

The impact of aviation authority directives relating to avionics. How are the directives affecting used aircraft values and what are the typical considerations for operators and lessors who want to upgrade their aircrafts' avionics?

# The affect of avionic standards on marketing used aircraft

An aircraft's remarkability can be improved by upgrading its avionics to meet its targeted market segment.

Avionics have not historically been a priority for commercial aircraft; over the long-term, when assessing a used asset for commercial flight operations, the avionics fit has generally been low on the agenda. Commercial aircraft buyers are more concerned about the number of flight hours (FH) and flight cycles (FC) on the airframe and engines; the airframe's and engines' maintenance condition; and the amount of green time remaining on its life limited parts (LLPs). With respect to the avionics fit, aircraft assessors simply list the components installed and then gravitate to the higher value components.

Recent mandatory avionics requirements by air traffic management (ATM) regulators worldwide, however, have placed more importance on avionics for an asset to be compliant. To ensure an aircraft is legal to fly within its jurisdiction, buyers, lessors and lessees need to know what the minimum obligations are.

New European Aviation Safety Authority (EASA) and Federal Aviation Authority (FAA) initiatives on avionics mean operators need to decide if the cost of the necessary upgrades can be justified.

Many factors must be considered when deciding on the cost of an avionics upgrade to meet legislation, against the overall value of the asset. Yet this offers many operational and marketable advantages.

## Regulatory requirement

The four key drivers for regulatory requirements are: safety, ATM, system updates and environmental. These are agreed by the International Civil Aviation Organisation (ICAO), and then set out in

Standards and Recommended Practices (SARPs).

Technical specifications adopted by the ICAO Council are demonstrated in accordance with Article 37 of the Convention on International Civil Aviation. Article 37's objective is to achieve the highest practicable degree of uniformity in regulations, standards, procedures and organisation within the industry, to facilitate and improve air navigation.

Many aviation authorities have set their own requirements beyond SARPs, to improve the safety of aviation under their own jurisdiction, while streamlining aircraft operations.

Consequently, the regulations stipulated by national and regional aviation authorities will influence the market that an aircraft can operate in, and the type of mission it can fly.

The three major authorities are EASA, the FAA, and the Civil Aviation Authority of China (CAAC); all have different iterations of SARPs regulations. Typically, an aircraft registered to any one of these three regulatory bodies can be transferred to most other national aviation authority jurisdictions around the world.

This is because an aircraft mandated by CAAC, EASA or the FAA will often meet a higher SARP requirement than other ICAO member states, even though each has mandated different SARPs minima. Nevertheless, an aircraft mandated under Chinese, European or American rules will be highly marketable for operation under most jurisdictions worldwide.

## Avionic mandates

Link 2000+ and future air navigation system (FANS) B+ are used by ATC to send navigational instructions in text to the flightdeck. These systems are to be

mandated by EASA in February 2020.

In January 2019, CAAC introduced a cockpit satellite communication (SATCOM) requirement that can connect voice communications between an aircraft and its airline operations centre (AOC) within four minutes anywhere within Chinese airspace, independent of the air traffic control (ATC) system.

ATC Mode S Transponder, Automatic Dependant Surveillance Broadcast (ADS-B) Out to DO260B capability, is to be mandated by the FAA in January 2020 and by EASA in July 2020. CAAC mandated the ADS-B Out for flights operating above flight level (FL) 290 in December 2019, and is expecting full compliance by 2022; the FAA will be fully compliant in 2025.

CAAC is introducing a single head-up display (HUD) requirement for the flightdeck in December 2020; a dual HUD requirement will be introduced by December 2025.

## ADS-B Out

By 2020, all commercial aircraft registered in the US and Europe will be required to transmit ADS-B Out positioning information, in compliance with DO-260B rules to fly in airspace where a transponder is required today.

Bill Tarpley, president Creative Conversion Management LLP, says: "ADS-B Out makes it possible to 'ping' the aircraft from the ground. The aircraft will then message its location to ATC. So basically, the aircraft will give its position away, instead of using radar to find it."

