

The 787 is the first aircraft to be offered together with a total engineering management & maintenance support product by its manufacturer. This type of support product is being extended to other aircraft types. Managing a fleet under such programmes is unprecedented for airlines.

Managing fleets under total care packages

Traditionally aircraft original equipment manufacturers (OEMs) have produced aircraft, delivered them to customers, developed and amended their maintenance programmes, and supplied spare parts. Carrying out maintenance and its associated planning and records management was left to airlines. This evolved to the point where a few third-party maintenance, repair and overhaul facilities (MRO) offered this service.

According to Bernard Hensey, vice president of fleet management at Boeing, the complexity of modern diagnostics systems and the increased trend towards outsourcing maintenance are leading airlines to require that OEMs stand behind the after-care of their products to a much greater extent than before. With this in mind, Boeing has introduced a suite of after-sales maintenance services under its GoldCare brand.

This was launched on the 787, but now has customers for the 747. It is also being extended to all production aircraft, including the 777 and 737 families.

This article explores GoldCare and compares it with some of the other total care offerings available from MRO providers including Lufthansa Technik (LHT) and SR Technics (SRT).

Regulatory aspects

Before examining the items included in any total care offerings, whether provided by an OEM or MRO, airlines need to know what they are allowed to sub-contract to a third party from an airworthiness and maintenance perspective.

While regulatory authorities stipulate that every airline is directly responsible

for its aircraft being in a state of airworthiness, there are many elements of maintenance that can be sub-contracted. In a European context this is laid out in European Aviation Safety Agency (EASA) Part M: airworthiness elements are laid out in sub-part G and these can be sub-contracted to an entity approved as a Continuing Airworthiness Management Organisation (CAMO).

If an airline chooses to sub-contract to a CAMO, that entity can perform the required functions including: operational compliance; airworthiness directive (AD) and service bulletin (SB) compliance; monitoring validity of the certificate of airworthiness (extension of Aircraft Review Certificate in an EASA context); maintenance programme development; maintenance planning; maintenance workscope production; technical records management; and reliability performance.

Ultimate responsibility always remains with the airline, whether or not it is part 145 certified, but the maintenance functions can be contracted to a third party. Airlines only need an accountable manager and a maintenance director as one of the key post-holders. The minimum requirement for a part-145 operation under EASA rules would be the addition of a quality manager. In practice, however, a team of technicians would also have to be employed to service even a small operation for line maintenance only. Meeting the regulatory requirements for a Part-145 operation is a time-consuming process, so this is one of the attractions of outsourcing to third parties.

Given these constraints, Harry Seeger, sales director key account lessors & banks at LHT, explains that legal responsibility for maintenance and airworthiness remains with the operator.

This cannot be taken over by a third party, so, for example, one set of original records must always remain with the operator and a second set can be held within the LHT system.

Hensey explains that the level of oversight required by local aviation authorities can vary considerably by jurisdiction. For example, most authorities now accept digital records, but the application of this principle has not yet been uniformly established. Some jurisdictions continue to require full paper records, while others are moving towards implementing electronically-held digital records. In other countries, records may now be held outside the relevant jurisdiction, whereas this is not possible elsewhere. To implement its GoldCare offering, Boeing needs to map out in detail with the airline and its local regulator what can and cannot be done, so that a tailored approach can be adopted for different national authorities.

In short, Hensey says that while almost all maintenance-related functions can now be outsourced, any individual operator must have enough judgement to have an overall quality assurance and oversight function, but that in some cases this can now be quite thin.

Total care packages

Parts

Most airframe total care packages can be tailored to suit customer requirements so that it is possible to subscribe to various levels of cover. The more basic packages tend to cover rotatable components and consumable spares. Boeing's service covers access to pool



parts, spares, supply chain management, and a repair-cycle system whereby parts are replaced with serviceable units and a base stock of commonly used parts if required.

