JULY 2007

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TECHNOLOGY

FAST 40

AIRBUS TECHNICAL MAGAZINE

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Customer Services
events

Just happened

SPARES, SUPPLIERS & WARRANTY SYMPOSIUM BANGKOK, THAILAND 12-14 MARCH 2007

For the fourth time the event linking spares, supplier and warranty services together generated an excellent mix of participants from customers (53 participants) and suppliers (48 participants) and provided an ideal platform to build on existing relationships and further discuss regional specificities and service strategies.
Airbus started by presenting the Customer Services portfolio of modular support and services 'Air+ *by Airbus*' and underlined the continuing efforts to improve, based on market and customer feedback from the Customer Satisfaction Improvement Programme, and spoke about the 'FIRST' programme, preparing the next 10 years' vision. Then Airbus presented the latest news concerning spares, supplier and warranty services.

15TH PERFORMANCE AND OPERATIONS CONFERENCE PUERTO-VALLARTA, MEXICO 23-27 APRIL 2007

The 15th Performance & Operations Conference representing the greatest forum for Airbus' Flight Operations Support & Services activities. Attended by 181 participants from 73 airlines, it provided flight crews, operations specialists and performance engineers with a unique opportunity to constructively exchange views and information and to facilitate communication. It included some 100 presentations spread in 12 different sessions covering the whole scope of Flight Operations activities (Operations, Performance, e-doc, EFB, all aircraft types issues, economics, services…).
The airline participants unanimously mentioned it was a real success: 'This type of conference is absolutely essential'.

A320 FAMILY SYMPOSIUM BANGKOK, THAILAND 07-11 MAY 2007

Customers supported Airbus aspirations expressed at the symposium, consisting of consolidating the high level of operational reliability, enhancing Airbus support and services and maximizing their aircraft availability.

Coming soon

A300/A310 FAMILY TECHNICAL SYMPOSIUM TOULOUSE, FRANCE 05-09 NOVEMBER 2007

Airbus Technical Symposiums are held for each Airbus programme every two years with the target audience of airline engineering and maintenance managers. The next A300/A310 event will focus on current technical and maintenance subjects as well as general customer support processes. There will be a particular focus on the assurance of long-term support of the fleet with consideration that the last production aircraft will have been delivered during the summer of 2007.

TECHNICAL DATA SUPPORT AND SERVICES SYMPOSIUM TOULOUSE, FRANCE 12-14 NOVEMBER 2007

This fourth Technical Data Symposium will provide a unique opportunity for airline technical data managers, maintenance engineers and information technology specialists to learn about the latest status of our technical data products. Separate, but integrated product demonstrations and sideshows, to complement the main sessions, will be available throughout to allow active participation and an exchange of views. Advance notification will be made in the near future via our communication channels and invitations will be sent in the coming months.

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Authorization for reprint of FAST Magazine articles should be requested from the editor at the FAST Magazine e-mail address given below

Customer Services Communications
Tel: +33 (0)5 61 93 43 88
Fax: +33 (0)5 61 93 47 73
e-mail: fast.magazine@airbus.com
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Every little helps!

Going green

Working towards environmentally friendly materials and processes

Today, global awareness of environmental issues is a fact and the number of regulations is increasing. Many processes and chemicals used have to be revisited. Traditional engineering and manufacturing practices are evolving to meet these needs and '*going green*' is becoming a way of thinking that is affecting all industries worldwide.

In the aviation industry the commitment of Airbus to environmental efficiency has long been central to activities and a key driver when it comes to new products, techniques and processes. It can be said that the environmental impact of building and flying aircraft is a core preoccupation of Airbus since the beginning. Airbus has sharpened and embedded its environmental approach into an Environment, Health and Safety (EHS) policy, designed to align, channel and leverage the separate environmental initiatives across the company.

Thomas McVeigh
Senior Engineer
Materials and Technologies
Airbus Customer Services

In 2003, Airbus set up an innovative Environmental Management System (EMS) as a key enabler to help continuously improve the environmental performance of Airbus products and services.

In January 2007, Airbus became the first aerospace company to receive a corporate certification to ISO14001 environmental standards from an independent auditor (the highly respected Det Norske Veritas), covering all the company's production sites and products throughout their lifecycle. This corporate certification demonstrates the efficiency of Airbus EMS and integrated Life Cycle approach.

What is this integrated Life Cycle approach all about?

Airbus uses this innovative approach to map, assess, prioritise and track all the environmental effects an aircraft and the related production processes have, or may have, at each stage of life; from design to end-of-life, in a continuous improvement process. Among the significant environmental issues identified throughout the aircraft life cycle, are the impact of chemicals and manufacturing processes. Therefore, specific focus is given in the Life Cycle approach to research programmes that will lead to reduction of the environmental impact of manufacturing, and similarly, to anticipate chemical regulations such as REACH (see information). Airbus has adopted a policy of replacing hazardous materials and processes used for engineering and manufacturing, wherever feasible, and joining in efforts by other industry partners.

However, suitable replacement options are not always readily available. In such a case, Airbus sets targets and milestones to develop alternatives that bring the same benefits and level of safety and quality in a more pro-environmental manner.

Airbus initiatives

Understanding that eventually certain hazardous materials would have to be removed from industry, Airbus decided to anticipate the changes and launched a number of initiatives.

LOW VOLATILE ORGANIC COMPOUNDS (VOC) SURFACE COATINGS

Over the last decade, Airbus has intensified its efforts to replace high VOC surface coatings (external paints, primers, etc.) by low VOC alternatives. This subject is to be expanded upon in a later FAST article, "*Maintenance of aircraft paint systems, ten years on*".

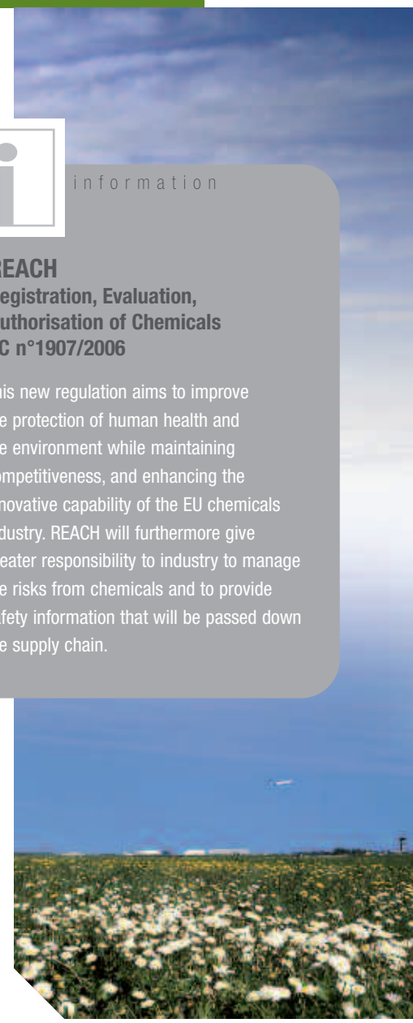
LOW VOC CONTAINING CLEANING AGENTS AND PROCESSES

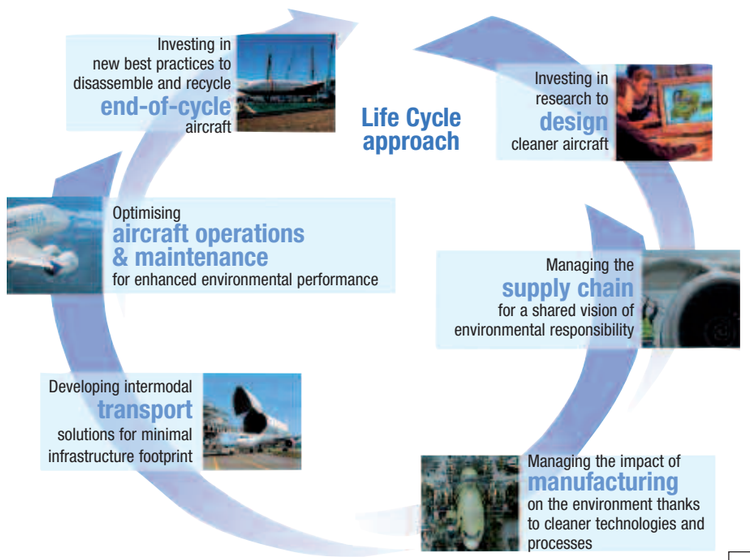
Traditional methods and processes for general cleaning have historically employed high VOC efficient solvents. However, these solvents, although capable of performing multiple cleaning applications,

information

REACH
Registration, Evaluation, Authorisation of Chemicals
EC n°1907/2006

This new regulation aims to improve the protection of human health and the environment while maintaining competitiveness, and enhancing the innovative capability of the EU chemicals industry. REACH will furthermore give greater responsibility to industry to manage the risks from chemicals and to provide safety information that will be passed down the supply chain.





Pressure cleaning

have been rendered obsolete due to their potential impacts on environment and health.

Two significant domains of improvement in solvent use at Airbus have been identified.

REPLACEMENT OF CLEANING WITH SOLVENTS BY PRESSURIZED HOT WATER CONTAINING ADDITIVES

This consisted of replacing traditional manual hand cleaning performed by surface flooding (with aggressive solvents) and removing residual material by wiping with cloths.

Solvents used were blends of suitable hydrocarbons, ethers, esters and alkyl ketones and the process involved a high consumption of solvent. After two years of research a new process with zero VOC emissions was established. During this research a number of processes were considered before finally choosing a new one. Exhaustive testing demonstrated the limitations of some environmentally friendly alternatives such as cleaning by pressurized additive-free hot water.

The logical progression was to identify and qualify a non-toxic and non-volatile additive to improve cleaning effectiveness. The additive selected had to remove all of the various soils and contaminants of the manufacturing process and not induce degradation (such as corrosion or embrittlement) of the materials it was being applied to.

A number of formulations were tested of which many unfortunately provided poor results. It was then decided to take a '*back to basics*' theoretical approach with the participation of a chemical supplier. From five short listed additives tested only one succeeded in fulfiling and meeting all of the requirements for a multi-purpose general cleaning process. The final additive enriched pressurised hot water process has proved to be extremely efficient and has facilitated deletion of the previous chemical cleaning processes using solvents.

PRE-IMPREGNATED WIPES CONTAINING 'NEW GENERATION' SOLVENT

In parallel to the previously mentioned cleaning process change, further industrial processes investigation identified the benefits of using pre-impregnated disposable cleaning wipes (cloths). This allows disposable wipes to be impregnated with a cleaning agent suitable for specific applications.

Airbus is currently employing and increasingly introducing the application of impregnated wipes to replace the previous practice of surface '*flooding and wiping*' with traditional solvents. The benefits of these changes also include supporting the global effort to reduce CO_2 emissions by reducing the energy used to manufacture and transport voluminous and heavy chemicals, and also their waste disposal management. This improved technology is commercially available and can be recommended by Airbus to customers and suppliers who wish to address local environmental issues whilst also improving the quality of their cleaning operations.

