

AIRBUS and the environment

New Standards. Together



AIRBUS



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EDITO

Air transport is the only global transportation network. By rapidly and safely moving people and high value goods worldwide, air transportation does not only greatly contribute to spread wealth towards the less developed areas, but it also helps the world economies to grow faster, thus improving the welfare of the world's population.

Equally important, although less quantifiable, are the social benefits brought about by air transport. For example, it provides services to remote areas where other transport modes are limited, thus giving them access to many essential services such as hospital, education, post, etc., and opening them up to other communities. More generally, air transport contributes greatly to understanding of different cultures and nationalities.

At a time when every community struggles to open up and benefit from the development of the world economy to improve the quality of life of its members, a world without air transport is not an option.

However, a development model that would irreversibly harm the environment is also not an option. That is why air transport, that already has a remarkable track record in reducing its energy consumption and in fighting against its environmental impact, is boosting its efforts to reduce them further more.

The very high level of eco-efficiency reached by commercial aviation – which contributes for 2% to the man made CO₂ while carrying each year more than two billions passengers over the world – is such that it is more and more difficult to continue improving. Airbus going further is not only committed to improve the economic and environmental performances of its aircraft, but it is committed to the optimisation of all elements of the commercial aviation activities.

That global approach has led Airbus to consider the environmental impact of its products through their entire life cycle, from design to dismantling at end of life. It includes the entire supply chain, all the company's sites in the world, as well as the way the aircraft are operated worldwide and the energy source they use. Airbus is convinced that by fighting on all fronts from product design and manufacturing to air traffic management and development of sustainable alternative fuels derived from the biomass, air transport will be able in the near future to stabilise its CO₂ emissions and on the longer term to reduce them by at least 50% despite the anticipated strong traffic growth.

But the Airbus approach goes further. Beyond the concrete actions to reduce fuel burn, emissions, noise, energy use and waste that are illustrated in this brochure, as a world industry leader Airbus feels it has a wider responsibility in supporting the global action for a sustainable development. Considering itself as an "eco citizen", Airbus works actively with United Nations and other international and national organisations to preserve the biodiversity and to raise awareness among youth worldwide.

THE ROAD TO ECO-EFFICIENCY

In recent years, awareness of the environmental impact of human activity has grown. In parallel, emerging countries are, legitimately, seeking to close the gap on the developed world, while inhabitants of developed countries want to maintain high standards of living. This situation has highlighted the need to improve global economic performance. Reducing environmental impact while developing the world economy appears paradoxical; the idea of eco-efficiency has been developed to solve this potential conflict.

"Eco-efficiency means doing more with less," said Christian Dumas, Airbus vice president of sustainable development and eco-efficiency. "It's what Airbus and the aviation community have always strived to do. Ours is an eco-efficient business whose objective has always been to carry more passengers using less fuel at the lowest possible cost. What has changed is our perspective; we are now taking more environmental value into account."

Parameters such as fuel costs and CO₂ emissions are now key to any value analysis. Airbus' principal response to this has been to develop products with their full life cycle in mind. "When Airbus became an integrated company, we created our own environmental management system, which is now in place across the company and certified under the ISO 14001 standard," explained Rainer von Wrede, head of environmental affairs within the Engineering function. "Instead of applying existing rules, we decided to consider not only the production processes and sites, but the operational life, end of life and recycling potential of our products."

"The environment is everybody's business. Airbus and our customers are in the same boat. Exchanging experience is important. We give airlines the means to do their job better; in return, they tell us how we can help them do that."

Recent years have seen the introduction of increasingly stringent environmental regulations on emissions and noise. But Rainer believes that regulation is not the main driver of the "eco-efficient revolution" Airbus has initiated. "The most important factor is certainly the efficiency of our aircraft. Regulation acts as a no-return valve."

That no-return process led Christian to add that: "anticipation is the most important factor. New products are not designed for the next five years, but for the next 40."

So, eco-efficiency must be considered as a journey rather than a destination. "It's a game of constant improvement," Rainer concluded. "The final objective is to have no environmental impact if that can ever be reached."

It may be a dream, but after all aviation was born from a dream.

FULL LIFE-CYCLE APPROACH



Investing in research to **design** cleaner aircraft

- A320 - The best keeps getting better
- A380 - New generation, new experience
- A350XWB - Shaping Efficiency
- Innovation Join technology Initiative Clean Sky



Managing the **supply chain** for a shared vision of environmental responsibility

- Making Eco-efficiency a common goal with our partners
- Deploying Airbus environmental policy through the supply chain



Inventing new best practices **disassemble and recycle** end-of-life aircraft

- Eco-efficiency in aircraft end of life: Pamela Project
- Up to 85% in weight of aircraft can be recycled
- Industrial phase launched successfully with TARMAC in Tarbes



Managing the impact of **manufacturing** on the environment thanks to cleaner technologies and processes

Airbus targets for leading eco-efficiency in manufacturing by 2020:
 30% reduction in energy consumption
 50% reduction in CO₂ emissions
 50% reduction in solvent emissions
 50% reduction in waste production
 50% reduction in water consumption
 80% reduction in water discharge



Optimising aircraft operations and maintenance for enhanced environmental performance

- 50% XTL now approved for revenue flight: GTL, feasible, available
- Bio fuels can be used in drop in without modification of aircraft system
- Alternative fuels can be fully compatible with existing infrastructure
- Full support to Air Traffic Management modernization programmes for operational implementation

A DESIGN FOR LIFE

From raw materials extraction to dismantling, Airbus aircraft are designed with the environment in mind. Lifecycle assessment is a platform for leadership in eco-efficiency, and its adoption is gradually spreading across the company, to ensure optimisation of environmental performance from early design stages.

Based on ISO 14040 methodologies, lifecycle assessment (LCA) was first adopted by the A340 and A380 programmes in 2006 as a basis for Airbus environmental management system (SPOEMS) certification. Since then, LCA has been improved and applied on a comparative basis to a number of technologies.

In response to the Advisory Council for Aeronautics Research in Europe (ACARE) commitment to green aircraft manufacture, maintenance and disposal, the eco-design module of the European Union Clean Sky initiative has been set up to focus on the development of sustainable technologies ranging from biomaterials to recycling techniques, integrating the life cycle thinking concept.

In support of eco-design, four criteria are systematically taken into consideration when using LCA to evaluate the environmental burden of an Airbus component, product, service or technology. They are: energy use; green house gas emissions; recyclability potential; and the use of hazardous materials.

Further criteria, such as water use and material scarcity, will also be adopted as part of LCA's wider deployment across Airbus, with a view to curbing threats posed by raw material supply to biodiversity and natural habitats.

LCA was key to Airbus' successful attainment of the ISO 14001 environmental management standard, said Isabelle Delay-Saunders, Engineering environmental manager.

"ISO acknowledged Airbus' approach to LCA as a major asset in achieving certification," Isabelle explained. "Applying the assessment as early as possible in the design phase is central to establishing the eco-efficient credentials of new technologies. Efforts are now under way to extend LCA adoption outside of Airbus across the aerospace industry, consolidating our position as a leader of Clean Sky eco-design."

During the ISO certification process, the LCA team carried out comparative studies for future programme airframe assemblies, with the goal of providing recommendations on environmentally sound technical options. They studied different options, including metallic and composite structures made from carbon fibre and other types of laminate.

"Finding the most eco-efficient material isn't always a clear-cut choice," said Alexis Martinet, Engineering materials and processes manager. "For example, composites don't always present an eco-efficient advantage when compared to metal. It depends on the design."

Indeed, composite materials offer a huge weight savings advantage, and this has a major impact on fuel consumption efficiency and CO₂ emission reduction during the operational phase of the aircraft life.

"It's clear that eco-design is central to developing sustainable technologies," Isabelle concluded. "Its enabling methodology, LCA, is still in its early stages," she explained. "Nonetheless, at Airbus it is developing slowly but surely. There's no turning back."

GLOSSARY

Clean Sky Joint Technology Initiative: a European Union initiative to reduce aircraft noise and CO₂ and NO_x emissions. It is one of the largest European research projects ever, with a budget estimated at 1.6 billion, shared between the European Commission and industry, over the period 2008 - 2013.

Eco-Design module: a Clean Sky module, or Integrated Technology Demonstrator, led by Dassault: Airbus leads the work package on life cycle assessment which is a key part of the project. Eco-Design focuses on green design and production, withdrawal, and recycling of aircraft by optimal use of raw materials and energies, thus improving the environmental impact of the product life cycle.

ACARE: the Advisory Council for Aeronautics Research in Europe comprises about 40 members with clearly defined and commonly agreed terms of reference, including representation from the member states, the European Commission and stakeholders including manufacturing industry, airlines, airports, service providers and regulators. ACARE's main focus is to establish a Strategic Research Agenda.

SPOEMS: A Site and Product-Orientated Environmental Management System.

SHARKLETS: FLYING FURTHER, FLYING GREENER



Thank to the innovative technologies included in their design new generation aircraft perform far better than their predecessors. It has been especially true for the Airbus A320 which has been the world first fly-by-wire commercial aircraft. However airliner models stay in production for decades and each of them is operated during thirty years or more. That is why it's of paramount importance keeping improving them year after year to maintain their competitiveness and to continue reducing the environment impact.

