

Mark Broadbent reports on the aircraft disassembly market and how the industry's sustainability push might create opportunities and challenges in the future



When a commercial aircraft reaches the mature stage in its life cycle, its owner must decide whether to overhaul

the asset to add value to it and return it to market. The decision has many considerations, including the economic environment, market demand, operating costs, the specific asset's age and its maintenance record. Owners must decide if the financial gains from returning the aircraft to market justify the costs involved in making the required regulatory modifications to the aircraft so it can resume service.

If an owner decides it is not worthwhile to return the asset to service, the alternative is decommissioning, selling, disassembling and parting out any serviceable material (USM) to sell as spares.

Removing USM

Parting-out or teardown involves removing USM from an aircraft in accordance with the maintenance manual. Parts removed from an aircraft go to the maintenance shop for upgrade, recertification, test and inspection before release back into the supply chain for parts traders, brokers and maintenance, repair and overhaul (MRO) specialists.

Prime USM includes engines, limited life parts, components for quick engine changes, auxiliary power units, avionics, landing gear, large assemblies, doors, flaps, ailerons, actuators, pumps, wheels, brakes, tyres and cabin seats.

Engines are the most valuable items. The half-life maintenance values (HLMVs) of CFM International CFM56 and International Aero Engines V2500 turbofans on Boeing 737NGs and Airbus A320neos, for instance, typically range between \$3.8 million and \$7.1 million per engine (depending on the specific model) according to a 2022 report by the consultancy IBA.

Certain factors affect engine parting-out, notably the overall supply-and-demand trends for replacement engines, fuel prices, the diversity of the engine type's operator base, the number of aircraft still flying using the engine and retirement profiles of similar engines.

There are also factors specific to an individual powerplant, including capital costs, maintenance records and future

Condition assessments for engine valuations involve calculations of maintenance adjustments, replacement costs and scrap material resale values EirTrade



LEFT:
An Airbus A320 undergoing disassembly by ASL at Kemble ASL

RIGHT:
Disassembly is underway at Kemble, where numbers have recovered from the pandemic low ASL

BOTTOM:
IBA predicts that more first-generation A320s will be retired during the second half of the 2020s ASL

requirements, spare parts availability, upgrade costs, residual value, aftermarket cost and long-term reliability.

Valuations are crucial in parting-out. According to IBA: "Part-out value is the actual or estimated selling price of aircraft, engines and or major assembly based on the value of marketable parts and components that could be salvaged for re-use on other aircraft or engines. Part-out value is primarily driven by the maintenance condition."

For engines, assessments for valuations involve calculations of maintenance adjustments, replacement costs and scrap material resale values. Maintenance adjustments themselves are based on 'green-time value' – the flight cycles remaining on life-limited parts – as well as maintenance shop visit costs and

the value of the engine's expected time on-wing before it requires upgrade or rectification.

Benefits

Lee Carey, VP of asset management at EirTrade Aviation in Dublin told *Air International*: "Aircraft disassembly benefits various stakeholders by increasing spare USM components availability, reducing the cost of procuring these parts for end users, allowing aircraft owners to monetise assets, while ensuring that the remaining material is then recycled and facilitating a more efficient global supply chain."

Carey said airlines and MRO providers benefit from "increased availability of spare parts which can contribute to better operational efficiency, along with the cost

savings which USM offers compared to new material offered by OEMs." He added that efficient levels of USM are useful for MRO companies in reducing turnaround times for their customers.

He said: "The analysis of components and systems during aircraft disassembly can provide valuable insights to OEMs and manufacturers for engineering enhancements, redesigns or improvements in future aircraft models or components."

Current trends

Mark Gregory is the founder and CEO of Air Salvage International (ASI) at Cotswold Airport in Kemble, Gloucestershire. He told *Air International*: "We are a founder member of the Aircraft Fleet Recycling Association. We



"If an owner decides it is not worthwhile to return the asset to service, the alternative is decommissioning, selling, disassembling and parting out"





LEFT:
Engines are the most valuable used serviceable material on an aircraft ASL

BELOW:
An ex-Thai Airways International Boeing 777 approaches the final stage of disassembly ASL

“Less aircraft being disassembled reduces spare parts availability, which together with the higher demand, has raised prices for USM”

work on best practices to disassemble aircraft and we're not owned by a big multinational. When the buyer buys an aircraft, they speak directly with me and they can work out a deal and make a decision there and then. Being in the business for a long time, I'd like to think we have a reputable company that has stood the test of time.”

