



As much as 95% of an aircraft can be reclaimed, reused, or recycled  
All images Ascent Aviation Services unless specified

The delivery of a new airliner can be cause for celebration by an airline and manufacturer, with parties that begin on the ground, continue in the air, and conclude at the plane's new home.

Other deliveries might be just one airframe of a hundred-plus aircraft order, with the airline's crew simply 'picking up the keys' and enjoying the new plane smell as they anticipate the aircraft's tens of thousands of hours in the air, carrying countless passengers to their destinations.

At the other end, retirement can be a bittersweet milestone.

Nostalgic throngs come out to watch final flights, take pictures and share memories, but the retirement of an aircraft type by an airline can also be cause for celebration.

In much the same way a decaying animal or plant nourishes the ground

on which it comes to a final rest, retired aircraft are no different.

An airframe may never take to the skies again, but the thriving aircraft disassembly industry ensures that needed components will find their way back into the air on other airliners.

The sustainability of the product is part of its life. By the time the remaining airframe meets its end, as much as 95% of the aircraft will have been reclaimed, reused, or recycled.

### A plethora of parts

"The main pull on a typical aircraft is between 700 and 1,000 parts," explained Scott Butler, chief commercial officer of Ascent Aviation Services, which systematically disassembles aircraft at its base in Marana, Arizona, in the southwestern United States.

He added: "They're pretty typical from aircraft to aircraft. Obviously the engines and the gear, and items like control surfaces and electrical

components, are standard across an aircraft type."

Ascent Aviation is best known in the industry for its massive 1,200-acre facility at the arid Pinal Airpark (MZJ), also known as Pinal County Airpark, where it can store as many as 450 aircraft.

Some stay permanently for reclamation and recycling, while others are just visiting for maintenance, repair, and overhaul (MRO) services.

It's boom time for Ascent, which has aircraft storage and narrow-body MRO services at nearby Tucson Airport (TUS) and will be expanding its operation next year to Roswell, New Mexico.

"The full pull takes about 30 days on a narrow-body and 45 days on a wide-body. After about 60 days we do a walk-through with the customer to see if there's any last items that they want," Butler told *AIR International*.

The dissection is methodical, guided by the manufacturer's maintenance manuals for the aircraft type. ➔

# The circle of life

What happens after an aircraft is grounded for the last time and taken out of service? **Howard Slutsken** dives into the world of disassembly





Every part is removed, thoroughly cleaned, any lines are capped, and openings are plugged before a parts identification tag is attached.

The part is then preserved and protectively wrapped, to protect it during shipment. Just like a piece of fine art, there must be a clear provenance, traceable throughout its life and into its passing from one owner to the next.

"We have to have the confidence that the part is properly identified with a data plate, with a part number that is indeed the part number and/or the serial number," said David Querio, president of Ascent.

"We're not determining the component to be serviceable, we're identifying the part and removing it, in 'as removed condition' which then requires it to go through some upper level of certification and inspection or maintenance before that component can be used on an aircraft again."

At any given time, Ascent will have between seven and 15 aircraft in the disassembly process.

A ten-person team will work together to remove the needed parts from a single aircraft. And although their focus is on protecting the integrity of the part, getting to a part might need a bit of brute force.

"The aircraft is going to be demolished anyway, sometimes it's easier to just cut a section of aircraft open to gain access versus pulling up all kinds of floorboards and panels.

"From our standpoint, we're not so much concerned about the surrounding structure because it will be recycled," said Butler.

The final step in the reclamation is a trip to Ascent's crush pad.

The description is quite literal, with the remains of an aircraft's metal hull ending their life through a methodical but violent disassembly. The remains will be sent to

a recycler, perhaps to live again as a mobile phone or beer can.

### Park it, or part it?

Throughout an aircraft's in-service lifetime, it's subject to ongoing maintenance, as defined by the operator, manufacturer, and aeronautical regulator.

Some of the work is relatively simple, with checks taking place during an overnight stop, while others are extensive and expensive overhauls that put a plane into the maintenance hangar for weeks, or even months.

Each of those major maintenance milestones is a decision point. As an aircraft ages, its owner, whether an airline operator or leasing company, must decide on the future of its flying asset – to keep it airborne, to store it, or tear it down.

"They typically will do a financial assessment to determine if the aircraft

value will warrant the cost of the upcoming maintenance.

"Once they determine that it doesn't make economic sense, or it doesn't fit their marketing profile, they'll typically sell it to an aftermarket parts provider who will coordinate the tear-down," explained Querio.

While some airlines or leasing companies might organise the tear-down to create a feed of parts to support the rest of the type in their own fleets, the disassembly is usually tied to the needs of the parts company.