Every year, Airbus invests over 100 M€ in research and development of its A320 single-aisle family of aircraft. Sometimes the improvement although effective are not spectacular, in other cases they are both effective and spectacular. It is the case of the Sharklets wing tips which should enter in service by the end of 2012 on the A320 and about a year later on the other models of the family.

These 2.4 m high vertical wing tip extension devices, curved towards the rear, will reduce the tip vortex and the induced drag with no increase of the wing span that remains within the operational limitation – in particular the airport 36 m gate size of the ICAO class C standard.

The proposed Sharklets will translate into a 3.5 reduction of the fuel burn by the A320 and, of course, into reduced CO₂ and NO_x emissions. On top, the Sharklets will offer either a revenue increase of around 500 kg, or an additional 100 nautical miles range to the fitted aircraft. And last but not least, they will improve rate of climb and allow higher initial cruise altitude which beneficial to both safety and environment (noise).

Sharklets are "part of long-term improvement programme designed to ensure the single-aisle programme remains highly competitive, efficient environmental and airport-friendly for years to come", conclude Pierre-Marie Glucker, head of the A320 family Sharklet development.

A350 XWB ECO-EFFICIENCY

Airbus recognizes the need for the sustainable development of air travel. The design of the A350 XWB seeks to create the least environmental impact from departure gate to arrival gate with less noise & emissions.

The A350 XWB design combines state-of-the-art aerodynamics, advanced material technology and the latest Rolls-Royce engine technology to provide a 25 percent reduction in fuel consumption and CO₂ emissions per passenger compared to other twin engine large widebody aircrafts in service today.

Moreover, the latest-generation Rolls-Royce Trent XWB engines offer major reductions in emission levels for NOx (nitrogen oxide), smoke, CO (carbon monoxide) and hydrocarbons. The emission levels are well below the most - stringent regulations in place today – as well as those planned for the future.

Quieter operations around airports reduce the environmental impact of arrivals and departures. The exterior noise levels of the A350 XWB will be well below today's ICAO Chapter 4 noise limitations by as much as 14 dB (cumulative margin).

The advanced technology of the A350 XWB enables eco-efficient operations. The aircraft is capable of flying with automatic Noise Abatement Departure Procedures (NADP), which optimises the flight path to reduce noise over crowded areas. The aircraft's high-precision navigation capability allows the optimisation of flight paths and routings (enabling it to fly shorter tracks) and thus

reduces fuel burn and CO₂ emissions. Capable of ETOPS for up to 350 minutes, the A350 XWB will always be able to fly the shortest and most fuel-efficient route.

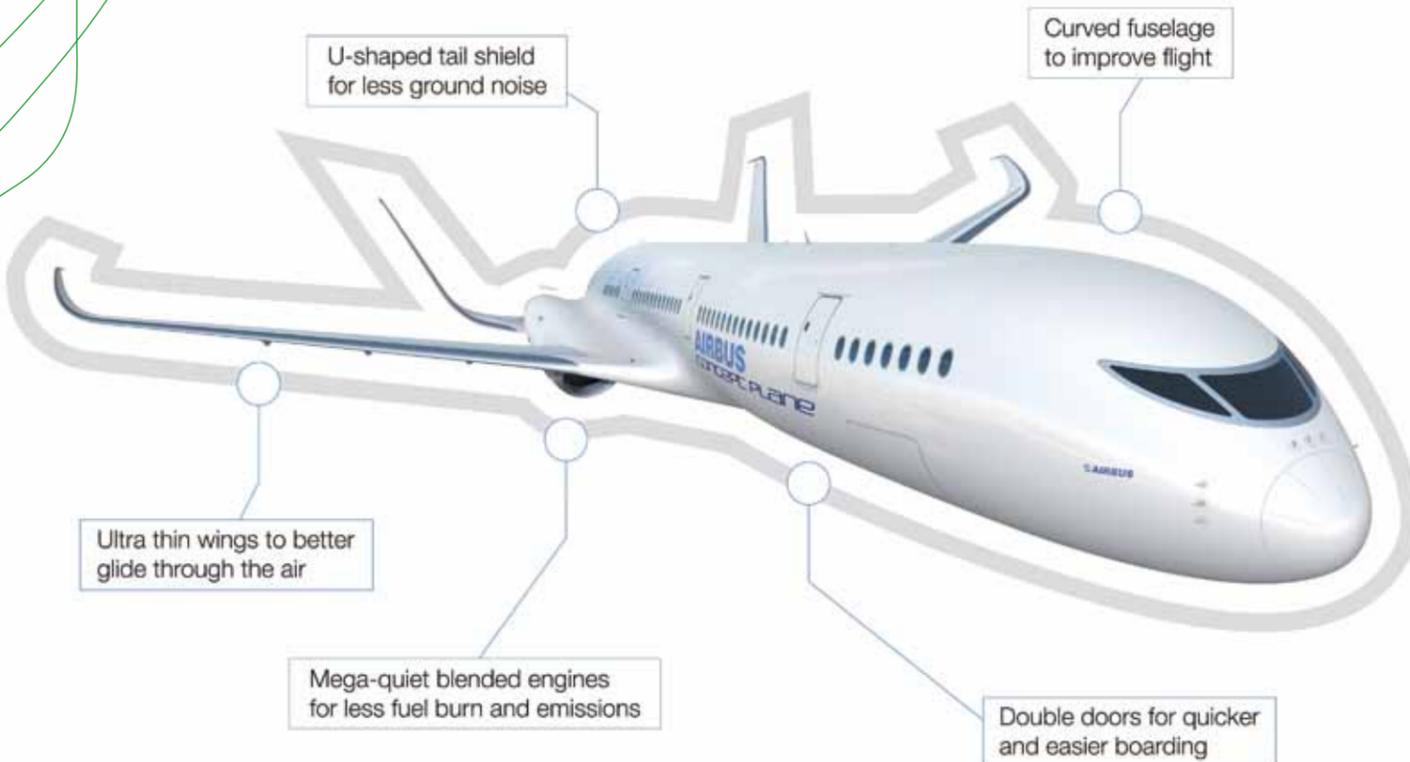
The production of the A350 XWB also focuses on eco-efficiency. In compliance with Airbus' commitments to eco-efficiency, the A350 XWB Final Assembly Line will be the "greenest" ever to be built by Airbus. Concerning the earthworks for the building, a large amount of the materials present on the site will be recycled during the construction work. Natural lighting will be used as extensively as possible in the aircraft halls to improve working comfort, keep the use of artificial lighting to a minimum and to reduce electricity consumption. The flat part of the roof has a total area of 44,000 m², half of which will be fitted with photovoltaic solar panels. The power generated by these panels will be equivalent to the amount of electricity needed to light 83,000 m² of offices. It is estimated that this building will produce 55 percent of its own energy.



THE AIRBUS CONCEPT PLANE

Over the last 40 years aircraft fuel burn and emissions have been reduced by 70% and noise by 75% thanks to improvements in technology. In the future, as more people travel by air, we will need to achieve further significant step changes to make this possible, while keeping air travel comfortable and affordable, and achieving the aviation industry's goal of halving carbon emissions by 2050. Future-gazing by Airbus shows blueprints for radical aircraft interiors. Airbus engineers talk of morphing seats made from ecological, self-cleaning materials which change shape for a snug fit; walls that become see-through at the touch of a button, affording 360 degree views of the world below; and holographic projections of virtual decors, allowing travelers to transform their private cabin into an office, bedroom or zen garden!

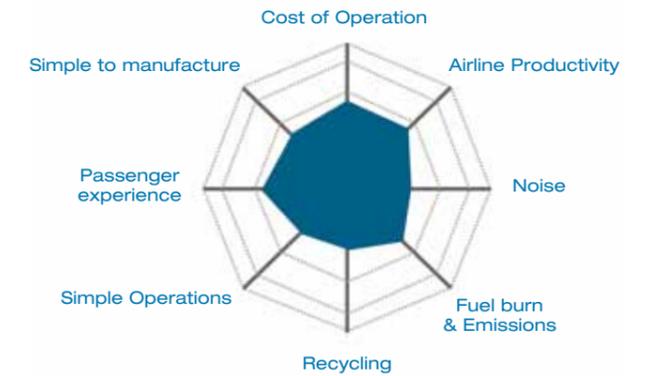
More than a flight of pure fantasy, the Airbus Concept Plane illustrates what air transport could look like in 2050 – even 2030 if advances in existing technologies continue apace. Airbus experts in aircraft materials, aerodynamics, cabins and engines came up with this 'engineer's dream'. It brings together a package of technologies that are unlikely ever to coexist in this manner. So it is not a plane that will fly, it is a representation of the main technological fields that are being explored to face future needs: a significant cut in fuel burn and emissions, less noise and greater comfort. Ultra long and slim wings, semi-embedded engines, a U-shaped tail and lightweight 'intelligent' body all feature to further improve environmental performance or 'eco-efficiency'.



