

The end of the line — aircraft recycling initiatives

About 300 aircraft are retired each year. Some are parked in the desert, waiting to return to service. Others are initially parked, then sold off piece by piece until the aircraft is scrapped. And a few are abandoned next to the runway and left to corrode. There is another option gaining increasing credibility — recycling or reusing parts in a profitable yet environmentally sound manner. *Daniella Horwitz* reports.



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What happens to an aircraft once it has been retired from service? The courses of action open to the aircraft operator are affected by the cyclical nature of the aviation industry and will be determined by a number of factors: the type of aircraft, its age, its location and whether it is to be dismantled for reusable parts or for the raw material. An airline can double its money if it decides to part out an A320, as the associated spare parts are currently in demand. There is less demand for parts of an older aircraft such as the A300.

Aircraft manufacturers and industry stakeholders have stepped up research methods into recycling and reclaiming materials from retired aircraft. In 2006, Boeing facilitated the formation of the Aircraft Fleet Recycling Association (AFRA). The association is dedicated to recycling aircraft and

now has 21 members. Airbus has initiated the PAMELA project (Process for Advanced Management of End-of-Life Aircraft).

Bill Carberry, Boeing’s project manager of aircraft and composite recycling and AFRA deputy executive explains that the seed of AFRA was planted in 2003, when he was travelling about America’s southwest “trying to refresh the picture for Boeing about what happened to older aircraft”. Gradually he discovered a group of companies that shared Boeing’s ideas about what should and should not happen to retired aircraft. In June 2006, the group of like-minded companies formed AFRA. The main objectives are to:

- help expedite the return of aircraft back into service if possible;
- facilitate the safer and more environmentally secure collection

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- and management of used aircraft parts; and
- develop safe and environmentally preferred ways of handling older aircraft.

AFRA has already written a document with guidelines on how to meet best practices for used aircraft parts and assemblies. That document will be finalised in July 2007 and Aviation Suppliers Association (ASA) auditors will then perform AFRA certification of used parts management. Two other best practice documents Reclamation of Engines and Airframe Recycling are in the early stages of development. Carberry says: "We are trying to develop best practices and help other companies that may be disposing of aircraft in a less desirable way. We give them something to refer to."

PAMELA

In France a €2.4 million project has begun to test environmentally-

friendly recycling procedures on retired airliners. The PAMELA project has its home at Tarbes airport in the southwest. Set up by Airbus and fellow partners — waste management firm Sita, EADS CCR, Sogerma Services and the Préfecture des Hautes-Pyrénées — the project aims to demonstrate that around 90 per cent of aircraft parts and materials can be safely recycled or reused.

Airbus' first flagship, the A300 (now over 30 years old) is the PAMELA guinea pig. The aircraft will undergo tests to establish best practices for aircraft decommission and recycling in an environmentally-friendly manner. The objective is to establish the best means of sectioning the airframe, so as to facilitate the separation of different materials. As the A310 and older A320s come to the end of their lives, new processes will be developed for

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these aircraft. Airbus intends to set the standards for aircraft recycling, while controlling the way retired aircraft are handled.

The initiative is supported by the European Commission, which has selected the project for its LIFE (l'Instrument Financier pour l'Environnement) programme, created to assist the development of solutions to environmental problems facing the EU.

Breaking up can be profitable

Aircraft dismantling and recycling companies currently handle between 100 and 120 aircraft a year. What happens to the remainder of the retired aircraft? Aircraft owners may choose to convert an older aircraft into a freighter or park it in the desert in the hopes of eventually finding a buyer. Derk-Jan van Heerden, MD of Netherlands-based Aircraft End-of-Life Solutions (AELS), says that "sometimes the sum of the parts is worth more than the whole".

There are not a lot of aircraft being dismantled at any one time, but there are a lot of aircraft being removed from service and stored. Whether they get broken up for spare parts or not is up to the owner. Sometimes an aircraft will get withdrawn from service, parked and stored because it is classed as an asset of the company that owns it. "Although the aircraft may only be worth \$500,000, it is on the books as \$6 million and if they reduce it to spare parts, they will lose a huge chunk of their asset. That is one of the reasons why the airlines keep some aircraft in storage for such a long time," explains Mark Gregory, MD of UK-based Air Salvage International (ASI).

The reusable parts of the aircraft are the most profitable. Once the engines, landing gear, avionics, rotatable parts and components have been removed, there is still value in the aluminium. When the airframe is chopped up various methods are used to separate the materials. If materials are hazardous, such as depleted uranium, they have to be disposed of according to the law.

ASI is a founder member of AFRA and has been dismantling aircraft for 10 years. The company breaks down the aircraft for the reusable parts. The raw material is sent on to other companies to recycle. "We will only go in and dismantle aircraft that have residual value in parts, because the aluminium does not cover the cost scrapping of the aircraft," says Gregory. The company dismantles about 20 aircraft a year. Currently it is working on a CRJ100, a Dash 8, a 747, a 737 and a BAe146.

Sometimes retired aircraft are parked permanently alongside the tarmac. This abandonment of aircraft primarily occurs in parts of Africa and some countries in the former Soviet bloc where infrastructure is lacking. Gregory acknowledges that some rusting hulks are parked by the side of the runway, but points out that if there is no value in dismantling the aircraft, the owner is not likely to pay a company to dispose of it.

