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MARCH 2025 • VOLUME 27 • ISSUE 2

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Vallair

SUSTAINABLE SOLUTIONS

Experts from aircraft recycling companies share how aircraft end-of-life activity is evolving to maximise value while reducing environmental impact

Sustainability efforts in aviation often centre around an aircraft's time in the air, as this is when emissions and noise pollution are at their highest. However, the environmental footprint extends beyond flight operations. The way aircraft are manufactured and eventually retired also plays a significant role, presenting further opportunities for reducing aviation's overall impact.

Companies at the forefront of aircraft recycling share a common ambition: to maximise the value of end-of-life aircraft while minimising environmental impact.

For aircraft storage, disassembly and transition services provider, ecube, this vision is encapsulated in their motto: 'reuse, repurpose, recycle'.

"Our name, ecube, comes from the three Es that underpin our work: economical, environmental, end-of-life," explains Lee McConnellogue, chief executive at ecube. "We want as much of an aircraft as possible to be either reused within the industry, repurposed for training or as memorabilia, or recycled for use outside of aviation."

Similarly, aviation asset trading and material management company, EirTrade Aviation, focuses on returning reusable components to service and ensuring optimal environmental sustainability. "Our goal is to maximise the value of the asset and return all reusable parts, materials, and components into service," says the company's quality manager, Jim Maguinness. "We are committed to

employing best management practices in the disassembly of end-of-life aircraft, ensuring optimal environmental sustainability and performance."

The company Vallair, a provider of integrated support for mature aircraft, engines and major components, focuses on adding value to parts removed during dismantling. François Feraut, Vallair's aerostructures and engines sales manager and business development, says: "Our goal is to extract the full value from each manufactured component while ensuring an environmentally friendly process. To complement the basic teardown services, we established a structural repair shop at our Chateauroux centre 10 years ago. This allows our customers to remove and

“The decision to retire an aircraft is no longer driven by age, or new technology, but by what someone is willing to pay”

Lee McConnellogue, chief executive, ecube

repair or overhaul valuable structural parts of the aircraft, giving them a second life.”

Manual activity or using technology?

As aircraft reach the end of their operational lives, advanced technologies are playing an increasingly important role in dismantling processes. While manual disassembly remains essential for preserving valuable components, companies are investing in material separation technologies to optimise recovery rates.

EirTrade Aviation’s Maguinness says: “After we remove all the reusable components from our dismantled aircraft or engine, our material recycling partners use advanced technologies to identify, sort and separate the remaining

materials so they can be re-used in manufacturing processes. Our partners use the latest non-destructive material testing technologies, such as x-ray analysis, Fuess Spectrometer and Nitron XRF to identify materials accurately and deliver high recovery rates.”

Vallair takes a meticulous approach to dismantling, ensuring proper tracking and segregation of materials. “At Vallair, valuable aircraft components are removed manually, as there are currently no automated disassembly tools available for this type of work,” notes Fermat. “This manual process also ensures proper tracking and traceability of all parts. For the remaining parts of the airframe that cannot be reused, we do not use automated cutting machines. However, we make sure all materials are properly segregated to optimise metal



▲ Lee McConnellogue, chief executive, ecube

recovery and collaborate with local waste management partners for the recycling of other materials.”

Maximising high-value material recovery

Aircraft contain high-value materials such as aluminium, titanium and composite materials, making their recovery a top priority. Industry leaders are exploring creative ways to repurpose and reintegrate these materials into the economy.

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“Our material recycling partners use advanced technologies to identify, sort and separate the remaining materials so they can be re-used in manufacturing processes”

Jim Maguinness, quality manager, EirTrade Aviation

“We work closely with experts in this space across our facilities and aim to repurpose as much as we can when it comes to airframes,” explains ecube’s McConnellogue. “We’ve had fuselage sections turned into glamping pods and garden offices as well as flight decks converted for flight simulators. There’s a big interest in the material from a recycling perspective, so the material we have left largely gets utilised outside of the industry.”

EirTrade Aviation works with accredited recycling organisations to extract valuable metals and reintegrate them into manufacturing. “Aircraft and engines contain many mixed metals and alloys to which various processes are applied to extract the elements,” Maguinness says. “They have a high monetary value in their raw state and this refined material is frequently used in the manufacture of new component parts. At EirTrade, we are committed to working with specialist accredited recycling organisations that have the advanced technology and capability to recover the high value materials and return them to the circular economy cost-effectively.”

Vallair also collaborates with international recycling companies. “Teardown and recycling are two different processes,” notes Fermat. “Around 10% of an aircraft cannot be reused. It is not the responsibility of the teardown company to manage this; there are specialised companies that handle post-teardown recycling. These expert companies have the necessary facilities to differentiate, segregate and process metal parts, which are then reused in other industries.”

Fermat adds: “A future challenge will arise with carbon-fibre aircraft, as companies like Fairmat are already working on solutions to recycle carbon fuselages from next-generation aircraft. This issue is not new – composite parts have been used in A380 horizontal stabilisers. What will change is the volume, especially with larger aircraft like the A350 and 787.”

Balancing complexity with circular economy goals

Recycling aircraft is far from straightforward. The complex systems and composite materials present both opportunities and challenges for

companies focused on sustainability. “We meet the technical challenges by having an expert disassembly team,” says McConnellogue. “This ensures that we can extract as much as possible from end-of-life aircraft to feed into the circular economy. At ecube, we don’t talk much about ‘teardown’ – a term that suggests ripping parts out. Instead, we see our process as skilled engineers removing components in such a way that they can be prepared for reuse in the industry. The circular economy requires expertise and precision to manage the complex systems within aircraft.”

