Aircraft owners and operators have a choice of passenger-to-freighter conversion programmes. OEM conversions are often more expensive, but entitle the aircraft owner/operator to full customer and technical support from the OEM. Non-OEM-conversions are cheaper, but require the owner/operator to pay an annual fee for customer & technical support.

Customer & technical support & avionic standards of passenger-to-freighter conversion programmes

If an aircraft operator, owner or lessor wants to convert a passenger aircraft to a freighter, it usually has a choice of several conversion programmes.

Aircraft can be converted by the original equipment manufacturer (OEM), or by a third party. OEM conversions are usually more expensive, but entitle the owner/operator to full customer and technical support from the OEM for the entire aircraft, including all conversion-related modifications.

Non-OEM conversions vary, and operators of such aircraft often have to pay a special fee to receive customer and technical support from the OEM only for those parts of the aircraft unaffected by the conversion. For parts of the aircraft that have been affected by the conversion, owners and operators of non-OEM-converted aircraft must get customer and technical support from the conversion houses. This is an additional cost.

Modifications and upgrades made during freighter conversions, other than the freight door and fuselage, affect the flightdeck and avionics. A number of flightdeck and avionic upgrades are needed during conversion, some of which depend on the region in which the aircraft will be operated. Other upgrades are due to operator preference and fleet commonality reasons.

The avionic and flightdeck specifications and levels of customer and technical support of different passenger-to-freighter (P-to-F) conversion programmes are analysed here.

Conversion programmes

There are several P-to-F conversion programmes available for each of several aircraft types. Conversions can broadly be classified into two categories: OEM conversions, carried out directly by the OEM itself, such as Boeing or Airbus; and non-OEM conversions, carried out by third parties. These can further be sub-divided into two categories: OEM-licensed supplemental type certificate (STC) holders and non-OEM-licensed STC holders.

To make any sort of modification to an aircraft, an STC must be acquired from the converter's regulatory authority, to approve the modification. The STC will consider how the modification affects the aircraft's original design.

More conversion programmes are available for Boeing aircraft than for Airbus types, which currently only feature the A300-600 and A310.

The A330 P-to-F programme has only recently been announced by EADS-EFW, with no converted A330s yet delivered *(see A330 P-to-F programme, 757 freight build costs decline, Aircraft Commerce, February/March 2012, page 58).*

No A340s have been converted, although LCF Conversions is launching a new modification for the A340-300 *(see A340-300 LCF passenger-to-freighter conversion programme, Aircraft Commerce, April/May 2012, page 66).*

"There are two companies converting Airbus aircraft," says Jacob Netz, senior consultant, Air Cargo Management Group (ACMG). "EFW, part of the EADS group, converts A300-600s and A310s and provides the same customer and technical support as Airbus. FSI also has an STC for A300-600 conversions."

The current Boeing conversion programmes available include 737 'Classics', 747-400, 757-200, and 767-200ER/-300ER. The P-to-F modifications for the MD-80 and MD-11 are also included here, because Boeing is their recognised OEM, following its merger with McDonnell Douglas.

"737-300/-400 conversions are provided by AEI, Pemco and IAI Bedek, and are all licensed by Boeing," says Netz. "Similarly, all 757-200 conversions are OEM-licensed (by Boeing), and are provided by Precision Conversions, ST Aero and Pemco."

AEI also provides a Boeing-licensed P-to-F modification for the MD-80.

"IAI Bedek provides non-Boeing-licensed conversions for the 747-400, 767-200ER and -300ER, which have the BDSF suffix in their names," notes Netz.

"Boeing, as the OEM, itself also provides its own conversions for the 747-400, 767-300ER, and MD-11 under the Boeing Converted Freighter (BCF suffix) program," continues Netz.

Boeing has never offered conversions for the 737-300/-400. Boeing did have a conversion programme for the 757-200, and did convert a number of aircraft for DHL. After this ST Aerospace took over the conversion as a licensed programme,

Boeing offered a conversion programme for the 757-200 for a short period. 757-200 conversions are now only available through independent programmes from Precision Conversions and Pemco. Both are Boeing-licensed programmes.

and it was used to convert aircraft for FedEx.

Conversion differences

There are differences between OEM- and non-OEM conversions, as well as between the various conversion houses. "The higher capital cost of widebody aircraft acquisition leads most customers to place slightly more value on OEM or OEM-licensed modifications," says Kerry Mitchell, manager business development at Pemco. "OEM-licensed, fully independent solutions, however, dominate the P-to-F market place for narrowbodies."