HALON FREE EXTINGUISHERS

Halon is a compound in which the hydrogen atoms of a hydrocarbon have been replaced by bromine and other halogen atoms. It is still used in fire extinguishers under specific exemption for aviation.

Over the last four years, Airbus and industrial partners have developed a halon free engine and auxiliary power unit fire extinguishing system with a research project called 'ECOLOG' (Extinguishing Concept Lowering Ozone depletion and Green house effect).

Following successful testing with a representative system demonstrator, the project was presented in late 2005 to the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA). The concept was seen as so potentially groundbreaking that the FAA launched its own test campaign to evaluate the new agent's extinguishing efficiency. Testing has been successfully completed, and although the FAA has not released their final report, all the signs so far point to them being extremely positive. When accepted by the authorities and implemented, this will become yet another Airbus step along the '*environmental road*'.

CHROMATE-FREE SURFACE PROTECTIONS AND PROCESSES

Airbus has launched a major initiative towards chromate substitution within various applications.

CHROMATE-REDUCED PAINT

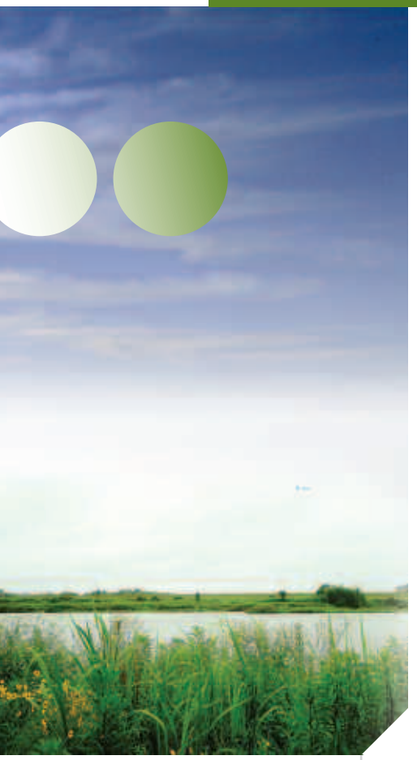
Chromate-free primers are used for the final paint scheme of the A380. Airbus is applying the most modern and environmental friendly techniques for the A380 painting process. Electrostatic paint guns are used to minimize paint mist. Used air is cleaned and washed through a multi-stage cleaning process to ensure that paint particles are disposed of separately.

CHROMATE-FREE ANODIZING PROCESS

Since the introduction of aluminium alloys into aircraft airframe construction (which was at that time a quantum leap), it soon became apparent that under certain circumstances these alloys preferred to return to their natural oxide state i.e. '*dust*'; this of course was a rather inconvenient and undesirable property.

With the enormous advantages provided by aluminium alloys (for mechanical stress and fatigue benefits) it was necessary to find a solution to preserve and stabilize the integrity of these materials. The turning point in stabilizing these alloys was the pre-oxidizing of the alloy surface, this process is known as '*anodising*'.

Anodization tank



The chrome-based chemicals used to achieve these protective coatings are now targeted as environmentally unfriendly. Therefore there is ongoing activity to find more EHS acceptable alternatives.

In 2002 Airbus launched a programme to investigate possible friendly alternative anodic processes. Following extensive investigation and research '*Tartaric Sulphuric Acid Anodising*' (TSAA) proved to be the most suitable replacement for corrosion prevention. Airbus has introduced this new TSAA anodising process to replace the current chromic acid anodising process in one of its facilities. The change has been promoted and introduced by Airbus to demonstrate the real possibilities for exchanging traditional (safe and secure) surface technologies for new innovative alternative solutions. The new anodic process will allow a higher oxide film thickness whilst maintaining at minimum, the same or better performance in fatigue.

Airbus will continue to up-scale the new TSAA process throughout its manufacturing facilities. This will be implemented at selected optimum opportunities, which will not impact or interrupt the current manufacturing cycle time. The ongoing programmes will initiate material and process changes as acceptable state-of-the-art alternatives are identified.

For Airbus customers and Maintenance Repair and Overhaul centre's involved with structural modification and repairs there will be no physical change with the introduction of TSAA technology, the only changes will be reflected in Airbus documentation such as the Structural Repair Manual (SRM), Consumable Materials List (CML) and the Process and Materials Specification (PMS). There will be no Airbus restriction on the use of consumable material and application processes currently used and referenced in the existing Airbus documentation for maintenance and repair.

CONTACT DETAILS

Thomas McVeigh
Senior Engineer
Materials and Technologies
Airbus Customer Services
Tel: + 33 (0)5 61 93 45 30
Fax: + 33 (0)5 61 93 36 14
thomas.mcveigh@airbus.com

Conclusion

Airbus' choice to anticipate Environment, Health and Safety (EHS) regulatory developments and introduce greener materials and processes is part of its commitment to the environment.

Although authorities do not yet mandate replacement or improvement of some materials and processes, Airbus believes that research and implementation of greener ways should be done as soon as technically and economically feasible to improve EHS.

Airbus has already achieved a lot in the introduction of environmentally friendly products and processes and is involved in many activities to develop cleaner, greener and smarter materials, processes and technologies for the future.

As further EHS improvements become available Airbus will inform the customer community of these through the FAST Magazine or other Customer Services publications. Environmental information is also available through environment, economics and social reports on airbus.com.

AIRBUS

A318 steep approach capability

Mainline jet comfort and efficiency into restricted airports

There are numbers of restricted airports around the world where mainline jet operation is presently not feasible due to height obstructions, runway length and/or noise restrictions. Perhaps the most significant of these airports is London City airport, which is shown in the picture above and described in more detail later. To answer this, Airbus has been working towards qualifying the A318 for steep approach since its type certification in May 2003.

This capability will allow mainline jet operations into airfields with steeper than normal approach requirements due to obstacles or noise constraints.

This article provides an overview of the benefits this new capability will bring to the latest A320 Family member as well as a summary of the technical solutions developed by Airbus to provide this capability.

Laurence Bernadac
Chief Engineering
Flight Physics Manager
A320 Family Programme

Daniel Carnelly
Product Marketing Manager
Marketing Division
A320 Family Programme

By courtesy of London City airport

Why steep approach requirements are needed?

The need to have a steep approach capability to operate into airports that have a challenging obstacle environment and already require such a capability for operation today is self-evident. Whether it is large buildings at city centre airports, prime amongst which is London City airport (LCY), or airports in mountainous terrain such as Sion or Lugano (both in Switzerland), it is Airbus' aim to be able to bring mainline jet comfort into airports where larger aircraft have struggled to operate due to obstacle constraints. Often these airports also have short runways – again usually due to the obstacle environment around them – and it is obvious why an A318 steep approach capability becomes important. When combined with the '*Florence Kit*' (see information), a series of hardware and software modifications including the upward deflection of ailerons to act as spoilers, that has been designed to improve the landing performance characteristics of the A320 Family, **the steep approach capability turns the A318 into a superb performer not just able to serve existing routes but also to open new ones for the first time.**

This capability becomes doubly important as the **A318 is the only 100 seat airliner to have a steep approach capability that is in production today.** Also, passengers prefer to have a jet service rather than a turboprop one. Due largely to all A320 Family members sharing the same wing and engines (in the case of the CFM56), the A318 has an excellent take-off performance that almost doubles the range capability offered by the 100 seat jets that it will eventually replace – and whilst burning up to 40% less fuel per seat.

LCY airport is perhaps the most significant example of one of the challenging environments that this capability was developed for. It is located very close to the financial district of London and is much more convenient for people who live and work in this area than Heathrow or Gatwick airports, as it is only a 15 minute journey away. Furthermore, due to the size of the airport and the volume of passengers, the time from check-in, through security and to the aircraft is much shorter (10 to 15 minutes against up to two hours at the major hubs). LCY airport is therefore much more convenient for the London financial community than other London airports. However, this airport can only be served today by turboprops and the previous generation of 100 seat jets due to its obstacle constraints. The A318 will allow operators to offer a superior on-board product than that offered today, often matching that already in service with their mainline fleet of A320 Family aircraft, as the A318 offers exactly the same cabin, seat width and comfort levels as the rest of the family. This is doubly so now that the Enhanced Cabin for the A320 Family has come into service.

A city airport capability is also of benefit to **the A318 Elite, the corporate version of the A318, which has the steep approach capability fitted as basic equipment**. When combined with the Auxiliary Centre Tank, this means that large private jet levels of comfort can be brought to city centre airports that previously could not handle such a large corporate aircraft. For this market, in particular, time is money and so the closer that the individuals who use such aircraft can arrive to city centre financial district locations, the better.

A second, and perhaps less obvious, use for the steep approach capability is what makes **the A318 a good neighbour for residents living close to airports,** particularly once again for those in city locations such as Bankstown in Sydney, Australia; Stockholm's Bromma airport or the Reykjavik city airport. In this case, the steep approach can be used as a noise abatement procedure. This is because at any given distance from the threshold of the runway, an aircraft will be higher when making a 5.5 degree approach than when making a standard 3 degree approach. During this phase of flight, engines are at a low regime so the noise source is primarily aerodynamic, but the higher an approach is over residential neighbourhoods the better for the people living there.

As airports expand and the environmental constraints become stronger, **the steep approach capability combined with the lower fuel burn than the jets that the A318 will replace enhance the aircraft's '*green*' credentials.**

information

The **'Florence Kit**' is a set of modifications developed first on the A319 to improve landing performance at Florence airport in Italy. This kit is now also available on the A318. It consists of:

- Using the ailerons as spoilers on the ground (upward deflection) to improve braking efficiency
- Defining an alternate forward centre of gravity limit that enables decrease of the approach speed, thus improving the landing performance

A318 STEEP APPROACH CAPABILITY - MAINLINE JET COMFORT AND EFFICIENCY INTO RESTRICTED AIRPORTS

Aircraft and operational modifications

The landing configuration of the A318 was initially designed to provide an optimum performance at landing for standard approaches, which are usually performed on a flight path of 3 degrees. It was clear from the beginning that this normal landing configuration was inadequate to provide the desired descent performance during a steep approach. Hence, the first challenge was to define an approach configuration that would enable flying the aircraft on a steep flight path angle of 5.5 degrees. This target was fixed in view of operations at LCY airport. According to the steep approach regulations, the aircraft must demonstrate the targeted approach plus 2 degrees margin, meaning the configuration had to allow the aircraft to fly a flight path of 7.5 degrees.

To achieve this approach path angle, the aircraft must either produce more drag, or less thrust, than on a normal approach. Several means are possible to achieve this by use of the existing control surfaces, by decreasing engine thrust on approach, or by the addition of drag increasing devices on the fuselage. To ensure minimum changes to the aircraft, the use of the existing control surfaces was the preferred solution.