AFRA now has its first African member — Universal Recycling in Johannesburg, South Africa. Universal processes approximately 1,800 tonnes of electronic scrap per annum. Carberry says AFRA is excited about using its relationship with them to start getting a better perspective on operations in Africa.

Finding an end-of-life solution

AELS (a member of AFRA) provides financially viable and environmentally sound solutions for end-of-life aircraft for clients. To help aircraft owners decide on whether to dismantle the aircraft or not, AELS have designed an end-of-life decision report. The client answers a questionnaire about the aircraft, the data is then input into the end-of-life decision tool system and a report provides information on the market value of the aircraft, its component parts and the costs associated with various strategies. If the client decides to dismantle the aircraft, AELS offers a dismantling base at Maastricht Aachen airport (European market) and at Gander international airport, Newfoundland



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ASI breaks down aircraft for reusable parts and sends the raw material on to other companies to recycle.

(North American market). They also offer on-site dismantling for aircraft unable to fly.

While concentrating on the best economic solution, AELS intends to minimise the environmental impact of aircraft recycling. The company has a basic process for every stage of dismantling the aircraft and each time it seeks to improve on the process. "Recently we did an Embraer 120 in Germany," says van Heerden. "Instead of the normal way of scrapping the aircraft and selling the aluminium, we traced it to the aluminium smelter and measured all kinds of procedures. We discovered we can use new kinds of technologies to separate several alloys and in that way we gained an environmentally improved process."

New methodologies

Passengers appreciate that aircraft are built to stay together; when the airframe is chopped up, metal tends not to separate along the rivet line.

As the metal is melted down, it becomes a mixture of aluminium, zinc and magnesium alloys. Methodologies to better separate the alloys are constantly being researched. The composites and metal-fibre laminates used in aircraft and the price of raw materials are pressing incentives. AFRA members such as Milled Carbon, Huron Valley Fritz West (HVFW) and AELS network on new technologies through the association.

UK-based Milled Carbon recovers carbon fibres from composites. It employs a continuous pyrolysis process which removes all the resin from cured and uncured carbon fibre composites. "The resultant recyclate has been tested by North Carolina State University on behalf of Boeing and has been found to have at least 90 per cent of the properties of virgin carbon fibre," says Milled Carbon's MD John Davidson.

The majority of virgin carbon fibre produced for aerospace is of very high specification (the long carbon fibres are used for strength applications such as wings and fuselage). The shorter (cut or milled) recovered fibre can be used for lower strength applications such as brackets in the aircraft interior, galleys and beverage carts. It can also be used in sporting goods, automobiles, computers and mobile phones.

HVFW, in Tucson, Arizona, breaks up and recycles military and commercial aircraft. It utilises a laser system that sorts aluminium by alloy series. It is able to separate 40 to 50 per cent of the aluminium of an aircraft, increasing the aluminium's value and aftermarket applications.

Milled Carbon and HVFW are currently in discussions to form a joint venture which would combine their capabilities in the use and disposal of carbon-fibre composites. If the collaboration goes ahead, Tucson will be the first of several sites in the US. There is a possibility of establishing separate facilities in France, Italy, Japan and China. Davidson says Boeing is very interested in the process specifically for the 787 (its wing and fuselage are made of

composites). "As you might imagine, they are very keen to close the loop on the airplane lifecycle and it also looks good for their environmental credibility," he notes.

There are many aircraft recycling initiatives, but currently the process is not heavily regulated. Given the environmental issues and amounts of money involved, stakeholders anticipate that it may become so. AELS is conducting research in collaboration with the Erasmus University of Rotterdam, to discover the effects of recycling legislation on the automotive and shipping industries and to draw some parallels to the aviation industry. "New legislation may bring changes. Some companies will be forced to further develop their methods and get to the standards they require. If they demand a 100 per cent recycling rate, we have to develop some new techniques," concludes van Heerden. ●

AFRA members

- Adherent Technologies *Albuquerque, NM* (carbon fibre recycling)
- Air Salvage International (ASI) *Alton, Hants, UK* (aircraft disassembly)
- Aircraft End-of-Life Solutions (AELS) *Delft, Netherlands* (aircraft disassembly)
- Bartin Recycling Group *Châteauroux, FR* (materials reclamation)
- Boeing *Seattle, WA & Chicago, IL* (strategic support)
- Châteauroux Air Center *Châteauroux, FR* (air center)
- ELG Metals, Inc *Los Angeles, CA* (alloy recovery)
- Europe Aviation *Paris / Châteauroux, FR* (MRO)
- Evergreen Air Center *Marana AZ* (air center)
- HKS Scrap Metals BV *Gravendeel Netherlands* (materials reclamation)
- Huron Valley Fritz West, LLC *Tucson, AZ* (materials reclamation)
- Milled Carbon Ltd *Warwickshire, UK* (carbon fibre recycling)
- Robert Gibbs Company Contracting *UK* (materials reclamation)
- Southern California Aviation *Victoriaville, CA* (air center)
- The Magellan Group *Shannon, Ireland* (aircraft parts)
- The Memphis Group *Memphis, TN* (aircraft parts)
- Turbo Resources International *Chandler, AZ* (aircraft parts)
- Volvo Aero *Boca Raton, FL* (aircraft parts)
- Rolls-Royce *Derby, UK* (engine reacquisition)
- Universal Recycling Co *Johannesburg, SA* (materials reclamation)
- WINGNet *Oxford University, UK* (strategic support)

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