During a normal year before the COVID-19 pandemic, ASL disassembled between 40 and 50 narrowbody aircraft. In 2021, only 12 aircraft went through ASL's facilities, while 18 were processed in 2022. At the time of *Air International's* interview in October 2023, ASL had disassembled 32 aircraft, with another three or four due by the end of the year. Gregory noted: “Some of the aircraft that were due to be retired or stepped down will be utilised for a little while longer.”

Two factors explain why. First, new aircraft deliveries have been delayed as manufacturers have reduced output due to raw materials, component shortages and labour constraints. Second, technical glitches with some newly delivered aircraft have led to higher-than-anticipated aircraft-on-ground (AOG) rates.

Gregory said that two aircraft he had been expecting to receive for disassembly by the end of 2023 had their leases extended by the operator and will remain in service rather than head to Kemble. Also, a 737 Classic freighter that arrived for disassembly has been turned around and returned to operations with a South African airline.

In July 2023, Pratt & Whitney disclosed that PW1100G Geared Turbo Fan engines would require inspection and, if necessary, repair after a durability issue was identified on discs in the high-pressure turbine. In a September 11, 2023 update, the company said: “Approximately 600 to 700 engines will

be removed for shop visits between 2023 and 2026.”

Gregory expects this issue will have a knock-on effect on disassembly in the near term. It is another reason for owners to retain assets for longer and/or return them to service so carriers can cope with capacity shortfalls. However, when the supply chain settles and new aircraft delivery rates do eventually increase, he anticipates “a glut of aircraft will come on the market, and prices will switch the other way.”

Cyclical

According to IBA's analysis, the rate of retirements of older narrowbody airliners, including first-generation A320-200s and older Boeing 737NGs, will increase during the second half of the 2020s. Around 500 such aircraft will be phased out in 2025, but in the 2029-2033 timeframe, the number is expected to be more than 700 aircraft per year. Retirements of widebody aircraft such as older Boeing 747s and 777s and Airbus A330s will increase too, with approximately 150 expected to be withdrawn in 2025, followed by around 160 in 2026 and 2027, 190 in 2028 and 180 in 2029. IBA noted: “Quad-engine widebodies [are] retiring fastest, but the A330ceo will become the predominant retirement type by the 2030s.”

In the meantime, EirTrade's Lee Carey pointed out: “We have seen a continuous increase in demand for USM components across all aircraft types in recent times with the increase in aircraft utilisation, maintenance activity and the evolving fleet renewal strategies of airlines.”

Less aircraft being disassembled reduces spare parts availability, which together with the higher demand, has raised prices for USM. The IBA analysis notes increasing values for the latest engines: the HLMV for a LEAP-1A26 (for the A320neo), for example, rose from

\$9.6 million to S\$9.7 million between 2021 and 2022.

Resource management

Sustainability is a key theme in the aerospace industry. EirTrade's Carey observed: “Aircraft disassembly processes are sustainable by their nature as they promote the recycling and reuse of valuable materials from retired aircraft. These processes enable spare USM component availability, all while reducing waste, conserving resources and minimising the environmental impact of disposal. In addition, many aircraft operators and airlines opt to obtain their parts from disassembled aircraft due to their cost-effectiveness. The popularity of sourcing parts through a USM over buying brand new parts from OEM can also reduce consumption levels of new parts, and thus limit the carbon output from production. Furthermore, using

USM components on aircraft reduces the number of new components that need to be produced.”

Carey said EirTrade strives to be a complete solution provider for its clients: “Our ability to carry out services inhouse, such as disassembly for a variety of engine types (CFM56-3/-5A/-5B/-7B/-7BE) and all aircraft types, significantly reduces the project completion time as well cost of logistics. These integrated services simplify the processes for customers because we provide an experienced partner that can manage disassembly from conception to completion. We are able to disassemble a narrowbody aircraft in 15 days, and this efficiency is a significant advantage to asset owners, especially now when the demand for USM is exponentially increasing.”

After any valuable USM is removed from an aircraft, disassembly specialists

evaluate what is left of value to be recycled. Electrical connections, for example, are sent away to reclaim the gold and platinum in them. Gregory said any unwanted material is fragmented and sorted, adding: “We do not landfill anything. What can't be recycled is incinerated to produce power generation. The ash from that power generation is used in road-fill. This reduces waste, conserves resources and minimises the environmental impact of disposal. The components salvaged from aircraft disassembly also reduce the volume of new components, therefore reducing the consumption of material and carbon output of production.”