"The parts supplier has become the owner of the aircraft. They've bought the asset from the leasing company or the airline operator," added Querio.

"The pricing is going to vary, obviously, based on the condition of the aircraft.

In most cases they'll sell them with engines, and then the aftermarket parts



As an ASA-100 certified parts supplier, Ascent removes, packs, crates and ships aircraft parts and engines under a strictly controlled reclamation process

provider will partner with somebody on the engines. The more sophisticated parts providers, they'll keep the engines and sell the whole aircraft as 'USM – Un-Serviceable Material' after the engines and parts are removed."

The parts provider contracts a disassembly company like Ascent to perform the work, but it's not often that the work is done without a parts sales plan in place.

"Those parts companies usually have very deep sales teams, so they already have a lot of that aircraft pre-sold before we even touch it," said Butler.

Demand for spare parts is tied to activity in the air – the more a plane flies, the greater the need for spare parts. The less it flies, the less need there is for spares.

"Customers weren't taking on inventory [recently] because they were trying to keep their cashflow positive. But now that people are back in the air, especially domestically in the US and Canada, a



Aircraft disassembly is undertaken at Ascent Aviation Services' base in Marana, Arizona

little bit in Latin America, we're starting to see an uptick again, with demand increasing especially in the narrow-body sphere." Yet the lifetime of an airliner has changed due to regulation, technology and economics, and the rise of aircraft leasing companies. That, too, has shifted how and when airplanes conclude their service.

### The generational lifecycle

As each new generation replaced older planes, the retired aircraft became parts donors for the remaining types in the fleet or were simply scrapped. The lifetime of a passenger plane was very much driven by an airline's fleet planning and replacement cycle, and it was often flown to the end of its useful life.

Boeing's recent market forecast assumes that over the next 20 years, 20,000 aircraft of the existing, ageing fleet will be replaced by new planes.

The economics of maintaining a type are a major criterion for the decision to retire a plane. Air Canada's first Airbus A320, fin #201, was only recently retired after 30 years in service, yet other planes seem to be grounded before their time.

A financial and operational analysis can send a young aircraft to disassembly just a few years after its entry-into-service, perhaps because the airliner is no longer cost-effective to operate, or the value of its parts is greater than the sum of them together in the whole airframe.

"If there's significant shortages of aircraft spare parts for the existing fleet, you'll see a lot more aircraft, younger in age, get torn down to add inventory to the spare parts pool," said Querio.

"I've seen aircraft, Airbus A318s, as young as two years old, torn down because they weren't a marketable aircraft. The parts were highly in demand for the A319 and A320 pools."

At the other end of the spectrum from the pint-sized A318, the Airbus A380 megajet has reached the end of its short, barely 15-year production run.

Operators such as Air France, Lufthansa, and Malaysia Airlines are retiring their A380s, and some of these relatively young aircraft are now stored, or have already been disassembled, providing parts feedstock for the rest of the fleet.

And while the thought of breaking down an airliner the size of an A380 may seem daunting, disassembly operators have industry guidelines that they follow to make the process manageable.

### Taking apart a plane

The International Air Transport Association (IATA) represents close to 300 member airlines, from its headquarters in Montréal.

Recognising the importance of airliner end-of-life processing, IATA developed its Best Industry Practices for Aircraft



Parts identification tags are attached to all parts following removal and cleaning

BELOW: Disassembly is made easier by the similarity in electronics across aircraft types



"The full pull takes about 30 days on a narrow-body and 45 days on a wide-body"  
Scott Butler, Ascent Aviation Services

### Stu-Art Aviation Furniture

Stu Abbott might be an experienced, qualified aircraft sheet metal and structural mechanic, but he clearly has the soul of an artist.

Abbott has spent almost a decade transforming aircraft components into furniture and unique objets d'art. At his workshop in Durham, northeast England, Abbott has turned aircraft seat belts into business card holders, fuselage window panels into wall clocks, and upcycled a Boeing 737's exit door into a glass-topped office desk, complete with handles, hinges and emergency markings. To finish the set, he can add a repurposed galley cart, newly equipped with desk drawers and emblazoned with a favourite airline's logo. "The pieces I'm making have to be functional, but they also have to be beautiful," he said.

When Abbott first started, he admits, it was difficult to convince aircraft recyclers of his artistic vision. "I was trying to buy some seats, or a section of wing, and they all thought this was a little bit mad. But now, people know what I'm doing, and they're coming to me."

As Abbott points out, "aircraft are built to withstand use by thousands of people while flying at high speeds through our skies, and reinventing aviation parts means that they can be enjoyed for years to come."

Stu-Art Aviation Furniture sells between 200 and 300 articles a year, and has a waiting list for boardroom tables, one of Abbott's signature pieces. The creative process might take some time, but ultimately this mechanic turned artist will transform a discarded component into a bespoke piece of art.