This could be why there are only two major conversion programmes for Boeing widebodies: Boeing as the OEM and IAI Bedek Aviation as the alternative. While the quality of IAI Bedek's conversion is not poorer than Boeing's, some customers do prefer to have the direct link to the OEM.

The difference in list prices between OEM and independent conversion programmes is in the order of 20%. Boeing now only offers conversions for the 767 and 747-400, with list prices of $13 million and $28-30 million. This contrasts to Bedek's list prices of $10 million for the 767, and $23-25 million for the 747-400.

Boeing no longer offers conversions for the 737-300/-400 and 757-200, which may be explained by the lower prices of independent conversion programmes. For the 737-300/-400, AEI's programme has a list price of $2.4-2.7 million, Bedek's programme is $2.8-3.0 million, and Pemco's programme is $2.45-2.75 million.

Pemco offers a fourteen-and-a-half pallet conversion for the 757-200 at $4.0 million, while Precision Conversions offers its programme for a 15-pallet 757-200 freighter at $4.65 million.

The size of active fleets of 747-400BCFs versus 747-400BDSFs, and 767-300BCFs versus 767-300BDSFs may reflect the difference in list prices between the various conversion programmes.

There are 44 active 747-400BCFs, with 15 operators; compared to 30 active 747-400BDSFs, with 10 operators. Bedek has further two outstanding orders for 747-400 conversions.

There are seven active 767-300BCFs, with one operator; compared to 10 active 767-300BDSFs, with four operators. Bedek has 10 outstanding orders for 767 conversions.

Despite this, IAI Bedek says that there are few and only minor differences between the widebody conversions carried out by Boeing and by IAI Bedek. "For example," says Jack Gaber, vice president and general manager marketing and business development at IAI Bedek, "the 747-400 conversions offered by IAI Bedek may be a little lighter in terms of aircraft weight, compared to Boeing's, but differences are negligible."

Mitchell explains, however, why some operators may prefer OEM or OEM-licensed conversions. "OEMs claim that factory-built production freighters and OEM-conversions share a lot of 'DNA', and take advantage of the data set produced during the original design and production phases," says Mitchell. "OEMs also have access to potentially valuable data collected during passenger operations. This can allow freighters converted by the OEM to have slightly higher capabilities."

Mitchell also says that having access to such data for OEM-licensed conversions allows for higher quality. "Pemco's is the only 737-300/-400 conversion designed, built, certified and supported using genuine Boeing data obtained under a unique-to-Pemco data licensing agreement with Boeing."

A number of tasks need to be carried out during a freighter conversion. "Unnecessary passenger items such as seats, galleys, lavatories and certain wiring looms are removed," explains Mitchell. "The floor and the structure (frames, stringers and fuselage skins) are reinforced and the interior is protected from extreme heat by cabin liner. The environmental control system (ECS) is modified to control smoke, ensure aircraft safety in the event of explosive decompression, and protect the flightdeck and other personnel from hazards of smoke and fire. This is done in part via installation of advanced smoke and fire detection systems and, in the case of the combi, a halon fire extinguishing system.

"We also install the cargo loading system (CLS) and cargo handling system (CHS)," continues Mitchell. "These are sometimes part of Pemco's design, or are built by separate CLS/CHS OEMs. Various displays, switches, and control panels are also added."

These systems differ by conversion type. For example, the main cargo door opening mechanisms differ between the AEI and the Pemco conversion on 737 Classics. "The AEI door is simple and easy to maintain," says Renato Spina, former line maintenance manager at VarigLog. "It has simple mechanical links, and is operated by an independently powered battery system. The Pemco door, however, is not so easy to adjust, and uses a hydraulic system linked to the aircraft. This led to more problems with hydraulic leaks with the Pemco door, and more customer support issues to handle."

Precision Conversions has a similar design to AEI on the main cargo doors. "Precision-converted aircraft do not mean a large maintenance workload," says Spina. "The door is reliable and easily maintainable because all the mechanisms are directly actuated by bars and there are no electrical interlocks."

VarigLog found Precision-converted aircraft to be very reliable. The six 757-200PCFs operated by VarigLog had accumulated about 14,400 flight hours

There are three passenger-to-freighter programmes for the 737-300/-400 available from AEI, Bedek Aviation and Pemco. All three are Boeing-licensed.

(FH), with 4,110 flight cycles (FC) in service with VarigLog. During these operations, it reported 96 conversion-related faults, which represents one fault reported every 150FH, or every 43FC.