ADS-B means the aircraft will tell ATC where it is, without the pilots having to manually communicate their position to ATC. To meet the required mandated standards, an aircraft's global positioning system (GPS) will need to be an approved avionic unit.



“Originally the only way to do this was to through Airbus or Boeing. They would upgrade the instrument landing system (ILS) to become a multi-mode receiver (MMR),” says Tarpley. “The MMR is both ILS and GPS. Instead of voice communications, an aircraft communications addressing and reporting system (ACARS) would be installed, and SATCOM for better international communications over water.”

The Mode S Transponder upgrade includes the extended (112 bit) squitter which will send messages via ACARS. The system functions by ground units asking where the aircraft is, and the aircraft reporting its position through ACARS.

The MMR modification requires an upgrade to the aircraft’s multifunction control and display unit (MCDU) on the centre pedestal, located in the flightdeck. This is the interface between the flight management system (FMS) and the pilot.

“You need to have the MCDU to type in a digital number instead of a whole number. Boeing charges about \$900,000 for the service bulletins (SBs), before the hardware has been bought or installed,” says Tarpley. “Boeing charges for two SBs; one for the MMR and one for the MCDU. Then it upgrades the required navigational performance (RNP) system.”

Upgrading the RNP system allows an aircraft to be located more accurately to 0.3 of a nautical mile (nm). This means it can fly along any airway and land at any airport.

In the context of a lease return, many aircraft are being returned because operators do not want to spend money on making them ADS-B compliant, if they are only going to fly them for a few

more years. More emphasis is being placed on the level of avionics equipment that is installed.

“Recently, the avionics fit has become one of the first things we look at after the engines,” says Tarpley. “A non-compliant avionics suite can reduce the value of the asset by up to \$1 million. That is the value difference between the cost of the upgrade, and it is the difference between putting the aircraft back on the market or parting it out.”

The issue is compounded when assessing older aircraft for freighter conversion, because of the additional investment for avionics kit needed to fly for an additional 15 years, plus the cargo door modifications. Both these factors need to be reflected in the initial aircraft purchase price to make the conversion worthwhile.

Sometimes operators will not only have to add the MMRs and the MCDU, but also upgrade the aircraft recorder system to handle all the additional messaging.

An updated digital flight data acquisition unit (DFDAU), sometimes called a flight data interface management unit (FDIMU), should be installed. A flight data recorder (FDR), with additional recorded flight parameters, and a higher processing rate and memory, will also be installed along with a faster cockpit voice recorder.

“What you usually find is that the operator will first sell or return the aircraft that needs upgrades. TUI had an aircraft that needed to be upgraded and it was one of the first aircraft out of its fleet to reach the market,” says Tarpley. “Aircraft come on the market at the right age and with the right FC, but then you

*The Civil Aviation Administration of China is introducing a single head-up display (HUD) requirement in December 2020; and dual HUD requirement will be introduced by December 2025.*

look at the avionics and think ‘that is too bad’.”

A lot of aircraft were delivered in the late 1990s with the MMRs and GPS already installed. In addition, Boeing has been retrofitting upgrades for 20 years.

The many alternatives on the market can conflict with the OEM system. Aircraft will have the legacy OEM GPS system in place, which is connected to the FMS for navigating the aircraft. Then a second, more modern, retrofitted GPS will interface with the ADS-B system. It is therefore likely that the two GPSs will disagree by a certain value. Yet if the two GPS receivers are calibrated within set parameters the system is safe to be certified.

Consequently, the regulations stipulated by many national and regional aviation authorities will influence the market that an aircraft can operate in, and the type of mission it can fly.

## MRO and RNP

GoAeroMx is a maintenance services company developed from worldwide operating and management experience of Part 25 transport category aircraft. Its services include consulting, and recommending and implementing avionics and entertainment retrofits and upgrades.

GoAeroMX, vice president of sales and business development, Mike Glover says: “Many clients say that they would like to upgrade the avionics or inflight entertainment suite on their aircraft. Our first questions to them are: what is the aircraft’s mission going to be? and what do you want to do with it operationally?”