Getting the balance right

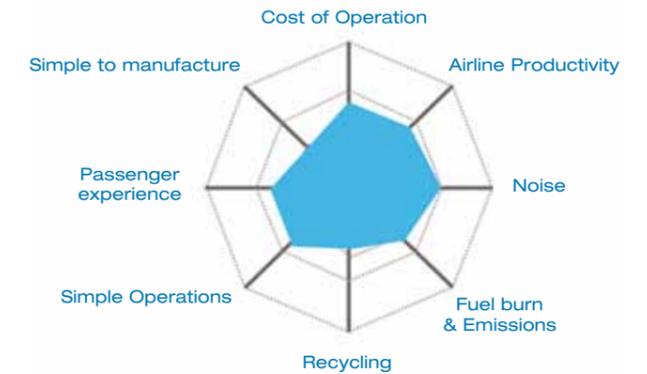
The Concept Plane is unique because it can bring together different technologies, without having to worry about the impact of one on the others – so it represents the best of all worlds. In reality engineers have to find the best balance of technologies, depending on what the priorities are.

CHART 1



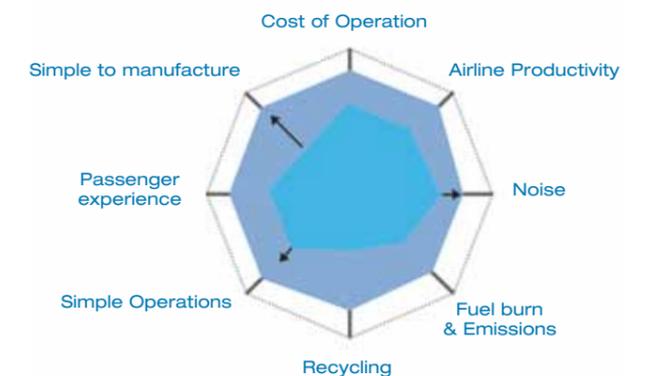
So for example, chart 1 shows that if you introduce new technology that improves fuel burn, emissions and the passenger experience, the performance on noise, costs and productivity may be reduced.

CHART 2



Likewise, chart 2 shows that if you concentrate on reducing noise and simplifying operations, the fuel burn and emissions could be less impressive, and the aircraft may be more difficult to manufacture and recycle.

CHART 3



However, as time progresses, new technologies mature and can be used to expand capabilities in the desired direction, as shown in chart 3.

KEEPING THE RIGHT COURSE

In January 2007, Airbus has become the first aerospace enterprise to receive ISO 14001 environmental certification covering all company's production sites and products throughout a full-cycle approach. This means Airbus uses a robust Environmental Management System (EMS) to continually monitor the environmental impact of its processes and products at each stage of its activity.

The ISO 14001 certification is not a static process. It implies constant progress towards the reduction of the environmental footprint of the company's activities. Each year two internal reporting campaigns are done to check the improvements achieved and to compare with the objectives set in the plan. Every three years a complete re-certification is done with the participation of independent third party auditors.

Delivering more and more eco-efficient aircraft has always been an objective of the manufacturing industry as it's a key competitive factor. Reducing the environmental impact of the company's sites is a more recent concern. But, what makes the Airbus approach unique is that it has decided to ISO certify all its industrial sites using the same rules and a centralised EMS.

So today all the sites throughout the world, from Europe to the United States and China, are certified according to the same rules and controlled through the same management system based in Toulouse.

That global ISO certification is a powerful tool to spread the best environmental practices worldwide and to improve them continuously.

Such a result would not have been possible if Airbus had chosen like some other multinational enterprises to certify its sites independently. It has also avoided all duplications in the certification process and it has permitted a full harmonisation of the environmental impact reduction actions worldwide.

The unique Airbus reporting system using a common tool throughout the whole company, allows the management to have a constantly updated view on the progress on each site. It is an essential decision making element in the process of integrating - environmental factors into the company's investments' policies.

Ambitious objectives

Airbus has set ambitious targets to reduce the environmental impact of its manufacturing activities. In reference to 2006, the objectives for 2020 are to reduce energy consumption by 30 per cent, CO₂ emissions by 50 per cent, water consumption by 50 per cent, water discharge by 80 per cent and waste production by 50 per cent. To achieve these targets new industrial processes are being developed. For example, water used in surface treatment can be limited by recycling it, by reducing evaporation thanks to lower bath temperatures, and by minimising the number of rinses as far as possible.



BUILDING A BETTER FUTURE

The range of environmentally friendly construction and power solutions available has never been wider. Airbus' buildings are using a mixture of these and other approaches to reduce energy consumption, consider the environment and give employees optimum conditions at work.

Solutions on offer include geo-thermal systems that use pipes to gather natural heat from the ground and then apply it to keep buildings at an appropriate temperature and rainwater harvesting, both of which make environmental and business sense. Equally, bio-mass powered boilers use carbon neutral fuels, thus reducing CO₂ emissions while doing the same job as conventional boilers.

Even the roof of a building can be a valuable resource when used in the right way. Skylights can have a positive impact on the need for lighting energy while photovoltaic panels can convert a lot of solar power when the space covered is as big as many on Airbus facilities. Plants that grow as part of 'vegetalised roofs' help to keep the surface cool - a 1°C reduction in temperature reduces the burden on the air-conditioning system by 5 per cent. All

of these technologies are in use at Airbus.

And, making the right choices at the planning stage can be an important support to eco-efficiency throughout the lifecycle of a building.

"The targets of a 30 per cent reduction in energy consumption and a 50 per cent reduction in CO₂ emissions can't be achieved by good facility management and vigilance alone," Christophe Carré, environmental officer, commented. "Using the right technology in the right buildings and integrating energy efficiency at the inception of all Airbus processes will help us to reach our goals and create a better working environment too".

New buildings, such as for the A350 XWB programme, are benefiting from these techniques. The North Factory in Broughton, due to open in December 2010, will incorporate the most advanced technologies yet, to achieve a very high score under the demanding worldwide environmental assessment method known as BREEAM, or BRE Environmental Assessment Method.



A380 flightline hangar, Hamburg

The building's shape follows the minimum heights needed for an aircraft.

Its reduced interior volume means that much less space needs to be heated.

The use of high windows maximises natural light and minimise energy consumption



Airbus' final assembly line (FAL), Tianjin

Natural light enhances working conditions for employees.

The use of huge windows lets daylight stream into the building.

Using 2.1 km of skylights minimises energy consumption for lighting.



Office and manufacturing buildings, Toulouse

The roof of the A350 XWB FAL is covered with 22,000 m² of photovoltaic cells.

The presence of a vegetalised roof moderates temperatures all year round for bio-climatic office buildings.

Office employees work in optimum conditions, even on the brightest days, thanks to solar protected windows.



Centre for prototype aircraft, Getafe

The building has pipes for geo-thermal heating run through thermo-active foundations.

Its waste water is treated through an aquatic garden.



A400M FAL San Pablo

The building benefits from 18,000 m² of solar panels.

The power produced by the panels is equivalent to ten per cent of the plant's total needs.



A350 XWB north factory, Broughton

The facility is equipped with passive ventilation, air sourced heat pumps and a bio-mass boiler to keep temperatures just right.

It also uses rainwater harvesting to reduce energy consumption.

AERIAL THERMO-IMAGERY: AN EFFECTIVE TOOL FOR AIRBUS' ENERGY SAVINGS PROGRAMME

Early on the morning of 2 March this year, a Piper PA34 aircraft equipped with an infrared camera flew over all of Airbus' Toulouse facilities.

The pictures taken reveal the extent of heat loss and highlight zones of potential improvement, such as better insulation or elimination of draughts of air. They will contribute to the creation of a set of corrective energy-efficiency measures.



PRESERVING OUR NATURAL RESOURCES



THE ST NAZAIRE WPC AND POLARIS 4 BUILDINGS WILL BE EQUIPPED WITH NEW ENVIRONMENTAL TECHNOLOGIES. THIS INITIATIVE CORRESPONDS TO THE AIRBUS 2020 OBJECTIVES, PARTICULARLY THOSE CONCERNING THE REDUCTION IN WATER AND ENERGY CONSUMPTION (ELECTRICITY, GAS AND COMPRESSED AIR).

“Airbus must continually improve its environmental performance within the ISO 14001 framework”, said Carole Salomon of the environment department. “This is why studies have been carried out since 2008 on new installations for the St Nazaire site.” In July 2009, the first intelligent lights were installed. They enable energy savings by the use of presence detectors and automatic dimmers which self-adjust in accordance with brightness levels.

WPC and Polaris 4, these two buildings currently under construction will benefit from this first experience, and will be equipped with new technologies. Thermodynamic hot water tanks will be installed which

will absorb the heat contained in the air to heat water for the toilet facilities. Two other means will be used to limit water consumption: a rainwater recovery system on the roof of the buildings for use in the toilets (flushing) and optoelectronic taps. Equipped with a detector, they let water run only when the user’s hands are under the tap.

“These new practices enable us to reduce our consumption of water and energy while preserving our natural resources. Respect for the environment is a daily commitment at the St Nazaire site, but most of all it is also an individual commitment”, concluded Carole Salomon.

A CONCRETE EXAMPLE AT ST-NAZAIRE

DURING THE CONSTRUCTION WORK ON THE WPC AND POLARIS 4 BUILDINGS IN THE CADRÉAN INDUSTRIAL ZONE, A PROTECTED SPECIES - CERATOPHYLLUM SUBMERSUM - WAS DISCOVERED IN A POND. THE OBJECTIVE OF THE ENVIRONMENT DEPARTMENT WAS TO MOVE THIS SPECIES TO A PLACE MORE FAVOURABLE FOR ITS PRESERVATION.

