see a rise in demand for maintenance after 2008, but the rate of increase in demand will be lower than prior to 2008.

If aircraft orders and then deliveries rise again from 2005, the demand for base maintenance will start to rise again from about 2012.

Maintenance programmes

The effect of longer intervals between checks of younger aircraft will at least partially offset the larger number of aircraft in operation, in terms of demand for maintenance.

Many airlines operated the 727-200 with a base maintenance programme of a C check every 3,200 flight hours (FH), equal to about 15 months of operation, and a heavy C or D check every 20,000FH (about every seven or eight years if in passenger operation).

The MD-80's programme typically has a C check every 15 months and structural inspections about every four and a half and nine years.

While its C check intervals are not dissimilar to those of older aircraft, the A320 has structural inspections every five and 10 years.

The contrast is greater between older and modern narrowbodies. The 747-200 has a C check about every 15 months and D check every four to five years. The Airbus widebody family has structural inspections every five and 10 years.



These differences highlight the fact that modern aircraft only have small advantages in longer check intervals over older types.

Man-hour consumption

The differences in MH consumption between older and modern types is more pronounced than differences in check intervals. A mature 747-200, for example, consumes 60,000-80,000MH in a D check. Most 747-100/-200s will have completed their third D check. MH consumption rises with age, and so the proportion of older aircraft has an important impact on demand for maintenance.

The 747-100/-200 also consumes 5,000-7,000MH in each C check. The D check would be performed at the fifth C check, and so the aircraft would consume about 80,000-100,000MH every D check cycle, lasting four-and-a-half to five years or 22,000FH. This is equal to a MH consumption of about 4MH per FH.

This compares with the A340s, most of which are in their first heavy maintenance cycle. The aircraft has a C check every 15-18 months. The fourth C check is combined with an IL check and the eighth combined with a D check. A340s consume 75,000-85,000MH in their first D check cycle of nine to 10 years, equal to about 45,000FH. This is equal to a consumption of about 2MH per FH.

Similar contrasts are drawn between old and new generation narrowbodies. The 727-200 consumes about 48,000MH every D check cycle completed every 20,000FH, a consumption of 2.4MH per FH. The MD-80 consumes about 53,000MH over each heavy check cycle

of about 25,000FH, equal to 2.1MH per FH. The A320, the most modern type, consumes about 40,000MH every D check cycle of about 25,000FH, equal to 1.7MH per FH.

“The difference in MH consumption between older and younger types is larger in widebodies than in narrowbodies,” says Dr Thomas Stueger, senior vice president of aircraft maintenance at Lufthansa Technik. “Initially new aircraft types have a large number of modifications, despite C checks getting smaller. This actually closes the difference between older and younger aircraft.”

Maintenance downtime

The utilisation of base maintenance capacity is dependent on downtime for completion of checks. Downtimes are shorter for modern aircraft.

The MD-80's IV and heavy checks, for example, take about three and five weeks to complete. The A320's IL and D checks, which are performed at similar intervals to the MD-80's heavy checks, take about two and four weeks.

A D check for a 727-200 takes about 54 days, while 45 days are required for a 737-300/-400, and it is estimated the 737NG will have a downtime of 39 days.

Although younger aircraft have better MH/FH ratios than older equipment, downtimes are not reduced by the same proportion. Aircraft downtime affects hangar utilisation and available capacity. Shorter downtimes mean transit times to and from checks account for a higher proportion of time out of service. Airlines sub-contracting maintenance will then focus on reducing transit times, and so are more likely to use facilities closer to their bases of operation.

The large volume of A320 family and 737NG deliveries over the past five to eight years will account for a large increase in narrowbody base maintenance checks over the next five to 10 years. The largest markets will be Europe and North America. Moreover, maintenance demand for new generation narrowbodies will increase while maintenance for old generation aircraft will decline.

The need for less maintenance capacity for younger aircraft will make it harder for airlines to justify operating their own maintenance facilities. More third party maintenance will have to be performed to maintain the facility's utilisation rates.

The importance of maintenance location is highlighted by Stueger: “Lufthansa Technik has strategically acquired facilities at various locations to capture local markets. For example, we recently founded Lufthansa Technik Malta, a joint venture with Air Malta's, a facility with 737 and A320 capability, because of the market in the Mediterranean and North Africa.”

Aircraft utilisation

The cost pressures airlines are experiencing, and the strategy of seeking lower cost models, will also stimulate an increase in aircraft utilisation. Most aircraft have check intervals specified in FH and calendar limits. “Higher rates of aircraft utilisation will mean checks being performed earlier than their calendar limits, leading to an increase in demand for base maintenance,” says Stueger. “This will particularly be the case for narrowbody aircraft.”

Aircraft trades

The parking of older aircraft after 11th September not only reduced demand for maintenance, but also led to a collapse in market values of older aircraft. This could lead to a large number being converted to freighters over the next five years. “These aircraft will be transferred from first tier passenger carriers, which perform their own maintenance, to small freight operators,” comments Paul Vonk, marketing manager at KLM Engineering & Maintenance. “Most sub-contract base maintenance, and so the conversion of these aircraft will contribute to demand for more third party maintenance in the next five to 10 years. There is still overcapacity, and this will take a few years to level out.”