The first task was to define **an aerodynamic configuration that would produce more drag than the classical high lift configuration in approach with minimum lift degradation.** Any change in the landing configuration resulting in decreased lift would necessitate increasing approach speed to balance it, which must be avoided to prevent lengthening of landing distance and degradation of landing performance. This was particularly important for LCY airport, due to the very short runway and was a key driver in the choice of the A318 steep approach configuration. To achieve the objective an aerodynamic configuration using the classical high lift configuration at landing, plus partial airbrakes extension was defined. This extension was optimized for the best compromise between descent performance and lift degradation, with only two spoilers (3 and 4) deployed over the three normally used in the speedbrake function, and deflected with the same angle. The final configuration and deflection angle of 30 degrees were validated in flight test.

After this, **the crew interface and system adaptations were developed to minimize steep approach specificities in operations.** Selection of the steep approach mode is done by a push button on the overhead panel in the cockpit, which arms the mode and checks system availability. The mode then becomes active once the landing configuration is selected and the speedbrakes are deflected. The cockpit displays are adapted to provide the crew with relevant

Aerodynamic configuration

Top of descent – P/B switched ON

information on the mode availability once selected. From a cockpit and general crew interface point of view, **steep approach procedures have been made as similar as possible to the existing Airbus standard.**

Due to the increased flight path angle during a steep approach aircraft vertical speed is increased and the landing becomes more dynamic than a classical one. Hence, the need to break the aircraft trajectory before touchdown is of primary importance. There-fore, special care was given to the flare phase for which two specific features were developed to assist the crew.

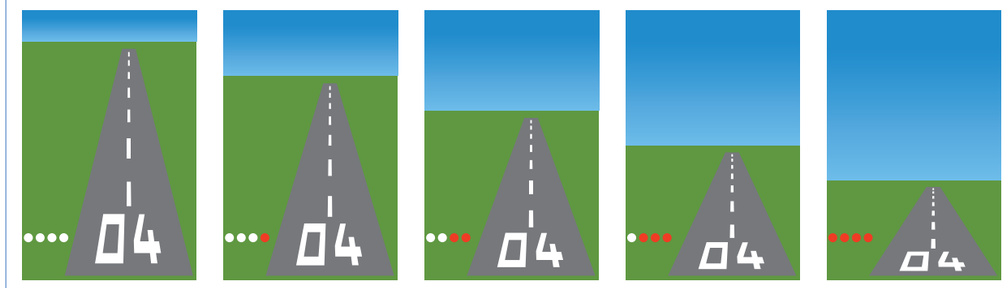
- The first was the introduction of a **dedicated audio callout during final approach** that guides the pilot to the correct moment to flare the aircraft.
- The second one, patented by Airbus, is a **partial auto-retraction of the speedbrakes just before flare** that limits pitch attitude variation during flare. This is transparent to the crew but efficient for their aircraft handling as it allows them to maintain a visual external reference during flare as close as possible to a classical approach while naturally generating the lift necessary to break the trajectory.

Other systems and flight control laws modifications have been introduced to accommodate the new steep approach configuration and ensure that it provides appropriate handling qualities and flight protections during approach. For example, Airbus has improved the existing steep approach mode for ground proximity warning and traffic collision avoidance systems (EGPWS-T2CAS) and proposed a specific envelope with alert thresholds adapted to the specific descent rate of the A318. This alert allows avoiding excessive flight path angle excursion away from the steep glide. Modifications were made to flight control laws in general, the aim being to provide the same level of safety in steep approach configuration as in any other landing configuration. Modifications address some points of the angle of attack protection, the speedbrake logic and some parts of the longitudinal law for the flare. The autopilot was also tuned as well to be as effective as for nominal operations.

Thanks to these features, **no dedicated pilot training will be necessary** to become familiar with steep approaches on the A318. All pilots qualified on the A320 Family aircraft will be able to fly steep approaches on the A318 without training other than the classical

A318 STEEP APPROACH CAPABILITY - MAINLINE JET COMFORT AND EFFICIENCY INTO RESTRICTED AIRPORTS

PAPI (Precision Approach Path Indicator)



If all of the PAPI system lights are white, you are too high.

If only the light on the right is red and the other are white, you are slightly high.

When you are on the guide path, the two lights on the left are white and the two lights on the right are red.

If only the light on the left is white and the other are red, you are slightly low.

If all of the PAPI system lights are red, you are below the guide path.

A320 training. Operational pilot training will of course remain necessary on site whenever the airfield characteristics require so, as for any other aircraft. Airbus training department will provide training tools (Flight Crew Training Manual and eBriefing), but no simulator or other training session will be required as it is considered to be easily manageable to fly steep approaches.

Standard operating procedures have been defined for steep approaches based on the extensive flight test campaign performed on the A318 and will be introduced into the operational documentation.

An extensive flight test campaign

All these modifications were developed and tested in several steps to reach the targeted level of maturity of the steep approach function. Tests were first performed in a simulator where the LCY airport environment was reproduced to improve the accuracy of the visual scene (steep approach on a short and narrow runway). Then the configuration was fitted on a prototype A318 for flight tests with different pilots to complete development and certification of the function.

For this purpose, a visual guidance system called PAPI (Precision Approach Path Indicator) was installed at Toulouse Blagnac airport to guide the aircraft through an approach at 5.5 degrees.

The first objective of this flight test campaign was **to check general handling qualities and performance** in steep approach conditions through free air assessment of the new aerodynamic configuration. Secondly, much effort was put into the flare phase assessment and an extensive campaign was carried out to assess approach, flare and landing in any aircraft configuration with a wide panel of flight test pilots. Another goal of this campaign was to validate the adaptation of flight control and display computers. All these flight tests were necessary to develop a robust configuration for steep approach and certify the configuration.

A total of 45 flights, representing 70 flight test hours and 220 landings were performed to achieve this target. This amount of flight tests performed with many different crews and various flight conditions is the key to maturity of the function at entry-into-service. Once the design was well advanced, airline pilots were also invited to participate in steep

approach flight tests to gather operational comments on the design and associated procedures.

In addition, complementary testing was performed at LCY airport to acquire knowledge of a real airport environment (traffic, air traffic control, obstacles) and check the configuration was adequate in this environment. This technical evaluation also gave an opportunity to check the aircraft compatibility with the airport's tough noise requirements. Two campaigns were successively organized in May and October 2006, first with a fully instrumented prototype aircraft, and second with a production aircraft on which the steep approach entry-into-service package was embodied.

These **last trials were witnessed by EASA** (European Aviation Safety Authority) **representatives and by airline pilots who were enthusiastic** about the easiness of flying steep approaches with the A318.

An Airbus team captured the noise signatures of the aircraft during take-offs with the results that the perceived **noise levels of the A318 were lower** than those of other aircraft operating the same day.

This flight testing demonstrated the adequacy of the A318 for operations at LCY airport, including ground manoeuvring.

CONTACT DETAILS

Laurence Bernadac
Chief Engineering
Flight Physics Manager
A320 Family Programme
Tel: +33 (0)5 61 18 14 48
Fax: +33 (0)5 61 93 07 58
laurence.bernadac@airbus.com

Daniel Carnelly
Product Marketing Manager
Marketing Division
A320 Family Programme
Tel: +33 (0)5 62 11 81 92
Fax: +33 (0)5 61 93 31 01
daniel.carnelly@airbus.com

Conclusion

The steep approach capability of the A318 will allow it to replace the previous generation of 100 seat jets and some larger turboprops, bringing the major benefits of A320 Family comfort levels and the preferred feel of a 'big jet' to passengers at restricted airports such as those mentioned previously, others like Paro in Bhutan, or in the Americas (depending on authority approval for steep approaches). Reduced fuel burn and the range to offer passenger's new destinations that could not be previously served from restricted airports are benefits for operators.

The easiness of flying steep approaches with the A318 is also an operational benefit, as no exceptional pilot skills or extra training (other than airport specific) are required. Introduction of a Head-up Display, which is ongoing at the moment, will also enhance the ease of operating steep approaches. Finally, A318 steep approaches can bring reduced noise levels to airport communities and enhance the aircraft's 'green' credentials.

Installation of the steep approach features will be available as an option for the A318, and proposed as standard for its Corporate Jet version, the A318 ELITE.

Certification of the A318 steep approach capability for models with Pratt & Whitney PW6000 engines was granted by the European Aviation Safety Agency on 19 June 2007 and is expected in the fourth quarter of 2007 for CFM56-5B powered aircraft.

AIRBUS

The Future Air Navigation System FANS B

Air traffic communications enhancement for the A320 Family

In today's busy Air Traffic Control (ATC) environment, and especially in high-density continental airspace, congestion on the voice channels used by air traffic controllers and pilots can be one of the limiting factors in sector capacity and safety.

Most messages on the voice channels are for routine activities such as the transfer of voice communications, flight level requests and clearances, route and heading clearances and requests, speed clearances and Secondary Surveillance Radar (SSR) code changes. Pilots and controllers need to exchange information in a flexible, reliable and secure manner.

Sophie de Cuendias
Design Manager
Upgrade Services
Airbus Customer Services

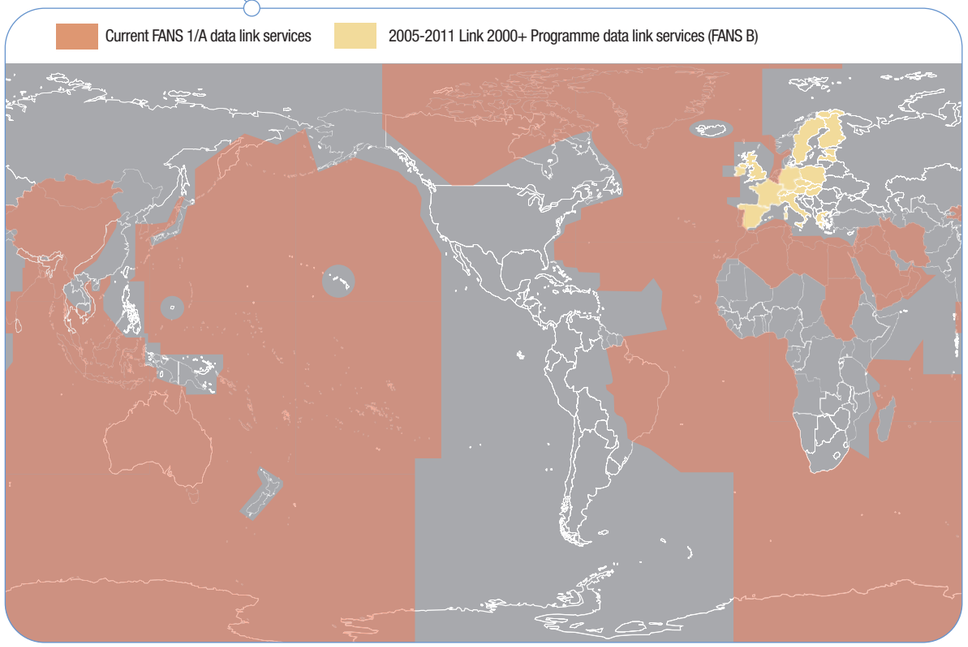
A Preliminary Eurocontrol Trial (PETAL), the Eurocontrol test of air/ground data link, a project at Airbus and the Maastricht Upper Airspace Centre (UAC), and its follow-on PETAL II, also conducted until the end of 2001 at the Maastricht UAC, demonstrated that the transmission of digital data via air/ground data link offers a reliable alternative to voice communications in relieving spectrum and ATC congestion and improving safety in air transport. The Maastricht UAC controls the upper airspace of Belgium, the Netherlands, Luxembourg and part of Germany, which carries a lot of Europe's air traffic.