The pond that provides the habitat for *Ceratophyllum submersum* could not be conserved because it was situated in the Airbus development area. Therefore, the environment department set up a transfer project with the assistance of experts. *Ceratophyllum submersum* is an aquatic plant. Its stems may reach one metre in length and they are entirely submerged, floating freely or set in the mud. This plant is essentially present on the Atlantic side of the country and in a large part of the north-west. It is classified as a protected species.

Validated by the Prefecture, the transfer of the protected species from its current setting to a new area is currently under way, with the creation of three new ponds where the plant will be relocated. These new stretches of water will re-create its habitat, with characteristics that will favour its development. This case has been approved by the DREAL (Regional Environmental, Development and Housing Department), the Regional Scientific Council for the Natural Heritage and, subsequently, the National Nature Protection Council.



The species to be preserved: *Ceratophyllum submersum*, also known as soft hornwort.

PROTECTING THE AIR DURING PAINT OPERATIONS

THE VENTILATION SYSTEMS IN THE FOUR SINGLE-AISLE PAINT SHOPS AT THE HAMBURG SITE ARE GIGANTIC ENERGY CONSUMERS. THEIR ANNUAL POWER CONSUMPTION AMOUNTS TO SOME 9,900,000 KWH, APPROXIMATELY TO THE SAME AS 2,475 TWO-PERSON HOUSEHOLDS. NOW, HOWEVER, THANKS TO A PROJECT IMPLEMENTED, HUGE ENERGY SAVINGS ARE BEING MADE.

Currently eight programmes control the two ventilation systems in each paint shop.

One programme has been restructured so that only half the usual volume of air is pumped through the paint shop. In addition, reducing the air changes from the current level of ten down to five per hour generates an energy saving of 50%. Positive spin-offs result in input filters being replaced less frequently and lower energy consumption on air circulation in the hangar. "Our project is a key contributor to eco-efficiency, after all we are still the second biggest energy consumer at the Finkenwerder site," commented project engineer Tevfik Arikanli. Engineers are now working to make further savings, turning their attention to the filter systems and improving the supply of air around the aircraft fuselage. "We are pioneers," stated Frank Fahrendorf, head of the single-aisle paint shop. "We are not just talking about eco-efficiency, we are making it a reality."

Reducing energy consumption in Getafe's paint booths.

In 2009, when the Getafe plant looked into reducing its total energy consumption by 2%, an initial study showed that its painting facilities accounted for 20% of all energy used. So, the paint, maintenance and environment departments worked together to identify areas where energy could be saved. Changing from a wet to a dry painting process allowed the team to do away with pit water, reduce waste management expenses and shorten waiting times between painting and drying when the booths need to operate to keep humidity levels down and guarantee the correct quality finish. An optimised process was introduced to ensure that for each task performed the greatest energy savings are made possible. In 2009 Getafe met its energy saving objectives resulting in the reduction of some 760.000 kilograms of CO₂.

- * Electricity savings of 9% since October and December 2009
- * One million kWh savings in 2010
- * CO₂ reduction of around 463 tonnes

Paint shop at Hamburg site is saving 50% energy.



HEAD OF TOULOUSE PAINT CENTRE SAYS "GREEN IS LEAN"

"Here at the Airbus Paint Centre, we must lead by example in terms of eco-efficient innovation", says Fabrice Rémésy, Head of Toulouse Paint Centre. "For example, the introduction of the revolutionary Base Coat / Clear Coat paint system allows a significant reduction in our paint usage (around 20%). Furthermore, this paint system is more durable in-service, therefore limiting the quantity of paint necessary for the overall lifecycle of an aircraft. By replacing three coats of coloured paint with a single one with a much higher pigment concentration, we achieve a reduction in our VOC (Volatile Organic Compounds) emissions into the atmosphere."

"Some other actions (solvent consumption optimisation through the use of pre-saturated wipes, low VOC painting systems as standard, etc.) have already been implemented in our Airbus paint-shops and have contributed significantly to reducing our VOC emissions. This new paint system will allow us to reduce the VOC emissions from our painting activities even further over the coming years."

"These reductions are part of our full commitment to respect the Toulouse site's environmental targets and objectives, and more generally to contribute to the continuous improvement of Airbus' environmental performance in order to reach the 2020 objectives. The Airbus Paint Centre is well aware of their significant contribution to the overall Airbus emissions, and, as a responsible organisation, that's why we have a major role in the accomplishment of these objectives."

"I would like to add that a solvent waste recycling project is currently being evaluated for the treatment of the used solvents resulting from the equipment cleaning operations that must be performed after every paint application. This will potentially achieve a significant reduction in new solvent consumption, whilst at the same time reducing our waste treatment costs. As soon as the potential benefits from this new system are confirmed it will be implemented in all of our paint-shops."

SHARING OBJECTIVES AND CARS



If nothing was done to change the behaviour of all employees in their day to day life, the integration of environmental impact into the company's policies would remain an abstraction for many of them. That is in that perspective that Airbus has embarked into vast company wide programme to optimise all the daily travels within the company's facilities as well as from home to work.

Despite cultural differences from country to country, common rules have been agreed upon with the aim of reducing both environmental impact and costs.

On each site a catalogue of all the transportation means available to the personnel has been established and made accessible to all through the intranet system. Action has been taken to favour collective transportation (bus and car-sharing) and to ease the use of bikes (secure parking and showers).

But the most innovative action has been to set up a car-sharing service within the sites to replace the large fleet of individually

dedicated cars. The system works according to the same principles than a rent-a-car network. Each authorised employee books electronically the car he will need (date, location, duration of the rent, etc.) with a login and his personal password. Five minutes before the beginning of the "rent" he receive a confirmation SMS on his cell phone with the location of the parking slot and the registration number of the car. Then he just needs his ID badge to open the car and to get the key.

Thank to that system each car can be used by several persons each day. When fully operational it should translate into a reduction of some 30% of the present fleet of cars and an even more important reduction of the environmental impact as all the cars of the service are small cars producing less than 120g of CO₂.

However Airbus is already planning to go further and to replace about one third of the new service fleet by electrical cars. The first ones will be delivered at the beginning of 2011.

A DIFFICULT ENVIRONMENT FOR CUSTOMERS?

Environmental issues are an important part of Airbus' marketing activities with customers. For airlines and leasing companies, environmental issues have always been part of fleet evaluations. Their objectives have been to meet increasingly demanding environmental regulations and have the aircraft with the best operating economics and most suitable design features.

Now, increasingly, there are the pressures of satisfying public expectations on climate change and correcting misleading opinions on air transport and global warming.

The Marketing team works closely with customers to address these concerns. We promote and sell our products, but additionally we support Airbus' technical reputation, assisting industry players in understanding the technical background to environmental issues, focusing on fuel burn, emissions and noise.

The industry has a responsibility to pioneer new solutions for greener flight. Airbus is striving to make aircraft more fuel efficient, through developing detailed design improvements such as sharklets for the A320 or the increased use of composite materials on the A350 XWB to reduce aircraft weight. The A380's underlying design philosophy is 'to do more and impact less'.

The financing industry takes an interest too, because meeting the strictest environmental criteria affects an aircraft's value in the market. For example, European government credit insurance agencies who often guarantee the loans needed to purchase aircraft, are insisting on environmental evaluations before giving their green light. So we work closely with all these

organisations.

While air transport contributes just two per cent of global man-made carbon dioxide emissions, Airbus is committed to helping those working to tackle climate change in a wider sense. We have partnered with the United Nations Environment Programme's Convention on Biological Diversity to support the Green Wave, an initiative to raise awareness among young people about the complexity of life on earth and its part in a sustainable future.

We also work pro-actively to support the industry as a whole. Last year's report by Oxford Economics 'Aviation: the Real World Wide Web', was commissioned by Airbus to consider the issues faced by aviation. As the report showed, aviation helps global development, not just through trade, tourism and agriculture exports from developing countries, but also by improving infrastructure.

Ours is a global economy, to a great extent made to work by aviation. Airbus believes that growth in air travel is a global need and is not inconsistent with creating a better environment for all and it is vital that we spread this belief to the world of passengers and policymakers.



ATM

The battle to reduce the environment impact of aviation and to improve its economic efficiency must be fought on all fronts. That is why Airbus is not only committed to improving the performance of its aircraft and to produce them in a responsible way, but it is also highly involved in improving the overall air transport system and it is playing a leading role in defining and promoting modernised air traffic management (ATM).

The existing ATM systems are not efficient enough. As a result airlines cannot operate their fleets in an optimum way. Flights are often delayed, aircraft fly longer routes than necessary and saturation in many terminal areas translates into extra flight time. That inefficiency has a huge cost and raises passengers' critics, but it is also highly damaging to the environment.

According to IATA, reducing flight time by a minute globally would save 4.8 million tons of CO₂ every year.

In Europe traffic growth cannot be sustained through the current fragmented air navigation services organisation and ageing ATM technologies. The Single European Sky ATM Research (SESAR) programme is aiming at changing radically that situation by the end of the next decade. That Public Private Partnership, the SESAR Joint Undertaking (SJU) in which Airbus plays a major part, is the technological component of Single European Sky initiative.