Alcoa-SIE also provided a conversion for 757-200s. VarigLog has operated one such converted aircraft, which has accumulated 1,200FH and 340FC since conversion, and had 14 conversion-related faults. This represents one fault for every 86FH, or every 24FC.

Spina explains why the Alcoa-converted aircraft reported more faults than Precision's. "The Alcoa door has interconnection Teleflex cables to the vent doors. These cables often broke, so the main door could not be operated. VarigLog also had several hydraulic leaks due to fractured ducts, which complicated normal operations, since only manual operations were allowed."

These experiences can differ between operators, however, and depend on the nature of operation, location and rate of aircraft utilisation. "Pemco's 95-plus in-service 737-300/-400s have accumulated unparalleled operating experience," claims Mitchell. "This has allowed Pemco to progressively advance the design, build and features of the modification, so that operators can achieve almost any mission available and maintain exceptionally high levels of utilisation."

Other differences between conversions include the position, as well as the design, of the main cargo door. "For example, one competitor (to Pemco) 737-300F product located its cargo door just a few inches from the number one engine nacelle," says Mitchell. "This design flaw has already lead to several flight cancellations and hundreds of thousands of dollars in nacelle repair costs due to loader damage.

"Another example is inadequate engineering, leading to floor beam cracking and mandatory removal from service as frequently as every few hundred cycles," continues Mitchell.

Nevertheless, non-OEM converted aircraft are often cheaper to operate and maintain. "While non-OEM conversions vary in terms of quality and capabilities, they do share attractive economics compared to production and OEM-converted freighters," adds Mitchell.

OEM customer support

When issues do occur, however, the aircraft owner/operator needs customer and technical support. In particular, operators use the OEM customer support systems for the relevant and up-to-date manuals, spare parts and repairs. Passenger aircraft and newly-delivered freighters are treated in much the same way, because the OEM is responsible for all parts and systems on the aircraft.

"Boeing-converted freighters, which are produced under a Boeing Service Bulletin (SB), receive much the same customer and technical support as aircraft delivered from Boeing production facilities," says Lee Cantrell, program manager, passenger-to-freighter conversion policy at Boeing.

Operators of Boeing-converted freighters benefit from only dealing with the OEM (Boeing) as a one-stop-shop for customer and technical support. Although this may be more expensive than that offered by non-OEMs, it covers the entire aircraft, including the conversion-related modifications.

Non-OEM customer support

Boeing aircraft converted by a non-OEM conversion house are converted either by Boeing-licensed or non-Boeing-licensed STC holders.

Narrowbody conversions are OEM-licensed by Boeing. These include conversions for 737-300s and -400s which are provided by AEI, Pemco and IAI Bedek. 757-200 conversions are provided by Precision, ST Aero and Pemco, and MD-80 conversions by AEI.

Widebody conversions are only provided by Boeing and IAI Bedek. Bedek's conversions are non-Boeing licensed, and include the 767-200ER, 767-300ER, and 747-400. These three are the only non-OEM-licensed third-party conversion programmes available.

Licensing affects the cost and type of customer and technical support available, partly due to the Boeing access fee, which has been enforced since 15th April 2009. "The third-party P-to-F conversion access agreement allows owners/operators or their designee (MRO or other third-party provider) to access Boeing technical support," says Cantrell. "A fee is paid per aircraft per year, with a minimum one-year agreement required."

The Boeing access fee applies to all Boeing aircraft converted after 15th April 2009 by a non-OEM conversion house. "All non-Boeing converted aircraft delivered before this date are considered to be 'grandfathered' aircraft, and so are not subject to the policy," adds Cantrell.

At the time this fee was implemented, Boeing said it was necessary to cover the cost of growing demand for technical support, as the rate of support requests is increasing faster than the rate of overall fleet growth. Boeing imposed the fee because it no longer wanted to cover the cost of supporting modifications made by other providers. Operators of these non-Boeing-converted aircraft are, therefore, forced to pay a premium for customer and technical support from Boeing.

"All converted aircraft not directly converted by Boeing are classified as licensed or non-licensed," continues Cantrell. "For Boeing-licensed converted aircraft, Boeing only supports service requests related to those parts of the aircraft not affected by the third-party freighter conversion. Boeing will direct service requests to the third-party STC provider when that request deals with a

While independent conversion programmes are sub-divided between OEM-licensed and non-OEM-licensed, operators of aircraft modified under either type of conversion will not receive technical support from the OEM for parts of the aircraft affected by the modification.

modified portion of the aircraft."