The experience gained from the PETAL projects was used for a new project in Europe known as the Link 2000+ Programme, which provides air traffic controllers and pilots with a second communication channel: An air/ground data link, over an Aeronautical Telecommunications Network/VHF Data Link (ATN/VDL) Mode 2 infrastructure in the core area of Europe. VDL mode 2 compared to VDL mode A improves the data rate exchanges between aircraft and the ground station (data rate multiplied by ten, new modulation scheme, new communication protocol).

Link 2000+ Programme phased implementation

Link 2000+ Programme will start with a pioneer phase whose objective is to gain operational experience on ATC data link use, with pioneer airlines and pioneer ATC centres, to prepare for full deployment of ATC data link in Europe's upper airspace. The product needed for the Link 2000+ Programme pioneer phase requires a voice readback in accordance with European Organization for Civil Aviation Equipment (Eurocae) standard ED-110A, which provides an interoperability requirements standard for the initial implementation of the Aeronautical Telecommunications network (ATN), which supports several Air Traffic services.

2007 Worldwide air traffic data link services



THE FUTURE AIR NAVIGATION SYSTEM FANS B - AIR TRAFFIC COMMUNICATIONS ENHANCEMENT FOR THE A320 FAMILY

The pioneer airlines are presently: Finnair, Aeroflot-Russian International Airlines, Air Berlin, Air Europa, Airbus Transport International, Alitalia, American Airlines, Federal Express, Niki, Hapag-Lloyd, Lufttransport Unternehmen, Lufthansa, Lufthansa City Line, Malev, Scandinavian Airlines and SAS Braathens. Tarom-Romanian Air Transport is also considering joining. Currently, these airlines operate more than 600 Airbus aircraft and have committed more than 160 Airbus aircraft to the Link 2000+ Programme pioneer phase. Operator acceptance for the pioneer phase is planned to end during 2007.

Following the pioneer phase, the Link 2000+ Programme is currently investigating introducing incentives for those aircraft that are Controller Pilot Data Link Communications/Aeronautical Telecommunications Network (CPDLC/ATN) equipped and operate in Link 2000+ Programme airspace. The intended follow-on from this incentive phase will be a '*mandate*' phase where all aircraft operators flying in Link 2000+ Programme airspace will be required to equip with CPDLC/ATN avionics, subject to certain conditions.

Incentive and mandate phases will require an upgrade of existing products to be compliant with the Eurocae standard ED 110B to remove the requirement for voice readback.

Link 2000+ Programme applications and services

THE CONTEXT MANAGEMENT APPLICATION (CMA)

This application provides the Data Link Initiation Capability (DLIC) service that is mandatory prior to any CPDLC connection. This function will typically be initiated when an aircraft is either at the gate in the pre-departure phase of flight, or before entering a new Flight Information Region (FIR) supporting data link communications. It provides the ground with the necessary information to make data link communications possible between the controller and the aircraft:

- Aircraft 24 bit address
- Aircraft flight identification
- Departure/destination airport
- Facility designation
- Information about available air applications

THE CONTROLLER PILOT DATA-LINK COMMUNICATION (CPDLC) APPLICATION

The CPDLC application provides direct pilot/controller communication using data link between an aircraft and the controlling ATC centre. A voice readback is required for any messages related to any changes of the aircraft trajectory.

This application provides a set of data link message elements corresponding to existing International Civil Aviation Organization (ICAO) phraseology.

Functions provided by the CPDLC application are:

- The ATC Communication Management (ACM) Service
- The ATC Clearance (ACL) Service
- The ATC Microphone Check (AMC) Service

AIR NAVIGATION SERVICE PROVIDER (ANSP) COMMITMENT

Maastricht centre (the pioneer ATC centre) has been controlling flights using CPDLC since 2005. Most of the European ATC centres have committed themselves to the Link 2000+ and their deployments are proceeding to schedule. Other ANSPs are split into two groups, those able to achieve by 2008 and the others able to achieve by 2011.

ANSPs committed for 2008	
Country	ANSP
Germany	DFS
Switzerland	Skyguide
Italy	ENAV
Ireland	IAA

ANSPs committed for 2011	
Country	ANSP
Portugal	NAV Portugal
France	DSNA
UK	UK NATS
Spain	AENA

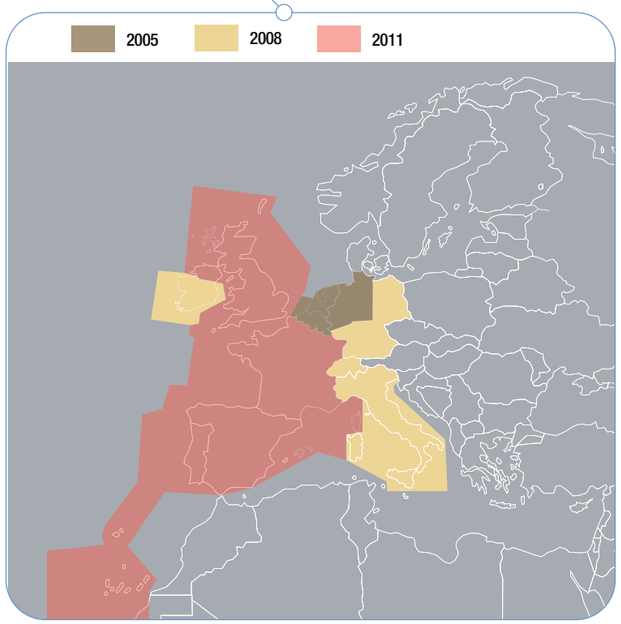
Future Air Navigation System B (FANS B)

The FANS B product is Airbus response to the Eurocontrol Link 2000+ Programme for utilization of ATC data link in continental areas (high density airspaces with radar surveillance) in the en-route phase, using the ATN air-ground communication network. As ATN is operational only in Europe, FANS B is proposed only on A320 Family aircraft for the time being.

The first FANS B package allows airline participation in early implementation phases of the Link 2000+ Programme - the '*pioneer phase*'. Airbus pioneer customers are Aeroflot-Russian International Airlines, Alitalia, Finnair, Niki, Lufttransport Unternehmen, Royal Jordanian, and Tarom-Romanian Air Transport.

For the following phases Airbus is aiming at a single FANS B evolution enabling airlines to be eligible and benefit from the incentive phase, and also be compliant with the Link 2000+ Programme mandate. Airbus is closely cooperating with Link 2000+ Programme management to finalize incentives and mandate conditions in the best interests of Airbus customers.

ANSP implementation plan



FANS B APPLICATIONS AND SERVICES

The Airbus FANS B product offers, at aircraft level, over ATN air-ground communication network and through VDL Mode 2 sub-network, the data link applications and services (Context Management Application, Controller Pilot Data-Link Communication application and ATC Communication Management, ATC Clearance, and ATC Microphone Check services) in accordance with Link 2000+ Programme specifications.

FANS B ARCHITECTURE

The FANS B architecture is the following:

- The airborne part with the ATSU (Air Traffic Service Unit), which is a modular hosting platform that centralizes all data communications (ATC and AOC/Airline Operations Communications) and manages the dedicated Human Machine Interface (HMI)
- The air/ground data link:
  - ACARS (Aircraft Communication Addressing and Reporting System) over VDL mode A/2, Satcom or HFDL (HF Data Link) are used to transmit AOC data. Satcom and HFDL for AOC are optional in the ATSU architecture
  - ATN over VDL mode 2 only, is used to transmit ATC data to the ground for communication purposes
  - The ground/ground data link: Two types of network have to be considered, the ACARS network for AOC messages and ATN network for ATC messages

THE FUTURE AIR NAVIGATION SYSTEM FANS B - AIR TRAFFIC COMMUNICATIONS ENHANCEMENT FOR THE A320 FAMILY

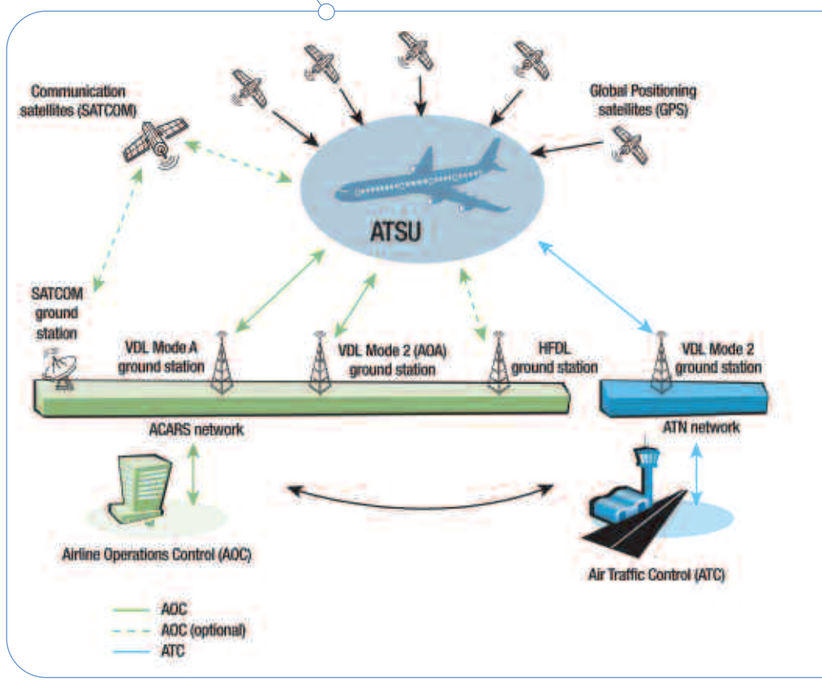
Data link communications between the aircraft and the airline operations centre optimize aircraft and crew management, improve data management like engine trend monitoring or maintenance reports, optimize spares management and speed up repairs.