SESAR has very ambitious targets. It must permit to handle three times more traffic, to improve the safety by a factor of ten, to cut the ATM cost by 50% and to reduce the environmental impact per flight by 10%.

In order to meet those targets moving from airspace to trajectory based operations is needed so that each aircraft achieves its preferred route and time of arrival. Equally necessary is a collaborative planning so that all parties involved in flight management from departure gate to arrival gate can plan their activities on the performance the system will deliver. Four dimensions (4D) trajectories (three spatial dimensions plus time) and performance driven approach are a complete change of paradigm.

The first phase of SESAR has been completed in early 2009. Now the programme has entered into the development phase. A key element is the "airborne initial 4D trajectory management" project led by Airbus. 4D trajectory is at the core of SESAR and will enable more direct flights with benefits for passengers, airlines and the environment.

Beyond that involvement in the SESAR programme Airbus is advocating strongly for a global approach of ATM. Not only on a geographical standpoint but also as far as all stakeholders are concerned.

Airbus and Boeing have signed a memorandum of agreement to insure the interoperability of SESAR and its US counterpart NextGen. Ultimately the new ATM concepts should spread to Middle East and Asia where traffic growth is very strong and the need for an efficient ATM system is key to the sustainability of that growth.



NOx STRINGENCY FOR ENGINES SET TO INCREASE

The environmental impact of NOx emissions, although less publicised than that of CO₂, is important. A new stringency level for NOx – the collective term for nitric oxide (NO) and nitrogen dioxide (NO₂) emitted by aircraft engines – is set to have important repercussions for manufacturers and customers.

A new ICAO standard will come into force at the end of 2013, reducing the acceptable levels for NOx emissions by a further 15%. All new engines requiring certification after 2013 must be compliant with this new standard (named CAEP 8).

Certified engines already in operation do not necessarily need to meet this standard and can remain in use. Moreover, no production cut-off for these engines will be introduced before the end of 2018 at the earliest. "However, they do risk being challenged as a good option for airlines", says Philippe Fonta who is in charge of environmental policy in Airbus Engineering.

"The moratorium on production cut-off until 2018, protects some engine options used on the A320 and A330", he says adding

that "engines for the A380 and some other A330 engine options already comply".

In theory, since the A350 XWB will be certified before 2014, its engines do not have to comply. However, these engine will be compliant.

Regular increase of stringency on NOx is something Airbus supports, as it reflects the technological improvements. However the ICAO targets are tougher than those that aviation manufacturers themselves would have recommended on cost effectiveness analysis performed.

"In agreement with other aircraft and engine manufacturers and customers, Airbus supported an increase in NOx stringency" Philippe Fonta concludes. "However the level set is tougher than studies recommended. For some engines this means the technical fixes required to make them compliant are either technically challenging or a real economic burden".

A380 'GREEN FLIGHTS': CHANGE IS IN THE AIRE

Air traffic has almost doubled in the last two decades. Playing catch-up, air traffic management (ATM) is undergoing an overhaul to reduce both saturation and aircraft emissions. Airbus and a number of its airline customers are closely involved in the main initiatives behind attempts to create a single sky.

One such programme is AIRE, the Atlantic Interoperability initiative to Reduce Emissions, spearheading energy efficient ATM operations to lower engine emissions and aircraft noise. AIRE is run jointly by the European Union and the United States.

As its name suggests, AIRE aims to demonstrate future CO₂ savings of SESAR and its sister initiative in the United States by using current technology. Under a comprehensive revenue flight trial programme, over 1,000 AIRE flights have been performed to date in Europe alone.

Airbus is contributing to the initiative, and has already participated in the AIRE Minimum CO₂ in Terminal Manoeuvring Area project. A number of further proposals are under preparation with Airbus as partner, including transatlantic Airbus A380 'Green Flights'.

'Green Flights' proposes a two-month series of trials in autumn this year, concentrating on regular Air France flights from New York to Paris operated with an Airbus A380. Should they go ahead, the trials will have a dual focus, as Markus Durstewitz, who works in the SESAR programme, explained.

"Firstly, more accurate take-off time estimates would enable the aircraft to taxi for as long as possible using only two of four engines, saving an estimated 500 kg of fuel and reducing CO₂ emissions by approximately 1,500 kg per flight," he said.

Secondly, will be optimised routing. Markus said that Green Flights will be provided with "more vertical, lateral and longitudinal flexibility" to reach an optimal combination of level, speed and track as they cross the Atlantic.

"The A380 is able to attain an optimal cruise level at higher altitudes than standard commercial flights," he noted. "As a result, the aircraft avoids most air traffic and has more freedom to make good use of preferable wind profiles. This has the potential to burn on average less fuel per Atlantic crossing, equivalent to more than 1.5 tonnes of CO₂."

"Reflecting Airbus' commitment to eco-efficient aviation, the A380 green flight' proposal is poised to demonstrate the benefits of next generation ATM operations with today's technology," added Tom Maier, an AIRE programme manager. "This and other AIRE trials are an excellent opportunity to ensure a smooth transition to large scale improvements which will result from SESAR and NextGen development work."



High flying: The A380's higher cruise altitude helps it take advantage of favourable winds.

GLOSSARY

SESAR: Single European Sky Air Traffic Management Research. A programme to prepare the industrialisation and deployment of future ATM systems in Europe. SESAR has four objectives: to treble airspace capacity; improve airspace safety by a factor of ten; reduce ATM costs by 50 per cent; and to reduce emissions per flight by ten per cent. AIRE is part of SESAR.

MINT: The AIRE Minimum CO₂ in Terminal Manoeuvring project. An AIRE initiative focused on demonstrating improvement in flight efficiency and emission reductions using existing technologies.

NextGen: The United States' sister initiative to SESAR

Airbus environmental commitment

FIGHTING EMISSIONS

Contrary to most human activities that produce environmental damaging emissions, aviation has always aimed at reducing its energy consumption for operational and economic reasons. As a result it has reached a very high level of eco-efficiency and new improvements are far more difficult to obtain than in other activities. That is why Airbus – and the whole commercial aviation industry – work in parallel at optimising further the aircraft and the way they are operated while testing alternative jet fuels derived from the biomass. Here are presented three examples of that constant search for improved eco-efficiency that should translate in the near future into an air transport neutral growth and on the longer term into a global reduction of emissions despite the anticipated strong traffic growth.



THE ALTERNATIVE FUEL SOURCES

There are at least three types of ‘drop-in’ alternative fuels that meet the performance of non-renewable (fossil) jet fuels - giving a slightly higher energy content (reducing fuel burn), flash point (temperature at which fuel vapours will ignite - critical for safety during ground handling/refuelling) and a lower freezing point (potentially increasing the effective operational envelope of the aircraft).

The Fischer-Tropsch (FT) process gives a synthetic fuel, made from natural gas (Gas To Liquid - GTL), coal (Coal To Liquid - CTL) and biomass (Biomass To Liquid - BTL) such as farm waste or woodchip/forestry waste.

- ❖ Hydrogenated Biomass Oils (HBO) fuels are made using the animal fats, oils from plants like camelina, jatropha and salicornia, or oils from algae.
- ❖ Hydrotreated Cellulosic Fibre (HCF) fuels are made using cellulosic biomass such as forestry and farm waste or switch grass, to name a few.

ALTERNATIVE FUELS

A step towards a cleaner aviation

Plant matter absorbs CO₂ as it grows. When it is converted into fuel and burnt, CO₂ is released. The net result is that the CO₂ absorbed and released can partially cancel each-other out, to achieve near-neutral emissions. That is why Airbus has embarked very early into the development of alternative fuel solutions.

The biggest challenge is producing sustainable feedstock in sufficient quantity, in order to provide the large quantities of fuel required.

Airbus is focusing its research from sustainable plants or biomass feedstocks that do not compete with land, food, or water resources.

Airbus achievements

On February 1st, 2008, Airbus completed the world’s first ever flight by a commercial jet (A380) using synthetic liquid jet-fuel made from natural gas (GTL), similar to conventional jet fuel in terms of CO₂ emissions but has virtually no sulphur

and is better for local air quality. Thanks to these and later tests, 50% blends of GTL and BTL were officially authorized for passenger flights. Qatar Airways flew the world’s first commercial service with GTL in October 2009 on an A340-600. The second commercial flight using GTL fuel was performed in April 2010 by United Airlines on an A319.

To carry out engineering, economic analysis and to move into the development of sustainable bio-fuels, Qatar Airways, in collaboration with Airbus, launched in January 2010 the bio-fuel value chain to commercialize bio-fuels.

In the view of the continuous collaboration with airlines, Airbus and the Brazilian airline ‘TAM’ announced in April 2010, a biofuel flight with an A320 with CFML engines, using 50% blend of Brazilian jatropha.

The role of Airbus

Airbus is playing a catalyst role in the alternative fuels’ development.

Airbus is:

- ❖ Working with airlines to implement projects and convince them of the benefits of such a development,
- ❖ Providing decision-makers with relevant bio-fuel data,
- ❖ Developing research programmes (for example algae, bacteria, etc.) in collaboration with universities,
- ❖ Participating in sustainability pilot phases and analysis (involvement in the Roundtable Sustainability on Bio-fuels),

❖ Supporting the approval process for new bio-fuels within the fuel specification approval bodies ASTM / DEF-STAN (ASTM International Worldwide Standards Organisation/ UK Defense Standards body).