"I have engine cowlings off 747s and 737s that may sit a while, but I know that I'll be able to turn them into a dining table, or a chair, or maybe just a massive wall sculpture."



Decommissioning (BIPAD). As described on the Association's website, BIPAD is intended for aircraft owners and operators, and "provides guidance on managing aircraft decommissioning in an economically sensible way, meeting all relevant regulations and avoiding safety and environmental risks".

The BIPAD manual covers five key aspects of aircraft end-of-life: the decision to decommission an aircraft; selection of facilities; disassembly process; dismantling process; and parts distribution and recertification.

IATA developed BIPAD in consultation with a multi-stakeholder aircraft decommissioning industry group that included the Aircraft Fleet Recycling Association (AFRA).

Representing the aircraft recycling industry, AFRA was initially funded by aircraft manufacturers that saw the importance of creating an association to develop guidelines for safe and environmentally-correct aircraft

### Looptworks

In 2009, Scott Hamlin founded Looptworks with the core mission to use what already exists, in a closed loop system.

Having worked in the apparel industry, he saw how much waste was created, with excess rolled goods and leftovers from garment manufacturing ending up in the trash. Hamlin set up his Portland, Oregon company with an ultimate goal – to avoid having textile waste go the landfill.

With a focus on custom upcycled goods made from excess or retired textiles, in 2014 Looptworks partnered with Southwest Airlines to create a series of unique products from what may have been an unlikely source.

Southwest was in the process of replacing the leather seat covers from the passenger seats in its fleet of Boeing 737s and wanted to find a new use for the high-quality leather, which included its replacement seat cover inventory and overstock of materials.

"Our design team started thinking about what they could do with seat leather, and created tote bags, duffel bags and toiletry kits," said Katie MacDonald, director of marketing for Looptworks. The well-seasoned seat leather goes through a washing and conditioning process – handled by a team of people with disabilities and barriers to employment – before being turned into its Inflight Collection of "sought after and useable products".

Describing the Southwest relationship as "wildly successful," MacDonald said that Looptworks has now partnered with Delta Air Lines, Alaska Airlines, and United Airlines, and expanded its source textiles to include excess uniforms and materials.

"We have transformed over 350,000 retired uniforms from Delta, 43 acres of leather from 80,000 Southwest Airlines leather seats, 3,000 leather seats from Alaska Airlines and 12,284 pounds of retired uniforms from United Airlines."

disassembly procedures. AFRA members include airlines, leasing companies, disassemblers, recyclers, plus research and development (R&D) organisations.

Similar to IATA's BIPAD, AFRA created its Best Management

Practice for Management of Used Aircraft Parts and Assemblies and for Recycling of Aircraft Materials (BMP), to provide guidance to its various members in the aircraft disassembly industry.

"I've seen aircraft, Airbus A318s, as young as two years old, torn down because they weren't marketable"

David Querio,  
Ascent Aviation Services



The manufacturer's maintenance manuals for an aircraft type include detailed instructions for disassembly

Now in its fifth iteration, the BMP's recommendations are intended to be auditable, to ensure that companies are maintaining high standards of disassembly operations.

"When you're dealing with an AFRA-certified site, there's a standardised way of processing the materials," said Butler.

In the competition for tear-down contracts, "AFRA certification is definitely preferred, with the majority of RFPs [Request for Proposals] specifying AFRA certification," he added.