ON BOARD EQUIPMENT

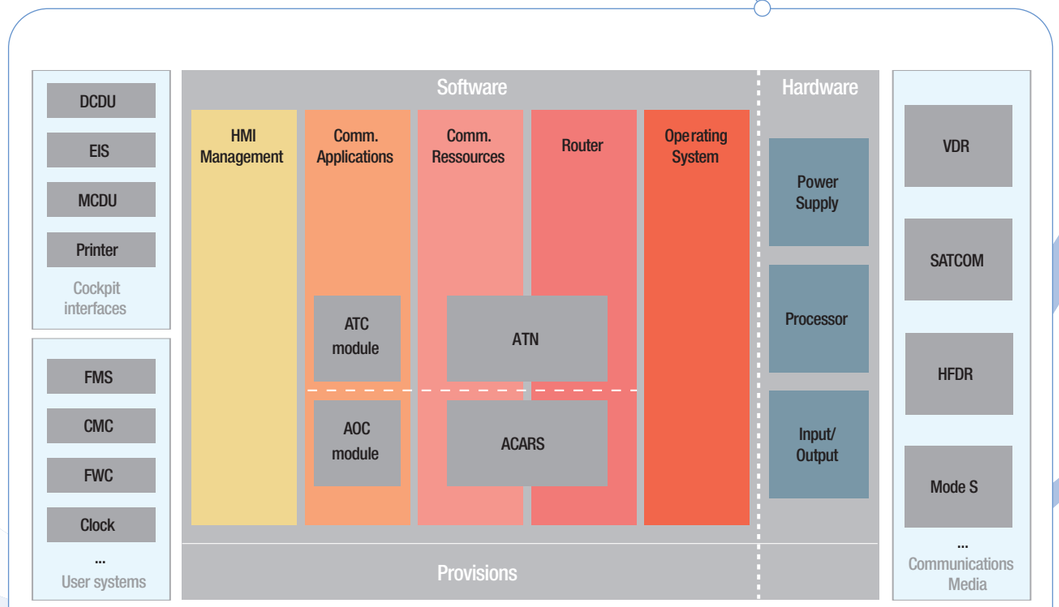
The FANS B installation requires a minimum standard of the following equipment/installation:

- ATSU and Data link Control and Display Units (DCDU) provision
- Two DCDUs that allow the flight crew to read, and answer, to CPDLC messages received from the ground
- Two pushbuttons with '*attention getters*' on the glare shield controlled by both Flight Warning Computers (FWCs)
- One VHF Data Radio (VDR 3) capable of VDL mode 2
- Two Multi Purpose Control and Display Units (MCDUs)
- Two Flight Warning Computers
- The Central Fault Display Interface Unit (CFDIU)

FANS B architecture



Air Traffic Services Unit - ATSU



1. Two visual attention getters
2. Two aural ATC alerts
3. FWC information about abnormal situations
4. Two DCDUs
5. ATC menu on each MCDU

THE FANS B HUMAN MACHINE INTERFACE (HMI)

The preceding product, FANS A+, has been in use for oceanic and remote area operations for several years (see information). The main HMI principles, defined on the A330/A340 and A320 Family FANS A+ installation, are also used on FANS B.

The HMI equipment used in the cockpit for FANS B functions are:

- Two DCDUs
- The MCDU to access the ATC message MENU
- Electronic Centralized Aircraft Monitor (ECAM) pages and alerts for FWC information about abnormal situations
- Two push buttons with visual attention getters, and the two associated aural ATC alerts
- The printer

A configuration with two DCDUs was chosen in accordance with safety studies and human factors studies, because of a clear dissociation of the ATC communication from other communications; absence of interference with the previously existing crew operational procedures; direct full time availability of ATC clearance messages; and its location in the forward field of view near the MCDUs.

The ATC alerts consist of:

- An aural alert:
  A specific sound named 'RING' (double brief ringing-phone-like alert)
- A visual alert:
  Two flashing lighted push-button switches labelled 'ATC MSG' (one for CAPT, one for F/O), located in the glare shield. The flashing period is one second

information

FANS A+ is the well-known air/ground data link and navigation system used in low density/oceanic environments.
It is basic on all Airbus A330/A340 and available as an option on A320 Family aircraft.

North Atlantic Region benefits from data link.

- In 2004, traffic levels exceeded pre–2001 levels
- NAV CANADA has reduced communication costs to users by 50%
- 55% of the fleet use either FMC (Flight Management Computer), WPR (Waypoint Position Reporting) or FANS A+ ADS–C for automatic position reporting

Pacific Sub–Region benefits from data link.

- Reduced separations to 50/50nm and 30/30nm (trials)
- User preferred routes and re-route (trials) for all city pairs in South Pacific
- Weather deviations
- Automatic position reporting
- 80% of the fleet in South Pacific use CPDLC (Controller-Pilot Data-Link Communications) and ADS–C, based on FANS A+, 60% in the Central Pacific, and 30% on average in the entire Pacific

THE FUTURE AIR NAVIGATION SYSTEM FANS B - AIR TRAFFIC COMMUNICATIONS ENHANCEMENT FOR THE A320 FAMILY

To ensure proper operation of FANS B aircraft in high-density continental data link airspaces an operator needs to ensure the following:

a) A contract with a Data Service Provider, DSP (ARINC or SITA*) is signed
b) The aircraft is declared to the data link service provider
c) The aircraft and its FANS capability is declared to the ATC centres of the operated routes
d) The aircraft's avionics are properly configured
e) Operational approval is obtained

*ARINC: Aeronautical Radio INC
SITA: Sté. Internationale de Telecommunications Aéronautiques

CONTACT DETAILS

Sophie de Cuendias
Design Manager
Upgrade Services
Airbus Customer Services
Tel: +33 (0)5 62 11 05 60
Fax: +33 (0)5 62 11 08 47
sophie.de-cuendias@airbus.com

Conclusion

The FANS B product is the first Airbus answer to ATN based data link operations. Highly inspired by the FANS A/A+ package, FANS B integrates the same interfaces and operational principles for denser airspaces and for the characteristics of the ATN environment (network architecture, technical acknowledgement timestamp, timers).

FANS B enables aircrew to manage data link communications between the aircraft and the ground Air Traffic Services, as well as communications between the aircraft and the AOC.

The availability of a second means of communication reduces communication errors, aircrew and controller workload and fatigue and will thus contribute to higher safety levels - radio voice communications have a number of drawbacks in today's busy traffic environment and pilots have to listen to each controller-initiated communication.

Other benefits are expected with the entry into operations of the data link technology in European airspaces such as an increase of airspace capacity by:
- 3.4% with a data link equipage rate of 25%*
- 8% with a data link equipage rate of 50%*
- 11% with a data link equipage rate of 75%*

** Figures given in the Eurocontrol website*

The above benefits are thanks to improvements such as better task sharing between controllers.

The Link 2000+ Programme can only be successful with the wide involvement of air navigation service providers, communication service providers, airlines and of course controllers and pilots. This is now under way – a contribution to safer, on-time aircraft operations.

It is anticipated that other regions will deploy ATN data link capabilities in their environment. A strong international standardization effort, in which Airbus has a key role, is being made to have interoperable standards. In particular CPDLC is part of Federal Aviation Administration (FAA) Next Generation Air Transportation System (NGATS).

Link 2000+ Programme and FANS B are key components of the Single European Sky ATM (Air Traffic Management) Research (SESAR) concept for future European Air Traffic Management System. Any airlines interested in information about FANS B or in upgrading their aircraft to this standard are invited to contact Airbus Customer Services Upgrade Services at upgrade.services@airbus.com or consult the 'getting to grips with Fans B in high-density continental areas part III' brochure distributed by Airbus.

AIRBUS

Initial experience from the FAIR-ISP on-line forum

Increasing airlines and Airbus collaboration on in-service fleet issues

The size of the Airbus fleet in-service has dramatically increased in recent years and a huge amount of experience is accumulating from almost 5,000 in-service aircraft and their millions of flight hours. This is raising questions for support and services:

- How can this huge and fast growing in-service experience be better shared for the benefit of all airlines?
- How can Airbus better determine and prioritize key issues for the worldwide fleet?
- How can Airbus bring effective solutions to these key issues, which meet customers' expectations?

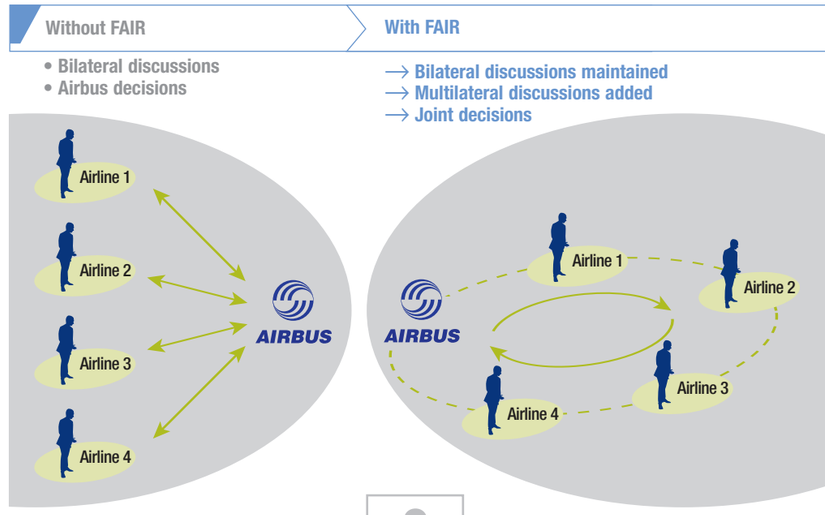
These are the main questions that have driven Airbus to launch a new service called FAIR, standing for Forum with Airlines for Interactive Resolution.

Denis Tissié
Deputy Vice-President A330/A340 Programme
Airbus Customer Services

FAIR is adding collaboration to the existing communication means and media, with the objective of identifying key customer issues and bringing to them the best solutions. Benefiting from new web technologies, FAIR has been developed in a two-step approach:

1. Establish web-based forums that allow the airlines and Airbus to openly exchange their experience and expectations in specific domains of support and services
2. Establish joint airlines/Airbus decision-making processes in each forum, in order to define the required go-forward plans

The first FAIR forum Airbus has developed is FAIR-ISP (In-Service Problems). FAIR-ISP enhances collaboration between the airlines and Airbus for the identification, evaluation, prioritization and resolution of In-Service Problems (see definitions next page).



Other FAIR forums are being developed. With the creation of other FAIR forums dedicated to various support and services, FAIR will progressively become the global collaborative platform between the airlines and Airbus Customer Services.

information

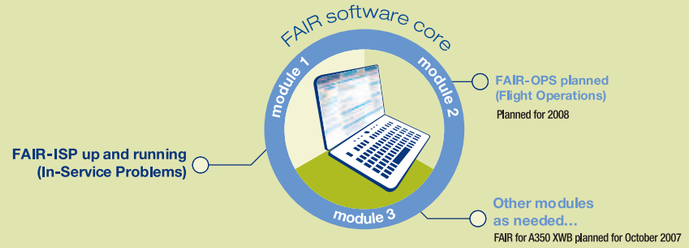
After a one-year development with 19 airlines and a one-year pilot phase with up to 42 airlines, FAIR-ISP was deployed to the worldwide fleet in December 2006. It has already met with great success among the 100 operators using the service.