Several hundred more of these aircraft could also return to service with passenger airlines following a rebound in traffic. These aircraft, however, will be acquired by smaller airlines, again leading

GLOBAL BASE MAINTENANCE FORECAST 2003 TO 2008

Region Year	Africa	Asia/Pacific	Europe /CIS	Middle East	North America	South America	Total
Narrowbody C checks							
2003	314	937	1,713	155	3,625	598	7,342
2008	275	1,039	2,045	147	4,169	556	8,250
Narrowbody D checks							
2003	47	135	176	24	672	57	1,111
2008	57	188	336	15	667	60	1,323
Widebody C checks							
2003	90	864	627	187	936	89	2,793
2008	90	915	669	191	959	96	2,943
Widebody D checks							
2003	19	164	108	21	200	21	533
2008	30	196	148	49	265	30	720

Source: AvSoft

to a rise in demand for maintenance.

Parked aircraft returning to service need bridging maintenance or heavy checks. This will be another factor in increased demand for base maintenance over the next five years.

Outsourcing maintenance

As described, the shorter downtimes to complete base checks means more aircraft are required to generate the same utilisation of base maintenance facilities. Although this effect will partially be offset by fleet growth, shorter downtimes and new tooling required for modern types will force more airlines to consider sub-contracting their base maintenance.

The trend towards a higher level of maintenance outsourcing will also be stimulated by the high growth in low-cost and start-up airlines, which have a definite policy of sub-contracting base maintenance.

Outsourcing will be hard for some airlines, since labour unions will resist the move, while others will attempt to offset the lower maintenance requirements of their new fleets by selling more of their capacity to other operators.

Large airlines, in particular the US majors, will find it hard to move to outsourced maintenance for much of their fleets, since they will have to find independents with a large volume of capacity. This is not possible in the US.

The trend towards more outsourcing is therefore likely to come from small- and medium-sized airlines. Vonk predicts other developments. "I think there is likely to be maintenance cooperation within airline alliances as there was within partnerships such as KSSU and ATLAS in the 1970s and 1980s. Airline

alliances, such as the Star Alliance, may set up centres of excellence for the 777 or A340. Moves like this could lead to intra-alliance outsourcing."

Net effect

While younger and modern aircraft have lower MH requirements and shorter downtimes, the deliveries of the past six years and growth in fleet numbers over the next five to 10 years will see an overall increase in demand for base maintenance. "Although the MH required for checks are low for younger aircraft, modifications like strengthening cockpit doors and installing reduced vertical separation minimum can mean their MH requirements are not too dissimilar to older types," says Vonk.

Downtimes of the heaviest checks for modern types are only about 20% less compared to older aircraft, while fleet numbers are expected to increase by 18% over the next five years to 2008 and by 38% over 10 years to 2013. Downtimes of younger aircraft will also increase as they move into their second heavy maintenance cycles.

The effect of shorter downtimes will be offset by increased aircraft utilisation, more frequent maintenance visits and fleet growth. "Fleet growth will outpace the effects of shorter check downtimes. Overall I expect a net increase in total MH consumed," says Vonk. "Although we will see a net reduction in maintenance for our own fleet, it will provide us with more capacity to sell. This is a positive factor for us, because more airlines will move to sub-contracting maintenance and we also expect growth in the low-cost airlines. Although there still may be a short-term

dip in demand for maintenance, there will be long-term growth. Facilities that have not got into new types will face the problem of declining business, and leave the growing market to those that have modernised."

Demand for maintenance

Predictions of demand for maintenance over the next five to 10 years vary, but all expect large increases in the number of checks performed and MH consumed over the period.

The fastest rate of climb in demand will be in the next five years to 2008. Demand is divided into the four groups of narrowbody C and heavy checks, and widebody C and heavy checks.

Taking into consideration fleet numbers, delivery dates, rates of utilisation and maintenance schedules, AvSoft makes annual predictions of checks for the global fleet. Predictions are summarised (see table, this page). A global total of 7,340 narrowbody C checks for 2003 is expected. This will increase to 8,250 by 2008, an increase of 12%, but there will be a higher peak of about 8,310 narrowbody C checks in 2006.

This increase is for all types. More important is the increase in checks for younger types, which will dominate the fleet. Vonk predicts the number of C checks for the 737, 757 and A320 family will increase by 23% in five years, indicating a strengthening market for these types.

The US accounts for the largest number of checks, followed by Europe. Demand in other parts of the world, such as the Middle East, Africa and South America will remain constant.

A larger increase of 19% in narrowbody heavy or D checks is expected over the same period, from 1,110 to 1,325 checks. Like C checks, the rise in heavy checks will peak in 2006, fall in 2007 and then rise sharply again in 2008.