In itself this type of service is nothing new, and could be offered by a variety of third parties. In practice, few such parties have yet built sufficient knowledge and stock for the 787. Hensey emphasises that Boeing's GoldCare offering is unique in offering close co-operation with local pools in the region where the operator is located and a network of links with parts vendors to supply components directly. Some operators such as TUI have opted for this level of service for their forthcoming 787 fleet.

Seeger explains that larger independent MROs, such as LHT with a network of facilities and stock located around the world, can offer a highly capable pool parts service, which it deems competitive based on the economies of scale that they can achieve through the number of participants in its pool. LHT calls this Total Component Support (TCS), and considers this to be one of its fundamental showcase offerings. LHT is also extending the TCS product with its Total Material Operations (TMO) service with complete materials supply and logistics.

Bas Gouverneur, head of aircraft engineering at SRT, says that it offers an integrated components solution. This positions a stock of commonly used parts at the operator's home base, while offering access to a global pool of further inventory of \$850 million in value. SRT can also provide comprehensive financing

options through Sanad Aero Solutions, a finance and leasing solutions provider for components and spare engines.

Engineering support

This comprises several management activities which airlines traditionally have performed in-house. In parallel, many elements of physical maintenance have been outsourced.

Engineering management functions include procuring and managing changes and updates to the maintenance planning document (MPD), and the associated publications. These include aircraft maintenance manuals and illustrated parts catalogues which are affected when the MPD is updated with a new revision status. Management tasks also include the engineering analysis and embodiment of airworthiness directives (AD) and service bulletins (SB).

Maintenance programme design and scheduling along with the definition of the associated workscopes are also included. Airworthiness management, quality assurance and entry into service (EIS) would also fall within engineering management.

According to Hensey, Boeing considers these engineering management functions to be part of its core offering. As the OEM, maintenance programme design is vital to every aircraft type and is core to Boeing's offerings for GoldCare on the 787. GoldCare includes maintenance planning elements and engineering analysis for ADs and SBs. It also includes a programme for reliability management and configuration

The 787 is the first aircraft to have integrated or total care engineering & maintenance packages offered by the OEM. Boeing has sub-contracted the 787's airframe maintenance under its GoldCare product to several third party providers, that include Monarch Engineering. Some 787 operators, such as LOT, have contracted directly with these maintenance providers, and avoided Boeing's GoldCare product.

management, which in this context relates to aircraft systems. Boeing argues that such elements all contribute to more efficient and reliable maintenance to ensure that service time for the aircraft is maximised.

Beyond LHT's core MRO and parts services, engineering services can also be provided, including planning and scheduling, workscope preparation, SB and engineering order (EO) embodiment.

Seeger says that LHT will also make recommendations when items are not required or not applicable to the relevant customer's circumstances. Even if some items are not strictly needed, there can be circumstances where embodiment maintains long-term value more effectively. An example is where it makes it easier to transition an aircraft to a future operator. Alternatively, it may render future maintenance easier by maintaining commonality within LHT's managed pool of aircraft, and so be less expensive to operate in the long-run.

Gouverneur explains that engineering support forms a strong part of SRT's offering. This includes acquiring and managing OEM-supplied documents and manuals, designing EOs and modifications, generating task cards, and shop-floor data collection (SFDC) recording and analysis. It can also offer troubleshooting and an aircraft-on-ground (AOG) desk.

Base maintenance

Although GoldCare and other total care packages typically include base maintenance, it is possible to include line maintenance as well. Boeing has a number of partners with which its GoldCare support is implemented and delivered.

As the OEM, Boeing has a strong capability in engineering and a broad ability to manage the supply chain for its parts support business.

As an OEM, however, Boeing has chosen not to develop its own MRO capability, so its ability to provide base maintenance is limited. It therefore needs to provide at least some of this capability through MRO partners, particularly outside the USA. In this context, Hensey explains that Boeing has agreements to deliver GoldCare base maintenance with



Boeing's joint venture MRO in Shanghai, China, and Monarch Engineering in the UK.