GoAeroMx will then analyse the desired operating needs against airspace requirements to identify solutions. For example, if a customer wants to routinely fly it across the North Atlantic between the US and Europe, it will ideally be equipped with Required Navigation performance (RNP) for navigation, and meet datalink communications requirements for access to the most efficient airspace.

The foundation of today’s global navigation system is that aircraft need to be equipped with a GPS-based satellite navigation suite. This GPS coupled with the capability usually contained within the Flight Management Computer (FMC) will support RNP which enables aircraft



to precisely navigate along the route it is trying to fly.

The value of having like-equipped aircraft flying the same route more precisely, is that it is possible to enhance the capacity of the system and allow more aircraft to access the same volume of airspace. Having more accurate avionic navigation along with datalink communications ensures Air Traffic Service Providers (ATSP) and pilots can safely manage and operate aircraft in the same airspace and in many circumstances closer together than with legacy equipment.

“This RNP system is not mandatory in most parts of the world, but if an aircraft is not RNP-equipped it may be relegated to less direct and efficient routes,” says Glover. “When a non-RNP aircraft is transitioning the North Atlantic it will often be routed over the northerly track system, which takes more time, and costs more. If the aircraft is equipped with RNP, or RNP and Datalink, then a more direct flight plan is likely to be authorised.”

The accuracy of RNP also extends to approach and departure procedures, because the accuracy and integrity of GPS and RNP allow for procedures to be designed where legacy ground-based navigation-aid limitations would drive higher approach minima or prohibit their use altogether. Instead of using traditional VOR or ADF navigational procedures, RNP-equipped aircraft are more likely to successfully complete their operational mission, as opposed to being delayed or diverted by a non-precision approach limited by the effects of weather, the radio or the technology on which the legacy approach procedure was built.

New aircraft are RNP-compliant and usually have a full complement of datalink capable avionics onboard. Legacy aircraft will most likely require some kind of avionics retrofit to meet these enhanced operational capabilities; especially if their operators want to maximise operational efficiency, access to different airport approaches and ultimately complete an on-time schedule while managing operational costs.

As significant as GPS and RNP are for navigation, the use of datalink equipment frees up congested voice frequencies and provides data from the aircraft to the ATSP more efficiently. When an aircraft transits in very remote locations, the Very High Frequency (VHF) radio communication spectrum is no longer effective due to its “line of sight” requirements. Typically, today’s remote or long-range communication source is supported by satellite communications; these are hosted by datalink service providers such as ARINC, SITA, Honeywell’s GDC, ARINC Direct and Satcom Direct to name a few. The satellite communications messages typically flow over an Inmarsat or Iridium satellite network, both of which are approved and certified to provide datalink messaging for ATC purposes.

“If our clients are operating globally, GoAeroMx reviews the avionics communication suite to determine what is required for datalink use in terrestrial, oceanic and remote operating environments. This review looks for Aeronautical Telecommunications Network (ATN) radios, satellite radios, Communication Management Units (CMU), control switches, approved data

*Avionics requirements need to be addressed when assessing older aircraft for freighter conversion. Upgrade costs must be reflected in the initial aircraft purchase price to make the conversion worthwhile.*

link software and anything else needed to support DATALINK-2000 in Europe or Controller Pilot Data Link Communications (CPDLC) in the US,” says Glover.

The Datalink 2000 and CPDLC systems are both essentially providing a similar service, which is using ATC services datalink messaging in lieu of voice radio calls. With this datalink capability, aircraft will either send pilot-initiated messages or in many cases automatically send messages such as aircraft position reports to controllers.

This is more efficient because there is no time lag communicating between the aircraft and the ATC. “There are a number of DataLink-2000 users in Europe right across multiple airspace regions, affecting multiple countries. DataLink is taking on a more prominent role for operations on the ground and in the air in the US. In both cases operators are having to review their communications equipment to meet operational requirements or access the preferred routes or service,” says Glover.