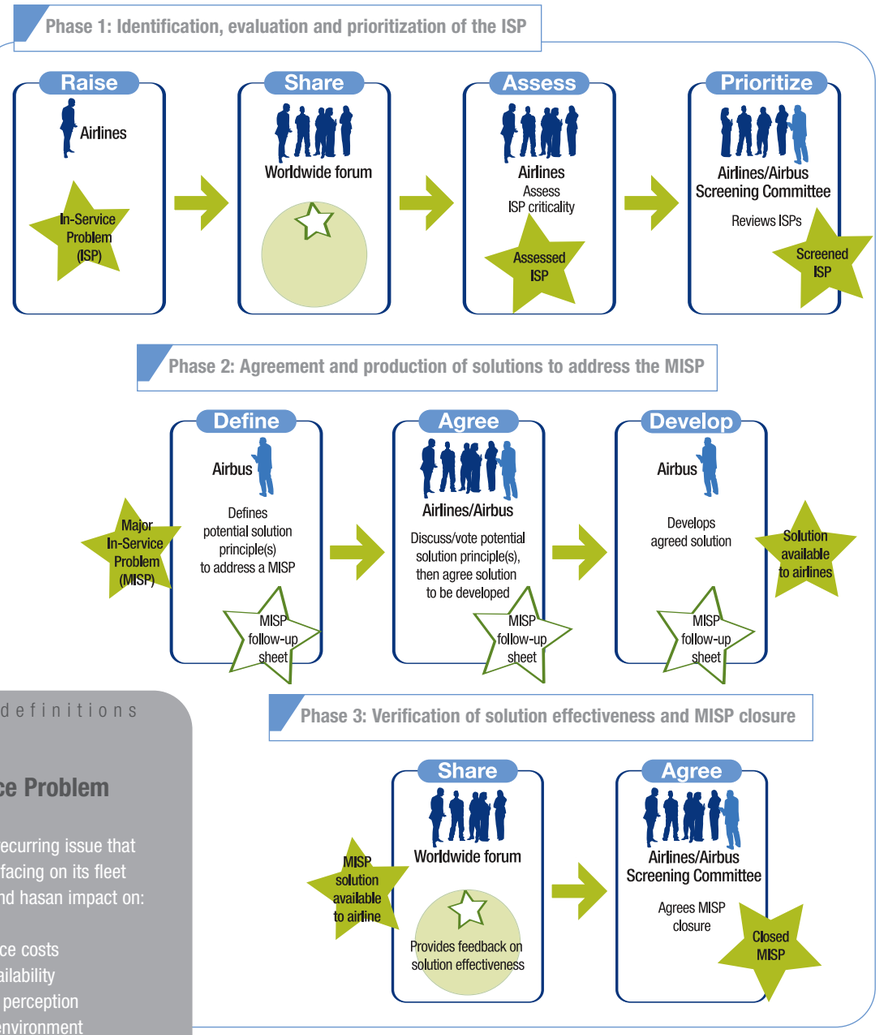
FAIR: More forums are being developed

In addition to FAIR-ISP, two other forums are currently under development.

FAIR-OPS, a forum for the Flight Operations domain, has received strong support from airlines. The initial specification was worked upon in a workshop in March 2007 with flight operations representatives from airlines already active with FAIR-ISP.
The FAIR-OPS project was presented to the airline community in the 15th Performance and Operations conference in April 2007.
The first version of the FAIR-OPS software will be reviewed with airlines in a workshop in the fourth quarter of 2007 and deployment will start early in 2008.

FAIR-A350 XWB is a forum that will be dedicated to the Airbus A350 XWB development. It is aimed at further improving communication between A350 XWB confirmed and potential customers and the Airbus A350 XWB development teams. To complement existing face-to-face A350 XWB progress reviews, the forum will allow permanent exchanges. This will result in enhanced uniformity between the A350 XWB design and airline community expectations throughout the aircraft development phases, until Entry Into Service.
Deployment of FAIR-A350XWB is planned for October 2007.





definitions

In-Service Problem ISP

An ISP is a recurring issue that an airline is facing on its fleet in-service and hasan impact on:

- operations
- maintenance costs
- aircraft availability
- passenger perception
- or on the environment

An ISP materializes with FAIR-ISP into an item that an airline will post on the online forum.

Major In-Service Problem MISP

A MISP is an ISP that is classified as major because of significant impact on:

- continued airworthiness
- and/or costs
- operational performance
- passenger perception
- or airframe image

A subject is accepted as a MISP by the FAIR-ISP Screening Committee.

The FAIR-ISP process

As described previously, FAIR-ISP is not just an on-line forum, it is also a tool for making decisions. The most important one to be made is to decide if an ISP that one airline has identified is a major fleet issue, a so called Major In-Service Problem (MISP), that needs to be resolved as a high priority (see definitions).

For this purpose, the FAIR-ISP process is split into three major collaboration phases, consisting of nine successive steps, each covering one part of the In-Service Problems identification, prioritization and resolution process. In each phase, the airlines and Airbus can voice and share their opinions and their experience. Forum contributions allow a joint airlines/Airbus Screening Committee to make the best decisions for the benefit of the entire fleet.

Through enhanced transparency and sharing of opinions, all phases contribute to the following objectives:

- Focus on the MISPs affecting the fleet in-service,
- Agree resolution of these MISPs

Roles and responsibilities

Four different roles have been defined among FAIR-ISP users. Each role has its privileges, making the whole process totally clear and easing participation and decisions (see definitions).

THE READER/DRAFTER

This is the default role of any FAIR-ISP user.

Reader/drafter access to the FAIR-ISP tool is controlled by the airline User Entity Administrator (UEA). Each airline UEA can create an unlimited number of FAIR-ISP reader/drafter accounts.

A FAIR-ISP reader/drafter can consult the forum and can create and save drafts of FAIR items. The draft items are only visible to users of the drafter's airline. The items that can be drafted are: New In-Service Problems, comments on In-Service Problems, replies to comments or assessments of In-Service Problems.

When a draft has been finalized and is deemed ready for posting on the forum, the reader/drafter can flag it as '*Ready to post*' in the software. The items in '*Ready to post*' status are then displayed to the writer/validator (see following) of the airline.

This draft process allows any maintenance or engineering specialist within the airline to prepare the items for posting by their writers/validators.

THE WRITER/VALIDATOR

The number of writers/validators is limited to two per aircraft family operated by the airline. They have a management level and therefore can act on behalf of their airline. Limiting the number of writers/validators to management levels who have an overview of their fleet operations ensures that items posted on the forum are of interest to the other users and remain fleet level issues.

Writer/validator access to the FAIR-ISP tool is controlled by the Airbus FAIR administrator.

FAIR-ISP writers/validators have reader/drafter rights. In addition to their reader/drafter rights, they are responsible for posting their airline's contributions on the forum. For this purpose, they can consult, edit, delete, or post all '*Ready to post*' drafts. A writer/validator can also directly create and post items without going through the draft process.

THE SCREENING COMMITTEE MEMBER

The Screening Committees are the decision bodies of the FAIR-ISP process. They are aircraft family-specific (A300/A310, A320, A330/A340) and consist of around 12 representatives selected from the writers/validators of participating airlines.

Each Screening Committee gathers regularly (every four to six weeks) through Webex conference calls, to review the ISP, define ISP closure criteria, select and prioritize MISPs, agree MISP resolution and agree MISP closure. All Screening Committee decisions are taken for the benefit of the entire fleet. The agenda and minutes are approved by the airline co-chairmen (see following) and posted on the forum for everyone to consult.

definitions

Reader/drafter

Anyone who has access to FAIR-ISP can create a draft of contribution elements

Writer/validator

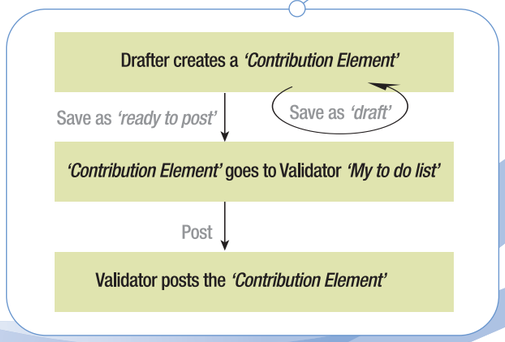
Two senior managers per airline per operated aircraft type can post contributing elements on FAIR-ISP

A contribution element

A contribution element may be:

- An ISP
- A comment to an ISP
- A reply to a comment
- An assessment of an ISP

FAIR-ISP draft process



The Screening Committee process also prevents accumulation of a backlog of open items in FAIR-ISP. At the end of the FAIR-ISP phase 1, the inactive, general discussion or low priority items are screened and closed as required.

Any airline can apply for Screening Committee membership. A yearly renewal is planned with a turnover of 25%. Candidates will be selected based on their contribution to the forum.

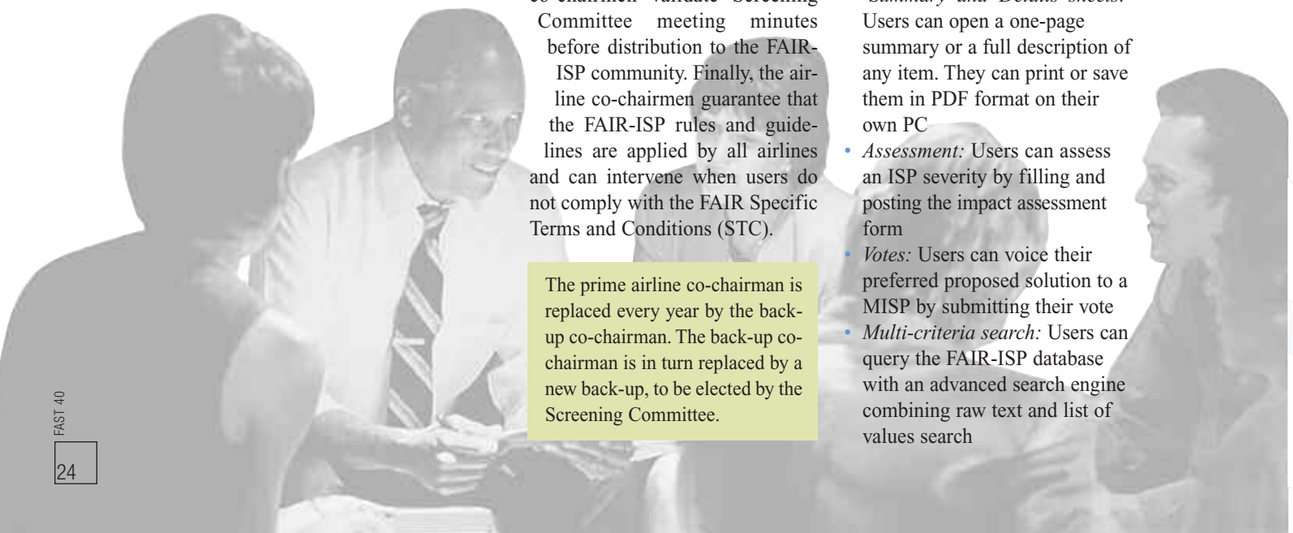
THE SCREENING COMMITTEE AIRLINE CO-CHAIRMEN

There are two airline co-chairmen for each Screening Committee, one prime and one backup.