While LHT can also provide line support, base maintenance is much of its core business and can be delivered through seven centres in its global footprint. LHT has over 20 airline customers in Europe alone. To the extent that this is not provided as part of its total technical support (TTS) offering, it can be provided as a total base maintenance support (TBS).

Application of total care

A number of integration issues arise when an airline contracts with either an OEM or an MRO for a total care support package. The regulatory constraints have already been addressed above, but there are practical communication issues inherent in the support provider and airline customer not being co-located.

Assuming that the airline is not starting from a blank page on records management, the first question that arises is how the information technology systems of the service provider and operator communicate with each other. The increased use of digital records makes the task easier, as long as both information technology (IT) systems can read the relevant data. Hensey explains that Boeing's approach is to work with the customer's IT system and adapt it where necessary to ensure that all necessary information is available to both parties, but he concedes that this can present integration challenges.

By contrast LHT encourages its customers to adopt its web-based 'Manage/m' system. This does not require any additional IT systems investment by

the operator, and it can read data from most existing systems. LHT says that Manage/m provides all the necessary information for an operator to live up to its responsibilities in full. The system is also sub-divided into 16 modules so that users may choose which are applicable. M-airborne, for example, is the tool for entering and monitoring flight hours and cycles, while the m-archive module is for storing and searching technical records. The m-compliance module addresses the airworthiness status of the aircraft, engines and components.

SRT can either work through its own platform whereby data is uploaded via its e-customer page, or it can operate directly through the customer's existing system. Gouverneur says that SRT can also establish a specific interface to ensure smooth data transfer.

Another potential concern is how to co-ordinate the operational needs of airline customers with those of the total care provider. Clearly maintenance scheduling cannot take place in isolation, so all providers have to account for this.

Hensey explains that Boeing's approach is to establish three different nodes in this process. While the Seattle-based centre has overall responsibility for GoldCare, there is a spread of centres around the world with a co-ordination role. Currently this comprises service centres in south-east Asia, north-east Asia and Europe. Third, Boeing embeds its own staff with airline customers in order to co-ordinate maintenance scheduling.

Gouverneur says that there is a very close link with SRT Maintenance Control Centre and the flight operations department of its customers, in order to ensure a smooth service for its airline customers.

Larger total care packages include complete services for the management, supply and maintenance of rotatable components.

Total care pricing

While traditional MRO pricing has been based on time and materials, LHT can price its TTS offering according to the needs of the customer. Seeger suggests that total care can be provided on a fixed price per event basis or on a per flight hour and flight cycle basis, depending on how intervals are normally calibrated.

Under its popular components service, the number of parts, the number of aircraft in the fleet, projected hours per year of operation, and the length of term of the contract are all taken into account to arrive at an hourly rate. Foreign object damage and unjustified removals would normally be excluded.

From an engineering services perspective, a monthly rate would be typical, but LHT can be flexible and offer this as part of a flight hour structure.

Typically a TTS offering would be priced on a 10-year term. LHT would also account for the specific operating conditions of the operator concerned, its credit quality and perceived risk both of the airline and the jurisdiction. If there was ever a need to terminate the contract early or partially end the agreement because, for example, aircraft are sold or returned to lessors, the contract contains termination clauses that enable services rendered to that date to be recalculated. It may also be possible to transfer the contract to a new operator, although this would be under new terms that reflect its operations and risk.

Gouverneur adds that each contract is tailored to the customer's needs. He agrees that component services are normally priced on a flight hour basis. Aircraft base maintenance services would normally be priced on a per check basis, while engineering services are also structured on a flat rate based on the number of aircraft, their age, scope of services and term of the contract. If a termination occurs there are specific clauses to cover this that can be agreed.

OEMs differ in their approach in that maintenance and engineering services are not viewed in isolation. Hensey explains that GoldCare is sold as an after-care product to support the quality and reliability of Boeing's own products. Boeing, he says, intends to deliver a commitment to its customers on its aircraft and some customers are driving



the OEM to lock in maintenance economics as part of that commitment. Hensey adds that it is also important to offer airlines a consistent proposition in the market, so the aim is to offer the most competitive balance between the technical performance of Boeing's aircraft and their cost.