Today, Airbus is supporting many national, European and international R&T initiatives.

Research and test flights have shown that synthetic bio-fuels can replace fossil fuels on today’s aircraft, without any modification. The biggest challenge is producing sustainable feedstock in sufficient quantity and at a commercially viable cost, in order to provide a feasible fuel for aviation. Airbus foresees that 30% of all flights will be powered by sustainable bio-fuels by 2030. The Airbus roadmap has set out a number of steps towards achieving this goal, and already succeeded in demonstrating that use of Biomass To Liquid (BTL) is viable, subject to available and sustainable feedstocks.

Airbus is acting as a catalyst to bring together the value chain and to attempt to speed-up the commercialization and visibility of aviation bio-fuels, as a solution towards “Greener, Cleaner, Quieter and Smarter” skies.

END-OF-LIFE IS ANOTHER BEGINNING

Over the next twenty years, about 7,000 commercial aircraft will be definitively retired from operation. As part of its full life-cycle approach, Airbus is addressing the need to manage these aircraft in an environmentally responsible way and to use the gathered experience to improve the design of next generation aircraft.

Initially set up as the Pamela experimental project (Process for Advanced Management of End of Life Aircraft), the project has now entered into an industrial phase called Tarmac-Aerosave. Airbus and its partners have established a dedicated centre at Tarbes airport in France, where aircraft are decommissioned, dismantled and recycle in safe environmentally responsible conditions.

In the frame of the Pamela project, two full scale demonstration programmes have been conducted using an A300B4 aircraft and the static test airframe of the A380. The results are a step change from the standard practices. The Pamela methodology allows increasing by more than 80% the re-use of components and material recovery, and by more than 90% the amount of valorised recoverable waste. So, up to 85% of the aircraft weight can be recycled and more than 70% of components and materials can be reused or recovered through regulated recovery channels

On a pure environmental standpoint, it translates into a reduction by a factor three of land-filled waste – from 45% down to 15%.

Tarmac-Aerosave is also a source of information and feedback for Airbus concerning aircraft ageing and changes in dismantling techniques. This data is fed back to engineers working at the start of the aircraft lifecycle, helping to improve the design of both the existing and future programmes.

Airbus believes an integrated approach throughout the full lifecycle up to end-of-life is the best way to understand and control aircraft environmental impacts.



BIODIVERSITY: WHAT AIRBUS IS DOING?

Airbus is committed to promoting actions that will support a more sustainable world. It believes that engaging young people in preserving diversity of life on Earth today, is a sound of investment for tomorrow.

For this reason, in June 2008, Airbus signed a memorandum of agreement with The Convention on Biological Diversity (CBD), part of the United Nations Environmental Programme.

This involved a commitment to support The Green Wave, an ambitious global youth outreach and awareness programme that seeks to engage young people and educate the future guardians of our planet about the complexity of biodiversity, the role it plays in our lives and its importance for our future.

As well as an ongoing programme of activities throughout the year, the GreenWave encourages young people around the world to celebrate life on Earth at 10:00 on the International Day of Biological Diversity, which always falls a 22 May. As the celebration passes through each of the world's time zones it creates a "green wave" of awareness and activity.

During 2010, the International year of Biodiversity, Airbus employees around the world are working with their local communities on activities ranging from tree planting, to creating school gardens and running biomimicry workshops to explain how engineers learn from nature.

For more information about Green Wave visit www.greenwave.cbd.int



ETHICS AT AIRBUS

With the 21st century we have entered into a new era. Mobility of people, goods and information has shrunk the distances and Humanity understands progressively that it lives in a finite world with limited resources. Its future development and well being rely upon its ability to protect the environment and to build sustainable economies.

Aviation – with information technologies – has been largely instrumental in that revolutionary change which affects the whole society worldwide; as an aviation industry leader, Airbus has committed itself to embed Corporate Responsibility & Sustainability (CRS) into its core policies and business processes, as well as within its strategy and vision.

Such a commitment implies a cultural revolution within the group and its network of partners and suppliers but goes also far beyond. “If we are to develop a truly sustainable future, then we must fully understand the complex interactions between mankind, industry, standards of living and the environment. They are inextricably linked, so if we want a lasting solution, they must be considered in parallel” said Tom Enders, President and CEO of Airbus.

The quest for an ever improved eco-efficiency, which is described as maximising economic value while minimising environmental impact, is one of the main drivers of the transformation. It affects not only the performance of Airbus products and industrial units but it is a mean to spread the best practices worldwide through the entire supply chain. At the other end, Airbus is committed to improving the overall air transport system and works with airlines, airport, air traffic management services and civil aviation authorities worldwide towards the objectives the industry has voluntarily set to itself: stabilising emission with carbon-neutral growth from 2020, and halving net CO₂ emissions by 2050 (vs. 2005).

But, as Tom Enders stated, developing a sustainable future implies many other things and in first place a better understanding of how human activities interconnect worldwide and of the true part played by air transport. As a first step Airbus has commissioned a report by Oxford Economics published mid-2009 under the title “Aviation: the real worldwide web”. The facts compiled as well as the case studies in that report show both the central role of air transport in economic and human development and the misperception of its environmental impact.



Other works are done to build a framework for appraising aviation's carbon exposure and related risks in collaboration with the World Resource Institute and the World Business Council for Sustainable Development (WBCSD). Airbus is signatory to the United Nations Global Compact initiative that brings together UN agencies, civil society and governments to advance ten universal principles on human and labour rights, environmental protection and the fight against corruption. Reference to the UN Global Compact is mentioned in the introduction of the “Airbus Code”, Airbus’ top document. The “Airbus Code” demonstrates the company’s commitment to the highest ethical standards in the way we do business, is available to all Airbus employees in different languages.

Because of the very long life-cycle of commercial aircraft that extend often over half a century, most of the passengers and crews which will fly the aircraft produced, developed or designed by Airbus today are not born yet. That is why Airbus is not focussing only on its industrial activity, but it feels it has a responsibility in building the future world and it is committed to assume it.

THE EASTER ISLAND CASE

Air transport has been largely instrumental in the world globalisation process which is progressively changing the life of the entire humanity. If “global” has become a measure of individuals and companies’ success it also means we all live in a finite space. Any of our activities has consequences on the whole world.

As a leader of the aviation industry whose aircraft are operated worldwide Airbus feels it has a corporate responsibility that goes far beyond its products and the way they are manufactured or operated. Airbus is working to promote a new way of looking at how industry’s major economic players can contribute to sustainable development - particularly in the area of protecting biodiversity - worldwide, including in the most remote areas.

In this perspective, Airbus has signed an agreement which aims to support the project launched by the international branch of the ONF (French Forestry Commission) for the “Sustainable and participative management of the natural resources of Easter Island”, a UNESCO World Heritage Site. It aims at supporting initiatives relative to ecology, tourism and agriculture which are set up in consultation with the local populations. This project is part of the environmental sponsorship policy that is being developed with the backing of the French Secretary of State for Ecology.

According to Christian Dumas, Vice President Sustainable Development and Eco-efficiency at Airbus: “Due to its insularity and geographical location (at the ‘other end of the World’ in the middle of the Pacific, 3,600 km off the coast of Chile) Easter Island is a perfect example of the added value brought by air transport. This simply strengthens the conclusions of the report drawn up last year by Oxford Economics on the economic and social impact of air transport and the benefits it generates. Airbus’ participation in this project shows that it is possible to work towards a sustainable economic development, the restoration of biodiversity and the protection of the Rapa Nui culture, while at the same time developing sustainable tourism on the island that respects its sites and inhabitants.”

Air transport is a necessity on a worldwide scale and is not incompatible with the creation of a better environment for all. Airbus is convinced that the essential social and economic benefits made possible by a more accessible world are still to come and will give rise to a more sustainable world.



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TAM will hold Latin America's first demonstration flight with bio-kerosene

With the help of Airbus and CFM International, the airline company will use Brazilian vegetable biomass, the Jatropha plant; studies point to a reduction of up to 80% in carbon emissions

Sao Paulo, April 27, 2010 – TAM (Brazilian Stock Exchange-Bovespa: TAMM4, NYSE: TAM) plans to hold a demonstration flight without passengers in the second half of 2010 with a mixture of aviation bio-fuel, that includes Brazilian vegetable biomass, the Jatropha plant. The airplane will be an Airbus A320 in the airline's fleet, equipped with CFM56-5B engines produced by CFM International, 50/50 joint company of GE on the United States and Snecma (Safran Group) of France.

TAM's CEO, Líbano Barroso, highlights that the company honors its social and sustainability commitments through such an initiative: "We have put forth our best efforts to use Brazilian raw materials in the production of this bio-fuel, with significant economic and social gains. A source of aviation bio-kerosene, the biomass is 100% domestic, resulting from family agricultural projects and large farms in the hinterlands of Brazil, devoted to the pioneer cultivation of the Jatropha."