The prime airline co-chairman co-chairs the Screening Committee with the Airbus co-chairman. There is always one airline co-chairman participating in the Screening Committee. During the meeting, the airline co-chairman can act as discussion facilitator to ensure that fleet interests are considered rather than individual airlines interests. They can also mitigate or advocate the different standpoints of Screening Committee members to reach a consensus.

The airline co-chairmen contribute also to the Screening Committee agenda preparation. The airline co-chairmen validate Screening Committee meeting minutes before distribution to the FAIR-ISP community. Finally, the airline co-chairmen guarantee that the FAIR-ISP rules and guidelines are applied by all airlines and can intervene when users do not comply with the FAIR Specific Terms and Conditions (STC).

The prime airline co-chairman is replaced every year by the back-up co-chairman. The back-up co-chairman is in turn replaced by a new back-up, to be elected by the Screening Committee.



The FAIR software

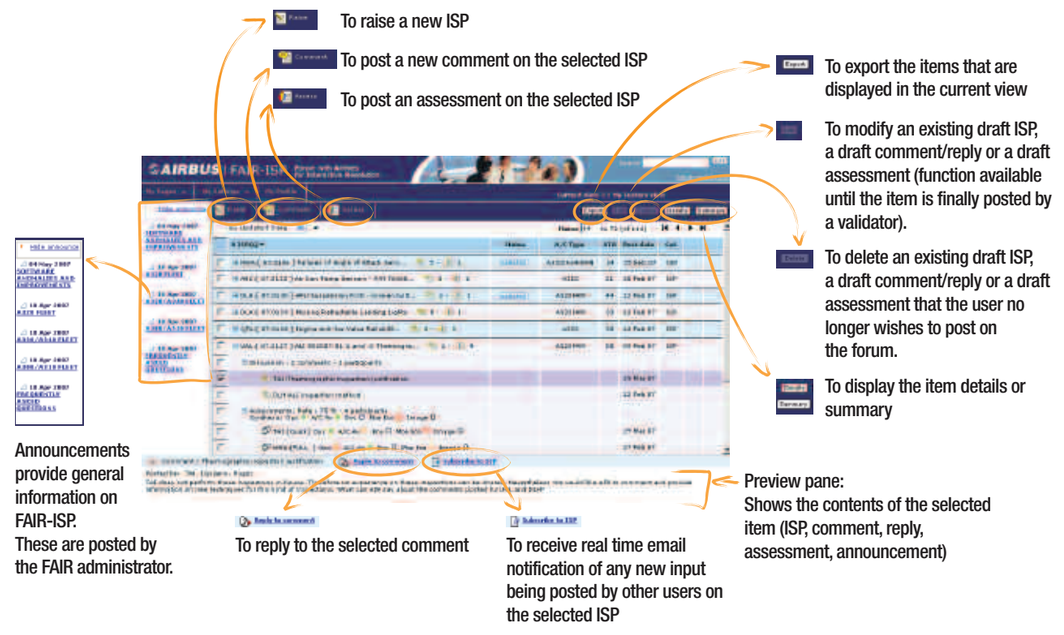
FAIR has been designed by the airlines for the airlines. A panel of 19 airlines representing the fleet (geographical distribution, fleet and type of operation) actively contributed to the development and the industrialization of the process and tool. This led to the specification of a web-based forum software, available on the AirbusWorld portal.

The key drivers for software development were friendliness and simplicity. Some of the main appreciated features are:

- *All major functions* such as Raise, Comment, Assess, Edit, Display details, Display summary, are accessible via simple buttons on the main screen
- *Customized views:* Users have access to predefined views and can even define their own custom view, based on their preferences (aircraft type, ATA chapter, etc)
- *Notification system:* Users are notified of new items matching their preferences. FAIR users can adjust frequency of notification and can also subscribe to specific items of particular interest to them, for which they will receive real time notification
- *Draft items:* Users can draft and submit draft items for posting by their fleet writers/validators
- *'Summary' and 'Details' sheets:* Users can open a one-page summary or a full description of any item. They can print or save them in PDF format on their own PC
- *Assessment:* Users can assess an ISP severity by filling and posting the impact assessment form
- *Votes:* Users can voice their preferred proposed solution to a MISP by submitting their vote
- *Multi-criteria search:* Users can query the FAIR-ISP database with an advanced search engine combining raw text and list of values search

FAIR-ISP ON-LINE FORUM - INCREASING AIRLINES AND AIRBUS COLLABORATION ON IN-SERVICE FLEET ISSUES

The FAIR-ISP main page



The FAIR software is in continuous evolution to include functional evolutions or ergonomic enhancements as requested by the users. Users have praised the friendliness and simplicity of the FAIR software tool. Continuous improvement is ensured while performance is being monitored very closely.

The Airbus flying fleet is also well represented through a very balanced worldwide distribution of connected airlines. However, the majority of airlines connected to FAIR-ISP are mostly consulting the forum and only part of them are actively posting.

FAIR-ISP status

FAIR-ISP is moving towards the success expected thanks to airline contributions. While still in a ramp-up phase, nevertheless, airline contributions keep increasing at a good pace (see information).

CONNECTION RAMP-UP

The number of airlines connected since the official FAIR-ISP opening in December 2006 has more than doubled. This is evolving very quickly: The 100th airline was connected in May 2007.

information

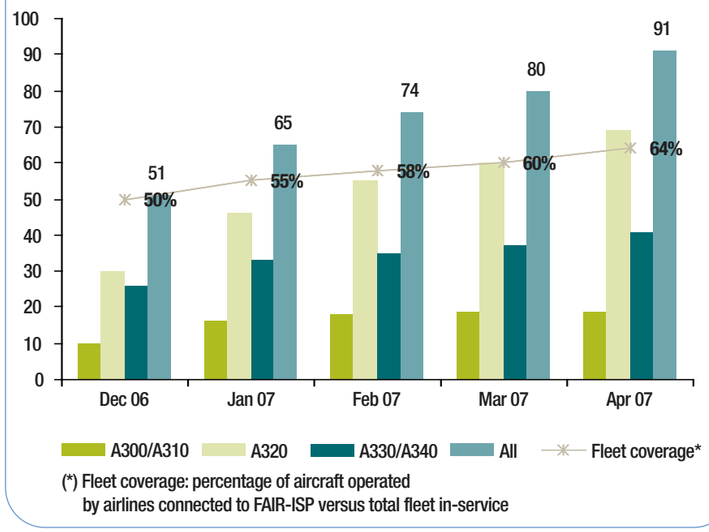
Airlines' contributions (May 2007)

- 70 % of the Airbus in-service fleet
- 100 operators of all aircraft families
- 5,000 users in reader/drafter mode
- 170 writer/validators
- 160 In-Service Problems
- 13 agreed as Major In-Service Problems
- 2 MISPs with solutions agreed
- 45 ISPs closed, usually with a solution

Therefore, Airbus encourages connected users to contribute more, and in particular to voice their opinion and share their experience on existing FAIR ISPs, so that Screening Committee decisions can be made better and faster. Airbus also invites all operators that have not yet joined the FAIR-ISP community to request their connection (see how to get access to FAIR later) and nominates their writers/validators to post their contributions.

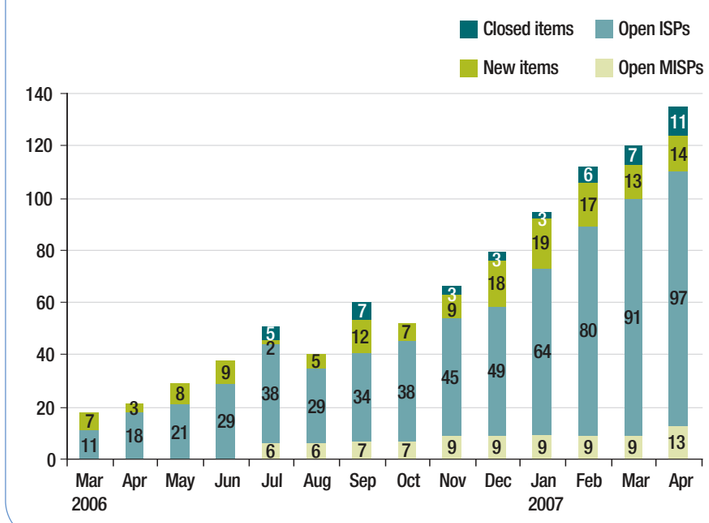
Leasing companies are not yet able to consult the FAIR-ISP forum, but this will come mid 2007. Airbus suppliers, who are key players in the MISP resolution process, also do not have access to FAIR-ISP yet, but this will be considered later, when the FAIR-ISP process and tool are mature and robust.

FAIR-ISP connected airlines



(*) Fleet coverage: percentage of aircraft operated by airlines connected to FAIR-ISP versus total fleet in-service

FAIR-ISP new, open and closed items



Forum activity

The number of posts in the forum has grown together with the number of connected operators. At end April 2007, 160 ISPs in total were posted on the forum for the three Airbus aircraft families: A300/A310, A320 and A330/A340. Of the 160 ISPs, 13 were accepted as MISPs by the Screening Committees.

Two MISPs have even gone through the solution selection process (phase 2 of the FAIR-ISP process described earlier). Among the proposed solutions, the airlines have either voted for their preferred one and/or rejected the others. Based on this input, the Screening Committee was able to select the final solutions to be developed to address the MISPs.

45 items have been closed with Screening Committee approval. Most of them already had an existing interim or final solution in place, documented by Airbus.

Airbus strongly encourages operators to participate actively in the FAIR-ISP discussion phases. This will allow building robust files quickly to speed and ease Screening Committee decisions for the benefit of the entire fleet.

How to get access to FAIR-ISP

FAIR-ISP is accessible on AirbusWorld. The pre-requisites for access are:

1. Access to AirbusWorld and
2. Signature of the FAIR Specific Terms & Conditions (STC).

The FAIR-ISP connection procedure is a two-step procedure:

STEP 1
OBTAIN READER/DRAFTER ACCESS

Every airline can apply for an unlimited number of reader/drafter accounts managed by their own airline User Entity Administrator (UEA). Contact your Airbus Customer Support Director (CSD) to obtain a copy of the FAIR STC.

Once the STC has been signed, your airline UEA will be given authorization to open FAIR-ISP to your organization. In case of access problems, contact your UEA.

STEP 2
OBTAIN WRITER/VALIDATOR ACCESS

Writer/validator access is limited to two senior managers per airline per operated aircraft family and is controlled by the Airbus FAIR administrator. The contact details of your airline writers/validators must be provided to your CSD for transmission to the Airbus FAIR administrator. The Airbus FAIR administrator will advise airline writers and their UEA as soon as writer/validator connection is established, or if there are any connection problems.