Typically, like LHT and SRT, the most common pricing mechanism is to charge per flight hour for a high-level support package. In Boeing's case this would include unscheduled items. Boeing is following a similar evolution to the engine OEMs that have been offering power-by-the-hour services for a number of years.

As part of its GoldCare package, Boeing has also recognised early on that a mechanism is needed to transfer the cover from primary operators to secondary users. With the objective of supporting its aircraft throughout their economic life-cycle, Boeing's offering is structured to enable a smooth transfer. Accordingly, Hensey stresses that there is no intent to, for example, impede the timely transition of records from one operator to the next. Instead, it is Boeing's intention to reduce risk and complexity in this regard. Since the product is new on the 787, however, there is so far no precedent for any such transfer.

Potential conflicts of interest

Historically, OEMs have manufactured aircraft while airline operators themselves or MRO providers have maintained them. There can be little doubt that the involvement of Boeing in after-sales maintenance and engineering changes these dynamics.

Needless to say, a number of MROs

may perceive an OEM-provided service as a competitive threat to their existence. The criticism that Boeing's GoldCare service is trying to lock in the after-market services traditionally provided by third-party MROs and airlines, has been made by a number of parties. This is to the extent that some believe that Boeing should concentrate on manufacturing aircraft, while MROs and airlines, as the case may be, should be involved in maintaining them.

Furthermore, some argue that while OEMs build aircraft, it is airlines that operate them, which is why they hold the operating certificate. Airlines are therefore responsible for safety and for carrying the costs of operations, maintenance and parts inventory. In addition, airlines answer to the aviation authorities, shareholders, staff and the travelling public for how well those responsibilities are met. Some airlines believe that they achieve the best value when they can choose where, when and how aircraft are maintained, and by which maintenance providers. The concern is, therefore, that the OEM, as a monopoly provider, could not only reduce competition, but may even restrict access to technical information so that no party other than the manufacturer could maintain the aircraft.

Boeing has responded to such concerns in a number of ways. First, Hensey states that the principal driver for the creation of GoldCare was its customers, who asked the manufacturer to stand behind the product that it delivers. Boeing needed a product proposition to underwrite that requirement to achieve this. This led to the creation of GoldCare.

Second, Hensey adds that Boeing has

Part of SR Technics's Integrated Solutions product is engineering management and support. This includes acquiring and managing all documents and manuals, and a wide range of engineering management functions.

no desire to have a major footprint in the MRO world, not least because it would be unable to maintain the entire world's fleet. Boeing has therefore established a network of partnerships with MROs around the world and is likely to grow that as the number of subscribers increases and the fleet grows. He says that, as a result, the OEM and MROs need to work together in partnership, so Boeing does not see this as an area of conflict.

Finally, Hensey adds that there is no obligation at all for an operator to enrol in GoldCare. Some operators either do not subscribe at all, or do so in only a limited way. Indeed, there are also examples where MROs that are partners in offering GoldCare can offer services to 787 customers outside this arrangement. For example, LOT Polish Airlines has signed a contract with Monarch Engineering to support its 787 fleet without GoldCare.

Concluding remarks

Gouverneur confirms that while Part M responsibility remains with the operator, airlines need to monitor any sub-contracted activities. This puts certain limits on how far a total care offering can go.

There are many levels of options within the offerings provided by the MROs and Boeing's GoldCare. Most providers allow airlines to choose from a menu of options, of which parts support appears to be the most popular.

Outsourcing base maintenance and, in some cases line maintenance, particularly at outstations, continues to grow. Although it is now possible to outsource many of the engineering functions, the popularity of this is more limited. This may be driven by fear of being unable to bring back these functions if an airline is unhappy with the provider's levels of service. A more common approach has been for smaller start-up operators to outsource engineering functions at the beginning and gradually bring these back in-house as they grow and mature. [AC](#)

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