The company has already ensured the availability of this aviation bio-fuel for the demonstration flight. Through the Brazilian Association of Jatropha Producers (ABPPM), TAM acquired seeds from Jatropha producers in the North, Southeast and Center West of the country, arranged to transform them into semi-refined oil and exported this to the USA, where UOP LLC, a Honeywell company, processed the Jatropha oil into bio-kerosene and its mixture with conventional aviation kerosene, in a 50% ratio for each component.

The demonstration flight carried out by TAM will be the very first experience of that genre in Latin America, with an innovative combination of this type of airplane and engine flying with aviation bio-kerosene produced from the Jatropha. The carrying of the demonstration flight will be aligned with the aeronautic authorities.

The Supply Chain and International Contracts Director at TAM, José Maluf, explains this: "We are working with the valuable cooperation of CFM International and Airbus to hold this flight in which we will use an Airbus A320 in operation in our fleet in domestic and international lines in South America".

TAM is surveying its participation in the development of the production chain for this vegetable biomass fuel to create a Brazilian sustainable bio-fuel platform. Known by the scientific name of "Jatropha Curcas L.", this shrub is a plant that does not compete with the food chain, as it is not meant for human or animal consumption, and it can be intercropped with pastures and food crops.

Through a joint effort with ABPPM, the company has studied means to further develop the Jatropha sustainable production at commercial scale, with an eye on transforming it into aviation bio-fuel. The surveys carried out by ABPPM show that presently there are 60 thousand hectares of land in Brazil with Jatropha plantations. Considering the natural resources and the favorable climatic conditions, a large amount of degraded pastures might be recovered with this plant. To be able to attain a commercial scale, estimates show that it would be necessary to expand the cultivated surface by about

one million hectares, sufficient to service approximately 20% of the domestic consumption.

“Airbus is exploring all types of alternative fuels because we believe there will be different solutions for different parts of the world. Any solution should be commercially viable and sustainable with no impact on people, land, food nor water, and should involve local jobs for local people. We call this the value chain, and this TAM initiative with Airbus is another step in this direction,” said Paul Nash, Airbus head of New Energies.

Well-to-wake Life Cycle Assessments (LCA) carried out by Michigan Technological University in conjunction with Honeywell’s UOP show that aviation biofuels made from jatropha using the UOP Green Jet Fuel process can achieve a reduction of greenhouse gas emissions between 65 and 80 percent relative to petroleum-derived jet fuel.

The cultivation and harvest of the Jatropha, done in a responsible fashion, add social and economic value to local communities and do not compete with the production of food or potable water sources, fully complying with the requirements set forth by the SAFUG (Sustainable Aviation Fuel Users Group), a group joined by TAM formally on November 11th, 2009. The SAFUG is made up of large international airlines whose aim is that of speeding up the development and marketing of new sustainable fuels for the aviation market.

Beyond the SAFUG requirements, through this projects TAM will also follow the principles and criteria established by the RSB (*Roundtable on Sustainable Biofuels*, a renowned international organization of acknowledged technical and scientific prestige) focused on the best production practices, the use and transportation of bio-fuels with regards to social, environmental and economic responsibilities in the transportation segment.

About TAM:

TAM (www.tamairlines.com.br) leads the Brazilian domestic market since July 2003 and has ended the month of March with a 41.8% market share. The company flies to 43 destinations in Brazil. With the business agreements signed with regional companies, it goes to 82 different destinations in national territory. TAM’s market share among Brazilian airlines that operate international flights was of 85.3% in March. International flights include direct flights to 18 destinations in the United States, Europe and South America: New York, Miami and Orlando (EUA), Paris (France), London (England), Milan (Italy), Frankfurt (Germany), Madrid (Spain), Buenos Aires (Argentina), La Paz, Cochabamba and Santa Cruz de la Sierra (Bolivia), Santiago (Chile), Asuncion and Ciudad del Este (Paraguay), Montevideo (Uruguay), Caracas (Venezuela) and Lima (Peru). Furthermore it has codeshare agreements that allow sharing seats in flights with international companies, thus allowing the passenger to travel to other 78 destinations in the USA, South America, Europe and Asia. TAM is a Pioneer in the launching of air company loyalty program in Brazil. As of January 1st, 2010, the TAM Fidelidade Program started being managed by Multiplus Fidelidade, which currently has 6.6 million associates and has already distributed 9.7 million airplane tickets through point redemption.

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ATTACHMENT to State letter AN 1/17-09/093

**QUESTIONNAIRE CONCERNING VOLUNTARY ACTIVITY FOR GHG REDUCTION/MITIGATION
IN THE AVIATION SECTOR**

A copy of the questionnaire, in Microsoft Word format, has been posted on the Internet at:
<http://www.icao.int/icao/en/env/measures.htm>.

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Q1. Name of the voluntary activity.

Airbus life-cycle approach to Eco-Efficiency, as laid down in EADS Vision 2020 (refer to the EADS CR&S Report 2009, p.37) encompassing each step of product life analysis from Industrialisation (design, supply chain, manufacturing) to Use Phase by customers and ultimately end of life (recycling) (refer to the EADS CR&S Report 2009, p. 28&29).

The EADS CR&S Report 2009 is available at: http://applications.eads.com/eads/investor-relations/global/e-book_agm/data/eads_corporate_responsibility_and_sustainability_report_2009.pdf

Q2. Type¹ of the voluntary activity.

Unilateral commitment Public voluntary scheme Negotiated agreement Other
(Please describe the activity in the box below.)

1. Unilateral commitment:
 - a. Activity to achieve the Vision 2020 targets of -50% direct CO2 emissions by 2020 for Industrialisation
 - b. Research activity towards the ACARE 2020 research target of -50% CO2 emissions for Use Phase
2. Public voluntary scheme
Maintain environmental action, including GHG emissions, part of a structured ISO 14001 certification process.
3. Other:
Airbus has entered separate agreements and understandings with other main aviation stakeholders in order to assess and implement the most efficient and cooperative ways to reduce aviation GHG

¹The features of each type of voluntary activity are as follows.

- Unilateral Commitment: The environmental improvement plan established by the participant itself, and declared to the stakeholders, such as employees, stockholders, consumers, etc. Target and measures to environmental improvement are established by the participant itself.
- Public Voluntary Scheme: The scheme which the participant agrees voluntarily with the standard on environmental improvement target, technology, management, etc. established by public organization such as Ministry for Environment.
- Negotiated Agreement: Contract based on negotiation between public organization (national government/local government) and industries. Both parties can independently decide whether to agree to the contract.

emissions

See the EADS CR&S Report 2009, §Aviation and climate change mitigation, p.41 at:

http://applications.eads.com/eads/investor-relations/global/e-book_agm/data/eads_corporate_responsibility_and_sustainability_report_2009.pdf

See Aviation Industry Commitment to Action on Climate Change on ATAG website at:

<http://enviro.aero/Aviationindustryenvironmentaldeclaration.aspx>

See Industry aviation resolution at:

http://www.enviro.aero/Content/Upload/File/AES2010_SummitCommunique.pdf

Q3. Please mark all the participants² of the activity.

X Airline X Airline association X Manufacturer X Manufacturer association X Airport authority
X Air traffic control X Government X Other (Please specify in the box below.)

ISO Auditors

Q4. Is the voluntary activity accompanied by a side agreement³?

X Yes (Proceed to Q4-1.) No (Proceed to Q5.)

Q4-1. If the voluntary activity is accompanied by side agreement, please describe the parties and outline the side agreement.

See Q2, point 3. Last agreement in this respect is the Aviation Roadmap to achieve Carbon Neutral growth from 2020 and on, aiming at halving CO₂ emissions by 2050 (compared to 2005)

Please, refer to the section of EADS 2009 CR&S Report on “2.2 EADS ‘position on major Environmental issues, §Aviation and climate change mitigation” available at:

http://applications.eads.com/eads/investor-relations/global/e-book_agm/data/eads_corporate_responsibility_and_sustainability_report_2009.pdf

Q5. Please answer the following questions concerning the coverage of the voluntary activity:

Q5-1. Select all green house gases (GHGs) which are part of the voluntary activity.

X Carbon dioxide (CO₂) X Methane (CH₄) X Nitrous oxide (N₂O) X Hydrofluorocarbons (HFCs)
X Perfluorocarbons (PFCs) Sulphur hexafluoride (SF₆) X Nitric oxide & Nitrogen dioxide (NO_x) X Water vapor (H₂O) Other (Please specify in the next box.)

Q5-2. Please select all operations⁴ which are part of the voluntary activity.

² If you marked “Public voluntary scheme” on Q2, the public organization which establishes the standard is included in the participants. If you marked “Negotiated agreement” on Q2, the public organization which agrees to the contract is included in the participants.

³ “Side agreement” is the agreement between the participant of the activity and a third party. For example, the agreement between an airline and an engine manufacturer, which prescribes that the manufacturer assist the airline to attain its target by introducing new emission-reducing technologies, is considered as a side agreement. For more information, please refer to Part II Paragraph 6.5.2 on “Template and Guidance on Voluntary Measures”, released on ICAO CAEP website (http://www.icao.int/icao/en/env/Caep_Template.pdf).

⁴ In case that the voluntary activity describes its coverage from the other viewpoint than listed above, such as “operation under IFR”, “operation of aircraft larger than specific weight”, etc. and that aim of the activity is not linked to operation

X International passenger flight X Domestic passenger flight X International cargo flight X Domestic cargo flight X Other (Please specify in the next box.)