Operators of Boeing-licensed STC-converted aircraft pay a lower access fee than operators of non-Boeing-licensed STC-converted aircraft.

Operators of aircraft converted by a Boeing-licensed STC holder will need to enter into a 'post-modification support agreement for special freighters', with Boeing. This allows operators to submit requests for technical support to Boeing. It includes features such as the hosting of aircraft conversion data and maps on the web portal 'MyBoeingFleet.com'.

The annual fee for this is $50,000 per aircraft, whether it is a narrowbody or a widebody. This applies to the first four aircraft of a converted fleet, with no fees per aircraft beyond this.

There are differences for operators of non-Boeing-licensed STC-converted aircraft. "As with licensed conversions, Boeing support for non-licensed conversions is only provided for those parts of the aircraft unaffected by the third-party freighter conversion," notes Cantrell. "The requestor is responsible for coordinating with the STC holder all service requests for the modified part of the aircraft."

Operators of non-Boeing-licensed STC-converted aircraft therefore need to enter into a 'customer support access agreement for non-Boeing converted freighters', with Boeing. This allows them to submit requests for technical support to Boeing for an annual fee of $150,000 per aircraft for single-aisle/narrowbody aircraft, and $250,000 per aircraft for twin-aisle/widebody aircraft. For access to customer and technical support, operators must enrol all affected aircraft operating in their fleet. There is also no cap on fees, unlike the fleets of Boeing-licensed STC-converted aircraft, which are limited to a maximum of $200,000 per year.

Supporting non-Boeing-licensed converted aircraft therefore costs at least three times the amount for narrowbodies and five times the amount for widebodies.

The Boeing access fee for non-Boeing-licensed conversions only applies to those widebody aircraft converted by IAI Bedek since 15th April 2009. IAI Bedek is currently, however, having these conversions licensed by Boeing, so operators of these aircraft will pay the lower technical support fees.

In both cases, therefore, Boeing will still provide customer and technical support for those parts of the aircraft not modified by the conversion, if the relevant fees are paid. Boeing maintains, however, that customer and technical support for those modified parts of the aircraft will have to be provided by the third-party STC holder for both types of non-OEM conversions.

Modification zones

In terms of customer support for converted aircraft, therefore, it is vital to identify which parts of the aircraft have been modified, to determine to whom the operator should go for technical support.

"Boeing will not provide customer and technical support for modifications made during P-to-F conversions," says Robert Convey, vice president sales and marketing at Aeronautical Engineers Inc. (AEI). "This is because there used to be a constant dispute between Boeing and non-OEM conversion houses over who is responsible for the support of certain repairs. This was the case within 10 yards of the main cargo door, for example."

This is because in 'grey' areas such as these, both Boeing and the non-OEM conversion house can claim that it is not their responsibility to provide customer support. In this example, the non-OEM conversion house can say that the area near the cargo door was not modified and is part of the original aircraft, while Boeing can argue that any issues in that area would not have happened if the aircraft had not been modified and a freight door installed.

AEI, a Boeing-licensed STC holder for 737 and MD-80 conversions, has worked with Boeing to solve this issue. "A site/zone map of each aircraft has been drawn up to clarify for which parts Boeing and AEI are responsible," says Convey.

"The parts and systems which are typically the responsibility of the conversion house are the main cargo door and surrounding structure, the 9G barrier, the floor supports and smaller parts fragmented through the aircraft," continues Convey. "Boeing does not know the loads and specifications of these, so the customer and technical support rests with the conversion house."

Brian McCarthy, vice president of marketing and sales at Precision Conversions, elaborates: "The conversion house is responsible for customer and technical support for all conversion-related modifications. This includes the upper and lower cargo doors and surround structures, as well as the lower sill, the crown skin, the forward and aft jams, the floor beams and structure, and the cabin door closeout structure. The CHS and CLS are also included, although operators will often go directly to these systems' OEMs for customer support."

For an operator of a converted aircraft to acquire customer and technical support, the process is fairly simple. "If there is a non-routine technical issue, which is not covered in the manuals, our customers can call our customer support line, which is available 24 hours a day, seven days a week," says McCarthy. "For example, if a cargo door rolls over in high winds, the operator can immediately call Precision. We will ask for photographs and immediately dispatch an engineer to further appraise the damage.