The industry continues moving towards datalink communications and it is likely that there will be limitations for aircraft that are not equipped with Datalink or CPDLC. When operators review the cost benefit of being equipped (priority access to preferred airspace) versus not being equipped (access to preferred airspace at less popular times, or a less desirable track), based on the number of operations in those arenas, they will decide whether equipping or not is necessary. Usually not being equipped to perform a desired operation equates to a longer route, which needs more flight time and costs more in fuel.

“Operators and airlines hold varying views on what they need to do to maximise operational efficiency. A key question we ask, is: ‘what is required to be competitive?’” Glover explains. “If you are flying an aircraft an extra 20 minutes a few hundred or 1,000 times per year, what is the operational impact in terms of aircraft utilisation, fuel cost, crew cost, power by the hour contract, consuming time on leased engines, etc.? Each of these items is an incremental “value adder”, and is used to build a detailed business case to justify why these avionics upgrades are needed.”

Other intangibles attributable to avionics refits are the commonality and

standardisation of installed items across a fleet. In terms of legacy aircraft, the decision to upgrade depends on the aircraft. For example, many operators have aircraft from previous operators or lessors or with new equipment provided by an original equipment manufacturer (OEM). It can be expensive for an operator if their aircraft are equipped with a mixed bag of avionics. Often parts are not interchangeable, so operators need to stock a large inventory of spare and replacement parts.

“The typical GoAeroMx review of aircraft in the fleet will assess all its avionics systems and where they fit, and document the differences,” says Glover. “If a client wants to standardise, we recommend all the areas that need attention, and offer solutions based on the mission that needs to be flown. We propose communication, navigational and surveillance technologies, and establish whether any of these can be procured as new, or as used serviceable material (USM).”

Looking at the fleet from a lessor’s perspective, they need to turn the aircraft when a lease expires and put it back into the market with the minimal time off lease. Lessors routinely ask what the next operator is going to expect in terms of avionics capability within the aircraft. Lessors are willing to upgrade if they can

invoice the upgrade costs to the customer as part of the monthly lease rate. Sometimes clients do not want to pay the money, so then the lessor’s business case analysis drives the discussion on whether to equip, while capturing revenue.

Understanding the operator, airline or lessor is important but so is exploring mandates. As discussed, while few mandates require an update to GPS, RNP or datalink, there are still mandates that need to be accounted for. The near-term mandate affecting the industry is Automatic Dependent Surveillance – Broadcast (ADS-B). There is a plethora of ADS-B solutions out there - one solution does not fit all. GoAeroMx provides clients with options.

“During our surveys we identify what is installed, and what can or can’t be done with that equipment. If an aircraft is equipped with a Rockwell Collins transponder, we can look at keeping it or trading it for another option to meet an approved path,” says Glover. “We will then quote the customer on each option and ask them what they prefer to do.”

Before creating any new certification paperwork, GoAeroMx will search the marketplace to identify an approved upgrade via Type Certificate (TC) or Supplemental Type Certificate (STC). According to Glover, there is no sense in developing an STC when is one already

available. “As we are dealers for a number of avionics suppliers and have access to a range of STCs, we can strategise and quote the whole implementation plan, including prices for the STC, avionics equipment, engineering to include any specific aircraft deviations and manpower for installation at our or a client’s location.” says Glover.

One of the issues that maintenance and repair organisations (MROs) are facing are the lead times for hardware, installation kits or engineering. If a transponder upgrade is needed, or a unit needs a software enhancement to meet the latest mandatory requirements, this wait time must be factored into the planning process.

“As a participant in the ADS-B Working Group in the United States, I see the metrics that are being tracked for ADS-B compliance, focusing on the number of compliant aircraft,” says Glover. “Overall everybody is working diligently to meet the requirements of the mandate.”

It is currently unlikely that the ADSB compliance mandate date will be extended; the FAA are holding fast to the January 2020 mandate date. The value of the ADSB-out will provide a highly accurate traffic depiction to ATC, resulting in an enhanced system. It is thought that EASA will also not change



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their compliance date. Another benefit of the ADS-B mandate is the GPS system based on Space Based Augmentation System (SBAS) based, which will enhance operational efficiency and eventually lead to traditional radar infrastructure being decommissioned.