The faster rise in heavy checks is partially explained by the large number of A320 family deliveries between 1997 and 2001. "Although demand may temporarily dip in the short term, demand for heavy maintenance for the second D checks on the oldest A320s, will rise as they approach 15-20 years old," says Jean-Pierre Boutin, marketing director for Air France Industries. "Europe will become a mature market for A320 heavy maintenance, since a large portion of the European fleet will have its first and second IL checks and first D checks performed over the next five years. The Asia Pacific and North America are younger markets for Airbus and new generation Boeing aircraft."

A similar pattern of an increase in



demand for base maintenance is predicted for widebody aircraft. Total widebody C checks are expected to total 2,793 in 2003 (see table, page 25), rise to a peak of 2,967 in 2005, fall in 2006 and 2007, and then climb again in 2008 to 2,943. This is an increase of about 5% in just two years, followed by a fall and increase to the same level over the following three years.

The increase in demand in Europe and North America for widebody C checks is not as high as for narrowbodies. In contrast, the Asia Pacific has one of the largest rises in demand. Moreover, North America accounts for the largest portion of demand, but the Asia Pacific accounts for a similar number of checks and is larger than the European market.

The largest increase of all is in the demand for widebody D or heavy checks. The expected demand of 533 checks in 2003 represents a trough, with a sharp rise of 35% in three years to about 720 checks in 2006 (see table, page 25), followed by levelling of demand for the following two years. This large rise is explained by the large number of A330/340 and 777 deliveries concentrated between 1997 and 2001.

The leading regions, North America, the Asia Pacific and Europe, are all expected to reach a peak level of demand between 2006 and 2008. "Until now, Boeing aircraft have represented the main share of the widebody heavy maintenance market, but this will now change to about a 50:50 share between Airbus and Boeing aircraft," explains Boutin.

Analysis by consultants Aerostrategy confirms that fleet growth is the overriding factor in demand for maintenance. Taking into account all the factors analysed, the delivery schedule of

aircraft in the mid and late 1990s, 2000 and 2001 will result in demand for base maintenance peaking in 2005 and 2006. "We predict maintenance demand in terms of annual dollar expenditure, rather than check numbers or MH consumption," explains David Stewart, principal at Aerostrategy. "Overall we expect a fast rise in the dollar expenditure in heavy maintenance of about 30% over the next five years. This is due to a combination of aircraft coming out of the desert coinciding with a concentrated first wave of D checks of young aircraft. D checks are currently low, following lower delivery rates over the past two years and the parking of a large number of older aircraft. This fast rise in the next five years will be followed by a slower increase in the subsequent five years. Overall demand for heavy maintenance is expected to rise by about 45% to 2013."

Splitting this between mature and new generation aircraft illustrates the effects of fleet replacement with younger aircraft, and also reveals which facilities are likely to be in the highest demand. Aerostrategy predicts demand for mature widebody maintenance will stay about level over the next 10 years, while maintenance of mature narrowbodies will actually decline. In contrast, it expects demand for maintenance of new technology aircraft will climb at an average annual compound growth rate of about 10% over the next 10 years to 2013. This is partially due to fleet replacement, but also concentration of deliveries affect of the timing of checks.

Captive market

The predicted increases in base checks indicate a growing market for third party

The delivery of large volumes of A330/340s and 777s will see a change in mix of the widebody fleet from a Boeing dominated fleet to an even Airbus-Boeing fleet. One region to experience one of the highest rates of growth in demand for base maintenance will be the Asia Pacific.

suppliers. The two most sought after market will be D or heavy checks for narrowbodies or widebodies. The total number of checks forecast in 2008 has to be put in perspective of what will be available for third party suppliers to pursue. Portions of these checks will be performed in-house by airlines, that is 'captive' business. The rest will be left for third party suppliers to compete for.

The portion of checks which are captive varies between aircraft types. The 777, for example, is operated by carriers which have their own in-house maintenance. Lufthansa Technik estimates that only 4% of the 777 market is available to third party suppliers. This compares to the A300/310 market, of which 38% is thought to be available.

The percentage of checks that are available to third party suppliers means they will have to take business from their competitors to make large increases in the number of checks they perform for third party suppliers.

Effects on suppliers

The maintenance market is currently oversupplied and MH rates are weak. Capacity for particular types in several regions is already tight, despite the global economy.

The predicted increases in demand are no doubt good news for suppliers. While profit margins are slim for third party suppliers, MH rates are unlikely to be able to increase since airlines will still seek to control costs.

The rise in demand for maintenance for younger types will see capacity for modern aircraft become tight, while facilities that have failed to modernise into new technology aircraft will be more available. This will lead to increased polarisation of the airframe maintenance market.

The reduction in capacity in certain global regions for particular types will reduce airlines' choices for maintenance facilities. "Maintenance is labour intensive, and so sensitive to MH rates. Rather than paying higher MH rates, airlines may be forced to provide maintenance suppliers with longer term contracts," explains Stewart. "The third party business will probably become more predictable and stable for suppliers, rather than more profitable." **AC**