Carbon challenge

Over the past decade, many new commercial aircraft have entered service with substantially higher proportions of advanced materials to reduce weight, ➤



fuel burn, emissions and overall operating and maintenance costs. Carbon fibre composites, for example, make up around 50% of the Boeing 787 Dreamliner and 53% of the A350.

In 2023, EirTrade announced it was the first company to disassemble two ten-year-old, early-production 787-8s. Carey told *Air International* that EirTrade “has focused on many newer technology aircraft and will continue to do so in order to service these markets for which there is very limited USM available.”

Most aircraft with higher proportions of advanced materials are some years away from retirement and disassembly. Nevertheless, many aircraft with these materials pose questions about the procedures and processes to sustainably and cost-effectively disassemble them. The Aircraft Fleet Recycling Association (AFRA) stated: “It is estimated that

by 2030, retired aircraft will feature high percentages of composites such as carbon fibre and other emerging materials. Both aircraft manufacturers and disassembly and recycling plants are actively developing strategies and processes to optimise these new materials’ reuse and recyclability potential.”

AFRA highlights further emerging challenges, specifically “the transporting of waste, the complexity of REACH legislation and the national implementation of end of waste legislation, which can result in a fragmented approach at the European Union level”.

In broad terms, modern materials bring more complexity, time and cost in disassembly, as well as health and safety considerations such as dealing with carbon dust. ASL’s Mark Gregory noted that while most of a 737 Classic can be recycled, that’s not the case for carbon



ABOVE:

The AJW Group is one of the world’s leading independent component parts, repair and supply chain solutions provider, supporting over 1,000 airlines

AJW Group

RIGHT:

Scott Symington, chief commercial officer, AJW Group

AJW Group

‘Recycling at its best’

AJW Group’s MRO operations are located at AJW Technique in Montréal and its Battery Centre of Excellence at AJW Technique Europe in Slinfold, UK. The company’s chief commercial officer, Scott Symington, told *Air International* that parting-out is “basically, recycling at its best”.

The group’s disassembly process begins with an initial asset value appraisal and valuation of the remaining ‘green time’ and aircraft condition. A potential ‘harvest list’ is created using historical data, current repair costs and fair market value analysis.

Symington said: “We carry out a full aircraft and records audit to establish the maintenance history and the potential for aftermarket resale of the parts. The team then begins the disassembly, removing external parts and moving internally to components, systems, avionics and other high-cost equipment while cross-referencing each component’s associated paperwork and maintenance history from the harvest list.”

He continued: “Components are inspected and assessed for possible reuse; those that can be used in the aftermarket are labelled and catalogued into an inventory tracking and location system. Items that will be reused are then overhauled according to industry standards and may be tested and recertified to meet requirements. Once the overhaul, refurbishment and regulatory certification are completed, the components are marketed directly to customers and on aftermarket buying platforms.”

Symington added: “The safety and efficiency of the process are paramount. Strict regulatory, compliance and environmental regulations are upheld throughout these procedures, and hazardous materials and fluids are removed safely and according to the relevant regulations.”

“We are able to disassemble a narrowbody aircraft in 15 days”

Lee Carey, vice-president of Asset Management, EirTrade Aviation



composite aircraft: “We’ve gone forwards, but we’ve gone backwards in some areas.”

Gregory explained that, to be recycled, carbon fibre must be ‘clean’ – that is, it must not have any other material attached, such as screws, nuts, bolts, washers or paint. Recyclers also ask for carbon fibre to be cut in a specific direction, meaning disassembly will take longer than a narrowbody made from conventional materials, which can be taken apart in hours. Gregory said: “At the moment, the cost of extracting the metal items to get clean carbon fibre outweighs what you get. It’s not cost-effective to recycle it. That said, we are working with multiple carbon fibre recyclers who are exploring the possibilities.”

With the use of advanced materials rising as the industry seeks to fulfil its objectives of greener flight, advanced materials in disassembly will become an ever-more important issue. AFRA said: “Awareness needs to be further built in the industry of the importance of proper aircraft end-of-service management, so that the environment, worker safety, etc, are taken into account, not only the disassembly/recycling project.”

Gregory concluded: “In manufacturing anything these days, you need to think of end-of-life. You don’t want it to be an issue 15 or 20 years down the line. Manufacturers need to think about if a vehicle can be recycled and how it can be recycled.” **AI**