In terms of avionics, impending mandates like ADS-B requirements are an operator's main focus, yet Glover believes that for the most efficient operations it is just as important for operators to pay equal attention to navigation and communication equipment (i.e. FMC and Datalink system), whether using a new aircraft off the assembly line or a legacy aircraft with many cycles left before retirement.

### Data harvesting & transmission

Depending on an aircraft's age, there are different levels of value in terms of what avionics upgrades can do. By upgrading avionics equipment on older aircraft, it is possible to make the asset more efficient to operate, and to analyse its safety and reliability data.

Murray Skelton, senior director of aircraft solution strategy, at Teledyne Controls, says: "ADS-B does not enhance the value of an aircraft. It is just that you will not be able to operate in EASA or FAA airspace without it. Teledyne designs products that increase an aircraft's marketability, and reduce operational costs."

Flight operational quality assurance (FOQA), also known as flight data monitoring (FDM), is a method of capturing, recording and analysing FOQA data to improve flight safety and increase overall operational efficiency.

Recording FOQA data is mandatory with most regulators in the world, but the

FAA is one of the few that has not made it mandatory. European aircraft all had the upgrades in 2005-2006 after EASA flight FOQA directives were mandated. China mandated FOQA shortly afterwards.

Teledyne Controls produce a wireless quick access recorder (QAR) that can collate and disseminate FOQA data. The QAR autonomously transmits FOQA data directly to the airline once an aircraft has completed a flight, typically across the long-term evolution (LTE) network. The system is autonomous and reduces operational costs, since engineers are not required to manually extract the data from the aircraft.

Airlines operating under a FOQA mandate self-regulate by sending regulators some of the recorded data, to demonstrate to them that they are mindful of unstable approaches, heavy landings and similar hazardous incidents. Airlines also need to show that they are addressing crews about these incidents.

"In China it is necessary for the airline to send a copy of the FOQA data to its regulator, so that they can complete their own analysis of it," says Skelton. "This procedure may be implemented by other aviation authorities in the future."

### Big sets & active health monitoring

Teledyne Controls, Boeing and Airbus sell an SB that allows operators to remove the data acquisition unit from an aircraft. This collects and records data sets and parameters from the many sensors onboard the aircraft, and in turn feeds that information to the wireless QAR, which distributes it.

"Everyone is talking about Big Data, and the harvesting of data. It is only

*The last time a large number of aircraft retirements occurred as a result of avionics fitment was when EFIS, 'glass cockpit' equipped aircraft replaced traditional instruments.*

possible, however, to record and transmit the data parameters that the aircraft is able to gather. Many older aircraft do not have as many data points," says Skelton.

For older assets, it is possible to upgrade the data acquisition unit, which will enable the aircraft to record data at a faster rate. By increasing the sampling rate, a faster unit will give operators more insights because of its ability to save more data.

Installing a newer acquisition unit will empower aircraft fitted with legacy FMS units, because it will be possible to harvest much more information by connecting a higher number of sensors.

The Teledyne GroundLink system automatically transfers the data when the aircraft connects to the LTE connection at the airport gate.

"Most of the data transfer takes place on the ground, when the aircraft parks. It is not recommended to start off-loading data when the engines are running, because you are missing shut-down and start-up data," says Skelton. "The best way to acquire the complete picture of the flight is when the aircraft has been shut down and is at the gate."

If an operator wants to do real-time data analysis, they can live-stream the data. An advantage of this is that it is possible to analyse aircraft performance and address faults or technical issues while the aircraft is still in flight.

Aircraft Health Monitoring (AHM) or Aircraft Condition Monitoring Systems (ACMS) are routine systems that 'alert' operators to potential issues. If there is a hard landing, they will produce a report and send this via ACARS automatically. Normally the whole reporting procedure will be completed before the aircraft has docked at a gate.