McConnellogue adds: “All the disassembly services we provide are AFRA accredited to Diamond level – the highest you can get – and we work to the association’s best management practices throughout every project. We are also looking to engage more with OEMs and companies developing new materials. We want to work on the challenge of developing materials that are not only strong and light, but

- 1. EirTrade Aviation disassembling two B787-8s
- 2. Engine teardown activity at Vallair

can also be reused, repurposed or recycled at the end of their lives too. To help move this forward, we're working with AFRA and IAEG, as well as with aircraft manufacturers."

Collaboration

The transition to a circular economy in aviation requires collaboration across the industry, from manufacturers to dismantlers and recycling firms. Companies are increasingly working with airlines, OEMs and research institutions to develop comprehensive end-of-life strategies.

"We work closely with airlines, lessors and industry associations like AFRA to ensure that every project aligns with circular economy principles," says ecube's McConnellogue. "Supporting our customers in contributing to aviation's circular economy is a major part of what we do."

Fermat notes that end-of-life strategies are increasingly being integrated into the design of new aircraft, but OEMs currently face

challenges with supply chains and new technologies, so their focus on teardown processes remain limited. "Airlines and aircraft owners are more directly involved, as the final owner of an aircraft is responsible for managing its disposal in a state-of-the-art manner," he explains. "Airlines are particularly interested in maximising the recovery of usable serviceable materials (USM) from teardown, especially for components like engines, APUs, landing gear and nacelles. Meanwhile, the final aircraft owner aims to maximise revenue by recovering value from all parts, including metals."

Fermat adds: "During the development of earlier aircraft models like the A320 and 737NG, OEMs were less concerned with end-of-life processes. Today, these aircraft are being dismantled in large numbers. Vallair expects greater synergy with OEMs in the future as they incorporate end-of-life planning into the development of newer models like the 787 and A350, driven by environmental regulations."



▲ Jim Maguinness, quality manager, EirTrade Aviation

Maguinness shares that whilst the company dismantles aircraft and engines at its facilities in Ireland, it also works with carefully audited third party specialists in Europe and the USA. He explains: "Our specialist teams are very conscious of following best practice throughout the process and that includes finding new, effective and economical ways to re-use or recycle as much of the aircraft as possible."

Maguinness adds: "As part of this policy, we have delivered sections

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▲ An aircraft at Vallair's facility

of composite airframes to research institutions and aircraft manufacturers for studies into composite material recycling and development of design for end-of-life aircraft. We constantly pursue environmentally friendly and sustainable solutions for airlines and owners in the management of their end-of-life aircraft."

Future considerations

As the aviation industry faces ongoing challenges, from supply chain disruptions to environmental concerns, aircraft recycling is set to play an even greater role in shaping its future.

Ecube's McConnellogue says: "In the immediate future, the demand for parts will grow the reuse and expert disassembly side of the industry. The post-Covid-19 hangover has left a shortage of new parts, which is driving the demand for reusable components. This is leading to a range of retirements. In the last year, ecube has disassembled an aircraft as young as nine years old and one old stalwart at 39 years old. The decision to retire an aircraft is no longer driven by age, or new technology, but

by what someone is willing to pay. In the longer term, aviation needs to consider recycling from the outset, to make sure that new components and materials being developed have an end-of-life option too."

EirTrade Aviation's Maguinness adds: "There are a number of short and long-term storage solutions for aircraft that are not being used, but swift reactivation into service is always advisable whenever possible because reactivation and recertification can be difficult and expensive if the aircraft is parked for too long. Parking is not an environmentally friendly solution for end-of-life aircraft and is not likely to be acceptable in the future. Aircraft recycling is economically viable when the majority of materials can be reused."

Maguinness says: "At EirTrade Aviation, we see how the development of efficient extraction processes and improved aircraft component design is enabling more parts to be recycled. This delivers return on investment, rather than the cost of parking up. That's good business sense and good for a sustainable industry."

120

Last year, approximately 120 aircraft were retired, compared to around 700 during the peak in 2020-2021

For Vallair's Fermat, the manufacturing challenges at Boeing and Airbus with delayed aircraft deliveries have meant that aircraft dismantling schedules have shifted significantly over the past year. "Many aircraft that were slated for teardown must remain operational because of a shortage of new aircraft on the market. As a result, fewer parts are available, making repair and overhaul even more important to keep existing fleets operational."

Fermat adds: "During a downturn or crisis, aircraft retirements surge. Efficient processes are critical to handle the large volume of aircraft teardowns that normally ensue. Last year, approximately 120 aircraft were retired, compared to around 700 during the peak in 2020-2021. Vallair anticipates that the next crisis could lead to a significant wave or even a tsunami of aircraft requiring recycling."

Aircraft recycling is no longer just about disposing of old airframes – it's about creating a sustainable ecosystem where valuable materials are continuously repurposed.

McConnellogue concludes: "The circular economy is not just something to think about when an aircraft retires. We want it to be at the forefront of an OEM too. We're at the start of a long-term trend. The economic and environmental benefits for reuse and recycling go hand in hand. There are huge benefits to be had in both areas and this will be a prevailing focus for the industry. Given the levels of innovation in aviation, if any industry can make a success of this, it's ours." ●