"Precision will produce a repair for the airline, and the changes are made," adds McCarthy. "If it is a structural crack that overlaps between any conversion modifications and the aircraft's original

The 767 and 747-400 conversion programmes are the only two non-OEM-licensed freighter conversion modifications in the market. These two modifications are due to become OEM-licensed modifications.

structure, we work with Boeing to ensure the right repair is carried out."

This process is fairly standard across different conversion types. "The customer can contact Boeing and AEI when non-routine damage occurs," says Convey. "The aircraft site/zone map is consulted to determine who needs to make the repair. If it concerns the cargo conversion, it is passed to AEI and we certify the repair and damage-tolerance details. The repair is then sent to the customer. It usually only takes one day to get DER (designated engineering representative) approval."

Customer and technical support processes are also similar for widebody converted aircraft, such as those provided by IAI Bedek. "Our approach is to be as customer-oriented as possible," says Gaber. "We will provide customer support for all of the conversion-related modifications, including the main cargo door, surrounding structures, the modified floor structures, and the CLS.

"Customers can contact us anytime, and we will try to provide the customer and technical support solutions that they need," continues Gaber. "For non-routine parts and repair requirements, we can send repair teams to the aircraft. We can also provide all spare parts, including entire main cargo doors."

IAI Bedek is also looking to improve its technical support process. "We plan to improve our worldwide customer support system by opening a large spare parts warehouse in North America," continues Gaber. "There are many IAI Bedek-converted 767-200s, 767-300s and 747-400s in North America, and this will allow us to improve our technical support to these operators. Spare parts will be available within a matter of hours, with local points of contact for the operators.

"IAI Bedek will be developing a similar facility in the Asia Pacific region further in the future," adds Gaber.

In general, however, the modifications and systems on freight-converted aircraft do not require as much customer and technical support as the passenger-related systems they replaced. "There is not much technical support needed for the freighter structure and systems related to the conversion," says Netz. "In a passenger aircraft, more systems require technical support, such as seats, overhead bins, entertainment systems and galleys. The main demand for support in a converted freighter is the CLS/CHS.

"Many converted freighter owners and operators tend to sign agreements for customer and technical support directly with the CLS/CHS OEM," notes Netz.

Flightdeck modifications

During freighter conversion, aircraft undergo required and optional flightdeck and avionics modifications.

"A good P-to-F conversion programme will maximise and optimise what is available on the passenger aircraft," says Netz.

Brian Hermesmeyer, director of product marketing at Boeing freighter conversions, agrees: "Other than changes required due to the deletion of passenger systems and addition of freighter-specific ones, the flightdeck is unchanged."

Netz summarises the required additions to the flightdeck for freighter conversions: "This includes installing the main deck cargo-door status indication, a modified ECS control panel, and a modified fire and smoke detection control panel. In some cases, on aircraft with a 9G net, there is a requirement to modify the right-hand sliding window to allow it to be unlatched from the outside."

The ECS is modified because in passenger configuration, an aircraft may have up to six air-conditioned zones, whereas a cargo aircraft may only have three. The modified fire and smoke detection panel is added to the main deck of a cargo conversion because in passenger aircraft, this system is only for the cargo belly. With aircraft with a 9G net, there is the possibility that the main deck cargo can block the emergency exit door, so the right sliding window has to be modified.

In terms of required modifications, passenger systems unrelated to the aircraft's use as a freighter are also removed. This includes the public announcement system, passenger oxygen systems, passenger service units, toilets and related plumbing, and galleys plus their related plumbing and wiring.

Required flightdeck modifications do not vary widely depending on aircraft type, although certain more advanced types require more modifications. "Until now, the most advanced aircraft type converted to freighter is the 747-400," says Netz. "In this aircraft, the status or schematics of various systems can be displayed on the Engine Indication and Crew Alerting System (EICAS). In the conversion, the aircraft must be reconfigured from passenger to freighter mode. The crew can then monitor the freighter systems through the EICAS."

Operators of converted aircraft can also choose optional upgrades to the flightdeck, usually based on operator preference and fleet commonality concerns. "During conversion, aircraft owners and operators sometimes take advantage of the opportunity to perform unrelated modifications," states Netz. "These cover system upgrades, layout improvements, or fleet commonality. For example, Airborne Express (ABX) installed flat-panel electronic flight instrument systems (EFIS) on its converted 767 fleet."

One provider of flat-panel EFIS systems is Innovative Solutions and Support (IS & S). "The IS & S flat-panel display gives operators more capability on the flightdeck, and improved reliability through a more robust platform," says Mike Glover, director Atlanta region at IS & S.