With upgraded acquisition, it is possible to generate and send a cruise report on how the aircraft engines are performing via ACARS.

Even if the report is not sent by ACARS, the aircraft will dispatch it when it connects to the LTE network at the gate.

The benefit of sending the information by ACARS is the types of report identifiers. If an engine has a vibration or an unusual core temperature, this will be in the report and can be shared with the maintenance department. Then it will be possible to continue with the flight or get the aircraft turned

around and back on the ground.

The main benefit of upgrading the OEM acquisition unit is the extra data that can be harvested. It is also possible to standardise the data across the fleet. Often aircraft have been configured to record different datasets. When an airline is operating many different aircraft that it has acquired from different operators, they are likely to be off-loading many incompatible and inconsistent data sets. Standardising decoding scripts enriches the data and makes it easier to translate the insights into meaningful information.

Teledyne Controls acquisition units are designed to be swappable to simplify the upgrade process.

“You update the aircraft manual, then swap the old acquisition unit for the newer one. However, there can be many permutations for the number of systems it can monitor,” says Skelton. “Teledyne Controls supplies an installation kit with the unit. Depending on how old the aircraft is, installation can be very quick or it may be necessary to install a new avionics tray and connect new inputs.

ACMS and AHM are not mandatory. They are airline efficiency initiatives aimed at more efficient aircraft operation by reducing unplanned maintenance.

If operators are changing an aircraft from an FAA to an EASA registration, it is likely that the aircraft will already have

an OEM acquisition unit fitted. It is possible that the basic mandatory dataset recording specifications are then loaded onto the system before it is compliant.

### Part-out

It has been reported by CH-Aviation that Blue Air will retire 10 737 Classics by the end of 2019 because of the cost of upgrading them to meet EASA ADS-B Out requirements. These include two 737-300s (29.5 years old on average), two 737-400s (28 years old), and six 737-500s (28.6 years old). The necessary ADS-B Out upgrades must be completed by June 2020 to meet EASA’s mandatory requirements and by January 2020 for the FAA’s.

Stuart Rubin, vice president at ICF, says: “I think that avionics driving the early retirement of aircraft because of the upgrade costs, is one of the elements that influences an aircraft’s value.”

According to Rubin, older aircraft typically do not generate as much revenue from part-out as newer spec aircraft with the latest updates. However, these older airframes may be acquired for lower prices, thereby improving returns on an asset by asset basis.

“When we look at assets during a valuation, we assume the asset has the required equipment to operate under

EASA or FAA or other regulatory authority. There may be aircraft coming off lease without all the necessary equipment or that need a specific piece of avionics equipment to move to another jurisdiction,” says Rubin.

In these cases, it will be the lessor’s choice to upgrade the aircraft’s equipment. Normally price adjustments can be made on the level of equipment the aircraft has installed. It is important to consider if the upgrades will increase the aircraft’s marketability within its targeted jurisdiction.

When it comes to the liquidity of popular assets, such as 737-800s and A320neos, appraisers analyse the market mass for the type. They evaluate how many of these types are in service and on order, combined with the number of operators. Aircraft availability is also a statistic ICF looks at when gauging aircraft demand and values.

“There may not be a significant difference in value between an aircraft with mandated equipment and one without, but the asset with the mandated equipment is likely to be more marketable,” says Rubin.

According to Rubin, the last time a high number of aircraft retirements occurred as a result of avionics fitment was when electronic flight instrument system (EFIS) or ‘glass cockpit’-equipped

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aircraft replaced older types with traditional instrumentation.

“Many older 737s and MD-80s without the glass cockpits were pushed into early retirement, although I think that the latest ADS-B Out mandate will be less significant,” says Rubin.

This is partly because there is a strong demand for engine material. This is expected to stay high for the next three to four years, partly because air traffic is growing at 4.5% per year, and partly because of the grounding of the 737 MAX fleet, along with delays with the A320neo family.

Aircraft that were expected to be retired at 21 or 22 years of age will now have to remain in service longer. For them to meet the forthcoming EASA and FAA avionics mandates, it will be imperative for the operator to install ADS-B Out.