1. International / Domestic Passenger / Cargo Flights:

Airbus is addressing aviation GHG emissions associated thanks to its Use Phase activities, also including optimisation of air traffic management and search for new cleaner energies such as bio fuels.

2. Other:

Industrial activities are impacted by the Scope 1, 2 & 3 GHG emissions inventory and reduction voluntary scheme. Industrial activities concerned are:

- Stationary sources of emissions (e.g., Combined Heat and Power plant, boilers, etc.)
- Mobile sources (e.g., fleet of vehicles on-site, flight tests, freight transportation, etc.)
- Electricity, heat and steam purchased
- Upstream or downstream value chain emission sources (e.g., business travels, transportation and logistics, etc.)

Q6. Please answer the following questions concerning the index to measure the effect of the voluntary activity.

Q6-1. Select the index used to measure the effect of the voluntary activity.

- Absolute quantity of GHG emissions⁵ (Please outline the index in the box below.)
 Unit of GHG emissions⁶ (Please outline the index in the box below.)
 Introduction of specific technology
 Introduction of specific procedure X Other (Please specify in the box below.)

1. Unit of GHG Emissions:

The index used for GHG emissions trends analysis of Industrialisation is the tCO₂eq/seat produced.

2. Introduction of new technologies and other:

AIRBUS continuously develops and implements new technologies issued from Innovation, Research and Technology.

Primary indicators are expressed in % improvement in fuel efficiency.

For more information, please refer to EADS CR&S Report 2009:

http://applications.eads.com/eads/investor-relations/global/e-book_agm/data/eads_corporate_responsibility_and_sustainability_report_2009.pdf

Q6-2. Please outline the procedure to acquire data to calculate or describe the index of Q6-1.

directly, for example introduction of new technology which contributes reduction/mitigation of GHGs, please mark "other" and please describe feature.

⁵ The example of the unit is Ton-CO₂, Ton-C, m³-CO₂, etc.

⁶ The example of the unit is g-CO₂/RPK(Revenue Passenger Kilometer), g-CO₂/ASK(Available Seat Kilometer), g-CO₂/RTK(Revenue Ton Kilometer), g-CO₂/ATK (Available Ton Kilometer), etc.

1. Industrialisation:

Airbus has developed and implemented a dedicated CO₂ emissions reporting tool that links to the Total number of seats produced during the reference year depending on aircraft class configurations and production rates.

2. Others: Innovation:

Procedures used to evaluate technology and design improvement are available on the EADS CR&S Report 2009, p. 28:

http://applications.eads.com/eads/investor-relations/global/e-book_agm/data/eads_corporate_responsibility_and_sustainability_report_2009.pdf

Q7. Please answer the following questions concerning the target of the voluntary activity.

Q7-1. Is the target of the voluntary activity clearly defined?

Yes (Proceed to Q7-2.) No (Proceed to Q8.)

Q7-2. Please describe the target of the voluntary activity, including substance of the target, target year, base year.

1. Use phase :

- a. Research activity towards the ACARE 2020 research target of -50% CO₂ emissions for Use Phase
- b. Aviation carbon neutral growth by 2020
- c. Aviation 50% Carbon dioxide net reduction by 2050 (versus 2005)

Please refer to the EADS CR&S Report 2009, p.26 & 41

For more information, see also our Airbus website at:

<http://www.airbus.com/en/corporate/ethics/environment/climate-change/>

2. Industrialisation

-30% in energy consumption by 2020 (base year: 2006)

-50% in CO₂ emissions by 2020 (base year: 2006)

Please, refer to the EADS CR&S Report 2009, p37

http://applications.eads.com/eads/investor-relations/global/e-book_agm/data/eads_corporate_responsibility_and_sustainability_report_2009.pdf

Q8. Please list the measures to attain the target or to reduce/mitigate GHGs.

1. Use Phase:

Please, refer to the section of EADS 2009 CR&S Report 2009 on “Towards sustainable mobility , accelerating improvement» available at:

http://applications.eads.com/eads/investor-relations/global/e-book_agm/data/eads_corporate_responsibility_and_sustainability_report_2009.pdf

It describes all technologies and industrial measures (advanced aerodynamics, systems and lightweight structures) and Airbus’s ongoing work to promote the development and eventual commercialization of sustainable bio fuels for aviation, as well as efforts to implement improved Air Traffic Management technology and procedures.

See also attached documents:

TAM media release

Airbus and the Environment brochure

2 Industrialisation:

A roadmap is being developed, listing all acts / investments that will be necessary to achieve the targets. In the meantime, some concrete projects are already being implemented :

- Electricity generation from wood chips power plant
- Solar panels installation on roofs and parking lots
- Low CO₂ emissive vehicle fleets
- Green IT purchases
- Energy Management Software

Etc.

Q9. Please answer the following questions concerning periodic review of the voluntary activity.

Q9-1. Is the progress of the voluntary activity reviewed periodically?

Yes (Proceed to Q9-2.) No (Proceed to Q10.)

Q9-2. Please describe the frequency of the periodic review.

Once per year

Q9-3. Is a third party’s opinion considered/to be considered in the periodic review?

Yes (Proceed to Q9-4.) No (Proceed to Q10.)

Q9-4. Please outline the third party opinion.

Airbus GHG Emissions Inventory Report according to the ISO 14064-1 and the GHG Protocol (2004)

Q10. Please answer the following questions concerning legislative obligation.

Q10-1. Is there any legislative obligation on attainment of the target?

Yes(Proceed to Q10-2.) No (Proceed to Q11.)

Q10-2. Please describe legislative obligation, including measures taken in case that the participant of the voluntary activity fails to attain the target.

Industrialisation

The French Law Grenelle II – Article 75 and 225 mandatory compels companies over 500 employees to report and reduce their Scope 1, 2 & 3 emissions. Scope 1 & 2 reports will be mandatory starting end of 2012 and Scope 3 report end of 2015.

ETS EU régulation applicable to Industrialisation :

AIRBUS direct CO2 emissions from Industrialisation are subject to European Trading Scheme for fixed Industrial installations.

AIRBUS internal flights for transportation with Beluga aircraft will be subject to EU Aviation Trading Scheme from 2012.

Q11. Please answer the following questions concerning disclosure of information⁷ on the voluntary activity:

Q11-1. Is the name of the participant of the voluntary activity disclosed to the public?

Yes No

Q11-2. Is the target of the voluntary activity disclosed to the public? (If you marked “no” at Q7-1, the answer to this question shall be “not applicable”.)

Yes No Not applicable

Q11-3. Are the measures taken/to be taken by the participant of the voluntary activity to attain the target/reduce or mitigate GHGs disclosed to the public?

Yes (partly) No

Q11-4. Is the result of each periodic review disclosed/to be disclosed to the public? (If you marked “no” at Q9-1, the answer to this question shall be “not applicable”.)

Yes No (only once a year) Not applicable

Q11-5. Is the effect of the voluntary activity disclosed/to be disclosed to the public?

Yes (partly) No

Q12. Please answer the following questions concerning effect of the voluntary activity:

Q12-1. Is third party’s opinion considered/to be considered when examining the effect of the voluntary activity?

Yes (Proceed to Q12-2.) No (Proceed to Q12-3.)

Q12-2. Please outline the third party opinion.

Third party opinion is major to AIRBUS that annually refers to ad hoc survey, trends and studies, and auditing by third parties.

⁷ Item(s) to which the answer is/are “no” from Q11-1 to Q11-5, are considered but this information will not be included in the final report.

Q12-3. How much of GHGs amount emitted per year, in CO₂ weight equivalent are reduced or mitigated/expected to be reduced or mitigated by the voluntary activity?

1. Use Phase:

This depends on each aircraft type being developed (e.g. since its entry into service in 2007, Airbus estimates that the A380 fleet has contributed to save 777.000 tonnes of CO₂ compared to a solution where passengers would have flown in a former generation Jumbo aircraft), also considering regular improvements to existing types (e.g. A320 sharklets, resulting in a saving of 300 Tons CO₂ per year per aircraft), resulting in Airbus bringing its concrete participation in the aviation roadmap to drastically improve its CO₂ efficiency.

Participation in ATM modernisation and bio fuels projects imply cooperative work with many stakeholders and are therefore more difficult to quantify.

2. Industrial activities

It varies each year but the average expected reduction of CO₂ emissions is 16 000 Tons per year.

Q13. Please provide the website address for the voluntary activity, if any, in the box below.

Please refer to the Airbus.com/environment for information on a variety of Airbus' environmental initiatives

www.airbus.com/en/corporate/ethics/environment/

www.cdproject.net

Q14. Please describe additional information, if any.

<http://www.ghgprotocol.org/companies-complete-road-testing-of-new-global-greenhouse-gas-accounting-standards>

Duly completed questionnaires should be returned to:

Voluntary Measures Focal Point
ICAO Committee on Aviation Environmental Protection (CAEP)
Attention: Mr. Tetsu Shimizu
Policy Coordinator for Global Environment
Civil Aviation Bureau of Japan
e-mail: fpvm@mlit.go.jp
fax.: +81-3-5253-1656

Copy to:
Jane Hupe
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E-mail: jhupe@icao.int
Fax: +1 (514) 954-6744