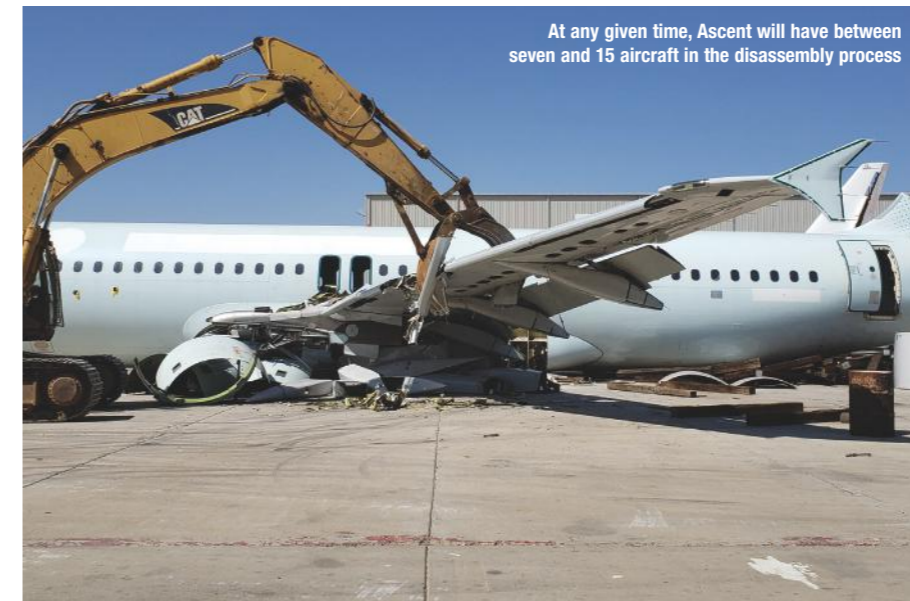
### Composites are coming

IATA, AFRA and the aircraft recycling industry in the decades to come face a new type of challenge. Tearing down a mostly-aluminium aircraft is industry standard, but new aircraft like the Boeing 787 and Airbus A350, made mostly of carbon fibre composites, will necessitate a rethinking of the reclamation process.

Part of the challenge is the nature of composite manufacturing, which requires



Hull and hazmat disposal are among the services on offer at Ascent's Arizona base



At any given time, Ascent will have between seven and 15 aircraft in the disassembly process

Leadership Award for "creating a market for recycled aerospace-grade excess carbon fibre".

Airbus also recognises the challenges of dealing with carbon fibre waste generated during the manufacturing process.

At its Nantes, France, facility some 100 tonnes of carbon waste is produced annually during the production of composite panels for the centre wing box of its A350.

While working for several years on a large scale recycling solution, the Airbus Technocentre Nantes 'Re-use Carbon' project team developed several demonstration products that utilise the waste material, including prostheses and surfboards.

Recently, Airbus partnered with Nantes-based bicycle company Petit-Breton, working with the start-up manufacturer to create a carbon bike, →

otherwise toxic chemicals and resins to bond the raw materials, such as carbon fibre, into complete components.

Boeing – which helped launch AFRA in 2006 – has taken steps to recycle excess composite material, leftovers from the manufacturing process, in partnership with UK-based ELG Carbon Fibre.

ELG uses its proprietary method to heat treat the cured composite components, with the cleaned material sold and recycled into various products, including laptop cases, car parts, and rail-car undercarriages, according to Boeing.

Excess carbon fibre from Boeing's manufacturing sites around the world has been recycled – mostly from its Washington State, Australia and Salt Lake City facilities – with an annual reduction of more than one million pounds of solid waste.

For its efforts, Boeing was honoured by the US National Association of Manufacturers with a 2020 Sustainability



Disassembly rarely takes place without a parts sales plan already in place





**Stu Abbott's 18 years' experience as an aviation engineer – and his knowledge of how aircraft parts are designed – can be seen in his furniture** Stu-Art Aviation Furniture

“Some composite materials, for example, we're not able to recycle properly. Instead we move them to recovery channels, where they are transformed by heat.”

And while these projects begin to address the recycling of carbon fibre components and excess production materials, the spectre of the fleet of composite aircraft reaching its end of service is looming on the distant horizon, with early 787s now in their second decade of operation.

Airbus and Boeing spent billions on bringing these airplanes to life. Now the pair must figure out how to bring them to their end, safely.

“Boeing and Airbus invested in this technology, now the other side of the industry will also have to,” said Butler.

“I think it's going to take an investment from everyone to get the value of this lifecycle.” **AI**

## Checking In

**How important is it to you that airlines dispose of aircraft in an environmentally-friendly fashion, and why?**

Share your view at [airinternational@keypublishing.com](mailto:airinternational@keypublishing.com) under the subject heading *Checking In*.



**“My aim is to highlight the skill, technique and craftsmanship that is invested into creating aircraft,” says Stu Abbott** Stu-Art Aviation Furniture



**Each Looptworks Southwest tote bag uses roughly 3,000 gallons of water less and 82% carbon less than making a bag from virgin leather** Looptworks



**Rather than being scrapped, this piece of fuselage has found a second life as a clock** Stu-Art Aviation Furniture

providing kits of reconditioned composite material for its frame, fork, handlebar, saddle and stern.

The airframer also prioritises aircraft disassembly at its TARMAC (Tarbes Advanced Recycling & Maintenance Aircraft Company) Aerosave facilities in France and Spain, where it recycles over 90% – and as much as 98% – of an aircraft, according to Lionel Roques, senior vice president, sales.

“Our work is really to make sure the footprint of the aircraft, once we recycle it, is as low as possible, at its end of life,” Roques said, during the 2021 Airbus Summit in late September.

“Depending on the aircraft, the [remaining] 10% is composed of some parts that we have to ‘energy recover’.



**Looptworks' designs will change frequently, as sources of supply vary, making each design effectively a “limited edition”**  
Looptworks