Prices for airframes have remained strong for the past 12-18 months, so the investment in the ADS-B upgrade will be diluted into the overall value of the airframe, while future-proofing the asset against jurisdictions that have yet to introduce an ADS-B mandate.

“A lot depends on how much you can buy the ADS-B upgrade for. I understand that the cost ranges from \$10,000 to several hundred thousand dollars, subject to existing provisions and configuration,” says Rubin. “The cost can be driven down further if the MRO gets a contract for a number of aircraft upgrades.”

A lot depends, however, on the age of the asset and the available alternatives at the time, and whether it is possible to acquire an asset to fly the mission for a fleet that already has the equipment pre-installed.

Replacing older aircraft such as the Blue Air 737s that are due for retirement,

makes more economic sense than upgrading them. The -300 and -500 variants are currently trading at \$2.5 million. The -400 series are trading a little higher, but are still below \$5 million. Because of their high age, Blue Air’s aircraft are thought to be reaching the end of their useful service life.

“Once operators factor in the cost of the ADS-B Out upgrade, they need to calculate how long they can fly the aircraft to recoup that expenditure,” says Rubin. “These aircraft are reaching 30 years of age, so they are unlikely to be operated for many more years. If you are making that investment, you have to fly the aircraft for long enough to recoup it.”

The 737 Classic is two generations behind the MAX and the Neo, so the older aircraft will cost more in terms of operations, maintenance and reliability. According to Rubin there are likely to be better alternatives, so it does not make sense to invest in some older assets.

“It is not possible to estimate how much an aircraft’s life would be shortened because of the ADS-B Out mandate. It is my guess that when regulators look at these requirements, they take into consideration that some of these aircraft may be retired a little early because of obsolescence,” says Rubin.

## Lessors & lease returns

If an EASA-registered airline is returning an asset before June 2020, or if an FAA-registered airline is returning one before January 2020, it is likely they will not invest in an ADS-B Out retrofit. However, lessors who will transition these aircraft should be planning the upgrade to ensure the asset will be ADS-B Out-compliant for its next customer.

*Blue Air is to retire 10 737 Classics by the end of the year because of the cost to upgrade these aircraft to meet EASA ADS-B out requirements.*

Lease terms have become shorter for narrowbodies. These used to be 12 years from first delivery, but have recently dropped to 10 years, Indigo and easyJet lease terms can be as short as five years. Therefore, a key driver to an aircraft’s value is the secondary markets in which it can be placed in 10 to 15 years’ time.

Lease transitions for widebody aircraft during 2019-2021 are expected to be 817 units. For the same period, lease transitions for narrowbody aircraft are expected to be 3,700 units.

About 390 aircraft are transitioning from airlines going bankrupt in 2019. Furthermore, there is a 10% extension in the narrowbody market because of the delays in the MAX and slow initial deliveries for the Neo.

The high turnover of lease transitions means that MROs are in high demand and many hangars are full. Many lessors are searching for somewhere to do lease transitions and ADS-B Out and CPDLC upgrades, because they want their aircraft back on the market as soon as possible.

Kevin Craven, chief operating officer, Summit Aviation, says: “At the moment there is a backlog with ADS-B Out and retrofits, because many airlines have been slow to react. If you signed the lease 10 years ago on an A320ceo, ADS-B Out equipment may not have been in the lease return conditions.”

Lessors are likely to insist their younger assets are maintained with OEM equipment. It is possible that lessors will accept third-party avionic solutions for older aircraft, as long as they have a valid FAA or EASA STC.

“The lessor becomes more flexible on the type of retrofit according to the age of the aircraft. When an aircraft is about 15 years old it is likely to be placed into a third-tier airline,” says Craven. “If the lessor is marketing the aircraft to first- or second-tier airlines they may not be as flexible, and will want OEM vendors to upgrade any equipment.”

Contractual lease agreements can state that any major avionics upgrade is based on the OEM standard, or that lessor approval will be needed. This means third-party upgrades could break the leasing terms and conditions. **AC**

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