The number of 747-400s converted by Bedek Aviation will soon be close to the number converted by Boeing. Bedek's conversion is non-OEM-licensed, but will gain OEM-licensed status.

Using a flat-panel EFIS can improve reliability for the converted aircraft. "The flat-panel EFIS provides a 70% reduction of line replaceable units (LRUs), which contributes to reliability improvements," says Glover. "This means that aircraft are kept flying for longer, and maintenance costs are reduced for flightdeck issues."

There are three major components to the flat-panel EFIS: the integrated flat-panel display (IFPD); the display control panel (DCP); and the data concentrator unit (DCU). "The IFPD is a self-contained display unit, which features the high-resolution LCD flat panel display. This shows all digital electronics, which have improved accuracy, dependability and responsiveness," says Glover. "The DCP provides pilot inputs and transmits data to the DCU, while the DCU replicates the existing instrument outputs and interfaces with aircraft components, such as the flight management computer (FMC), weather radar, and traffic collision avoidance system (TCAS)."

If a converted freighter operator updates its flightdecks with flat-panel EFISs, it can expect payback within 12–18 months, depending on its rates of aircraft utilisation.

Avionic modifications

Upgrades to individual avionics are also an important component of freighter conversions. Avionics requirements differ around the world and often dictate which upgrades are installed. If an aircraft being converted had previously been operated in one area of the world, for example, and is going to another area with more stringent avionics requirements, then the relevant avionic upgrades must be made.

Requirements for avionics are set by the regulatory authorities in different areas of the world, such as the Federal Aviation Administration (FAA) in the US, and the European Aviation Safety Agency (EASA). "EASA leads the world in terms of avionic requirements," says John Schildroth, vice president business development at CommercialJet. "EASA is the most stringent, while the US, Asia, etc. are trying to keep up.

"The modifications needed for EASA are the 8.33 KHz radio spacing, enhanced mode S air traffic control transponder, the RNP (required navigation performance) 5 MOD dual UNS1FW flight management system (FMS), FM immunity for navigation receivers, fixed emergency locator transmitter (ELT), and a flight data recorder with 32 channel upgrade," says Schildroth.

These are required to improve aircraft spacing, navigation and communications. The 8.33 KHz radio spacing, for example, has been required by EASA since 1999 to help aircraft cope with high levels of airspace congestion. The enhanced mode S air traffic control transponder is required to work with the TCAS, and has been required since 2000 in Europe, and 1993 in the US.

There is some difficulty in installing these avionic upgrades, because each airline configures its aircraft differently for passenger use. Conversion houses must therefore reconfigure these aircraft with avionics for their new global area of intended operation, and to the new operators' requirements.

"Every aircraft that is converted has different features and configuration, even if they are the same model," says Schildroth. "Each aircraft has different components and equipment installed, and has been wired differently. Some are half analogue and half digital, whereas others may be completely analogue."

As other regulatory authorities catch up with EASA, it is likely that avionic upgrade requirements will become more uniform for future freighter conversions.

Summary

Aircraft owners and operators can choose from a direct OEM conversion, or a non-OEM conversion.

Direct OEM-conversions provide the security that all customer and technical support will be handled, as with as any passenger or factory-built freighter aircraft. This often comes at a higher conversion price, however, so some owners and operators look to third-party non-OEM conversions. For Boeing aircraft, these owners and operators have the further choice of an OEM-licensed or non-OEM licensed third-party conversion house.

To access customer and technical support for the non-modified parts of the aircraft, owners and operators pay the annual Boeing Access Fee. For operators and owners of Boeing-licensed converted aircraft, this fee is $50,000 per year, per aircraft, and is applicable to the first four aircraft of a converted fleet, with no fees beyond this. That is, a maximum fee of $200,000 per operator.

For operators of non-Boeing-licensed converted aircraft, this fee rises to $150,000 per year, per narrowbody, and $250,000 per year, per widebody.

This must be taken into account when assessing the overall costs of owning and operating a converted aircraft.

Owners and operators must also consider the requirements of the regulatory authorities in the regions where the aircraft will be operated. If the aircraft has only been operated in North America as a passenger aircraft, with fewer avionic requirements, but is due to be operated in Europe, which has more stringent ones, the avionics upgrades must be performed at conversion. The flightdeck and avionics can also be upgraded to be the same as other aircraft in the fleet to maintain fleet commonality. This helps control operating costs. AC