CONTACT DETAILS

Denis Tissié
Deputy Vice-President
A330/A340 Programme
Airbus Customer Services
Tel: +33 (0)5 61 93 47 30
Fax: +33 (0)5 61 30 00 79
denis.tissie@airbus.com
or:
FAIR administrator
fair.admin@airbus.com

Conclusion

Since the official opening of the FAIR-ISP forum in December 2006, things are progressing very quickly and very much in the direction expected. One hundred operators are connected today and several additional ones are being added every month.

The FAIR-ISP decision process is working as expected, with up to 13 MISPs opened on the forum, 45 items closed (usually with a solution) and others being discussed or monitored.

Feedback from the airlines using FAIR-ISP is positive and they highlight numerous benefits of using the process with the top two being:

- Managing together with Airbus the list of top fleet issues and being able with Airbus to define the top priorities to be addressed
- Defining and delivering solutions that are validated, or even improved, by airlines through FAIR-ISP

The FAIR-ISP process provides a new and innovative means for airlines and Airbus to work together in a common on-line forum to share fleet experience and issues, identify and prioritise problems, and define and validate solutions. Airlines in completely different regions of the world can therefore become aware of the experience of each other and share this common knowledge to the benefit of their planning and fleet operations. For Airbus, the benefits are an increased awareness of fleet operational issues, the ability to prioritise problems and define solutions with airlines and hence provide a better and quicker service for customers.

Not all airlines are currently connected to FAIR-ISP and Airbus encourages all airlines to connect to FAIR-ISP and contribute actively to identifying, evaluating, prioritising, and resolving the in-service problems that may impact their operations. FAIR-ISP is a tool defined by airlines, for airlines, and will be increasingly successful with open, regular and constructive dialogue - to the benefit of all using it. Airbus looks forward to building this working-together forum with customers.

AIRBUS

August 1972
First A300B roll-out of the assembly hall in Toulouse

27 March 2007
...and roll-out of the last of the Family.

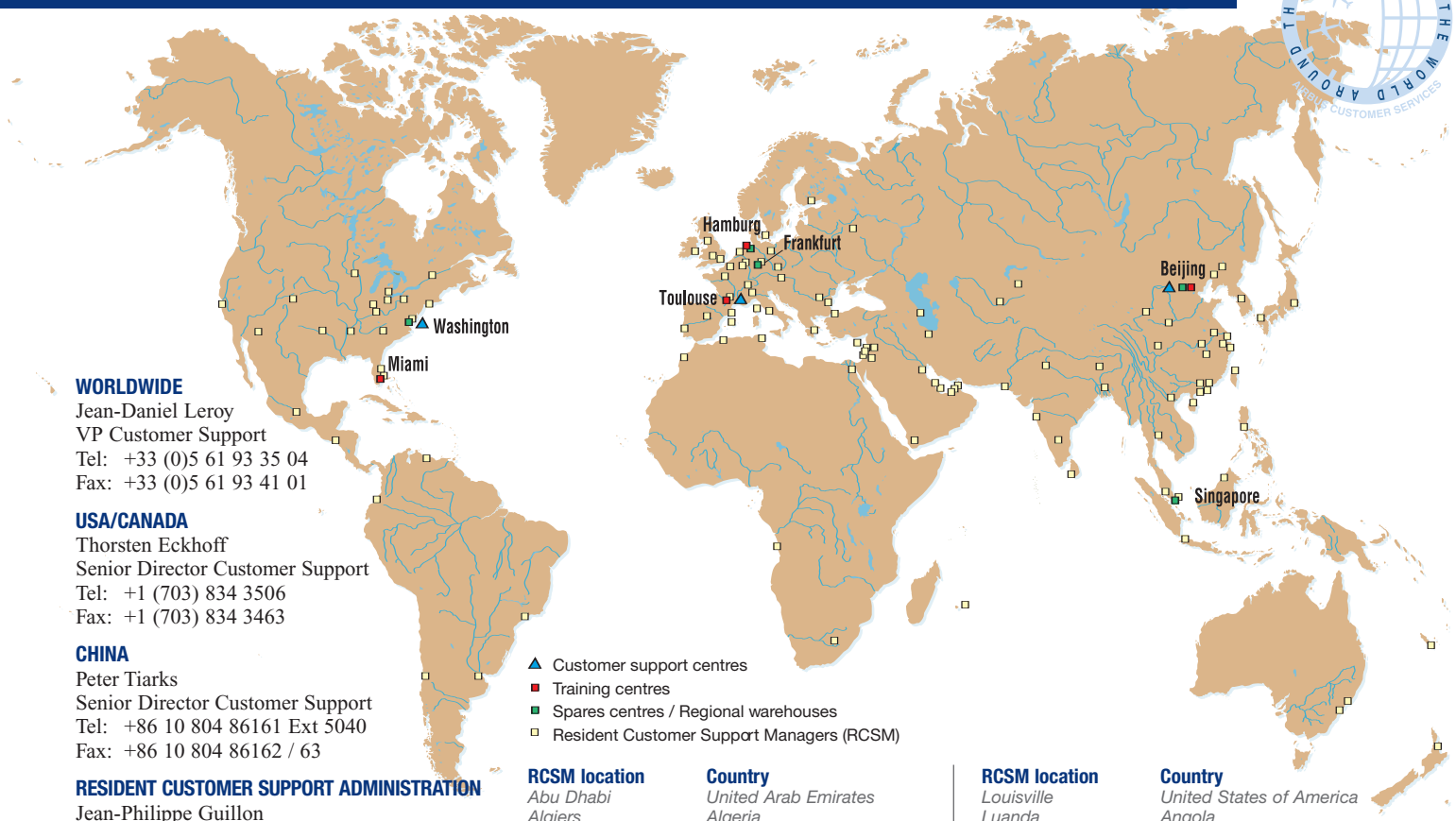
35 years ago...

September 1972 saw the official ceremony of the debut of a new '*star*' in the aircraft world - the Airbus A300B, the first twin-aisle twin engined aircraft designed for short and medium range operations. The aircraft offered many advantages over comparable aircraft of the day, such as being quieter and more fuel efficient, having nearly double the passenger capacity and the ability to interline standard freight containers between long-haul and short-haul flights. These advantages were recognized by the industry and led to steady sales and a number of variants to meet market needs. The first aircraft were the B2 short-range and the B4 medium-range. These were followed by the A310 and the A300-600, plus a number of variants of these aircraft.

Early passenger aircraft have taken on a second lease of life by being converted into freighters and the capability of the aircraft as a freighter is such that a large number of new-build freighters have been delivered during the latter part of production. Perhaps the most notable variant is the A300 SuperTransporter, known as the '*Beluga*' that transports Airbus parts from site to site and is also used in other freight activities such as flying outsize paintings from France to Japan.

A total of 822 A300/A310 Family aircraft were built and currently almost 90 organizations either operate or own family aircraft. The service life of the A300/A310 Family is expected to extend to close to mid-century, giving a life of over 70 years from roll-out to final retirement.

Naturally, Airbus is sad to see production of its first '*star*' cease, but this is a normal evolution and aircraft from the family will still be in service for decades to come. Therefore, Airbus energies are now focused on providing a level of support, service and customer satisfaction at least equal to that of in-production Airbus aircraft. Support will be ensured to the aircraft family's operators until its end of life and then, finally, to ensure the environmentally friendly break-up of retired aircraft.



WORLDWIDE
Jean-Daniel Leroy
VP Customer Support
Tel: +33 (0)5 61 93 35 04
Fax: +33 (0)5 61 93 41 01

USA/CANADA
Thorsten Eckhoff
Senior Director Customer Support
Tel: +1 (703) 834 3506
Fax: +1 (703) 834 3463

CHINA
Peter Tiarks
Senior Director Customer Support
Tel: +86 10 804 86161 Ext 5040
Fax: +86 10 804 86162 / 63

RESIDENT CUSTOMER SUPPORT ADMINISTRATION
Jean-Philippe Guillon
Director
Resident Customer Support Administration
Tel: +33 (0)5 61 93 31 02
Fax: +33 (0)5 61 93 49 64

TECHNICAL, SPARES, TRAINING
Airbus has its main spares centre in Hamburg, and regional warehouses in Frankfurt, Washington D.C., Beijing and Singapore.

Airbus operates 24 hours a day every day.

Airbus Technical AOG Centre (AIRTAC)
Tel: +33 (0)5 61 93 34 00
Fax: +33 (0)5 61 93 35 00
support.airtac@airbus.com

Spares AOGs in North America should be addressed to:
Tel: +1 (703) 729 9000
Fax: +1 (703) 729 4373

Spares AOGs outside North America should be addressed to:
Tel: +49 (40) 50 76 4001
Fax: +49 (40) 50 76 4011
aog.spares@airbus.com

Spares related HMV issues outside North America should be addressed to:
Tel: +49 (40) 50 76 4003
Fax: +49 (40) 50 76 4013
hmv.spares@airbus.com

Airbus Training Centre Toulouse, France
Tel: +33 (0)5 61 93 33 33
Fax: +33 (0)5 61 93 20 94

Airbus Maintenance Training Centre Hamburg, Germany
Tel: +49 40 743 88288
Fax: +49 40 743 88588

Airbus Training subsidiaries
Miami, USA - Florida
Tel: +1 (305) 871 36 55
Fax:+1 (305) 871 46 49
Beijing, China
Tel: +86 10 80 48 63 40
Fax:+86 10 80 48 65 76

RCSM location	Country
Abu Dhabi	United Arab Emirates
Algiers	Algeria
Almaty	Kazakhstan
Al-Manamah	Bahrain
Amman	Jordan
Amsterdam	Netherlands
Athens	Greece
Auckland	New Zealand
Baku	Azerbaijan
Bandar Seri Begawan	Brunei
Bangalore	India
Bangkok	Thailand
Barcelona	Spain
Beijing	China
Beirut	Lebanon
Berlin	Germany
Brussels	Belgium
Bucuresti	Romania
Buenos Aires	Argentina
Cairo	Egypt
Caracas	Venezuela
Casablanca	Morocco
Changchun	China
Charlotte	United States of America
Chengdu	China
Cologne	Germany
Colombo	Sri Lanka
Columbus	United States of America
Copenhagen	Denmark
Damascus	Syria
Delhi	India
Denver	United States of America
Detroit	United States of America
Dhaka	Bangladesh
Doha	Qatar
Dubai	United Arab Emirates
Dublin	Ireland
Dusseldorf	Germany
Fort Lauderdale	United States of America
Frankfurt	Germany
Guangzhou	China
Haikou	China
Hangzhou	China
Hanoi	Vietnam
Helsinki	Finland
Hong Kong	S.A.R. China
Indianapolis	United States of America
Istanbul	Turkey
Jakarta	Indonesia
Johannesburg	South Africa
Karachi	Pakistan
Kita-Kyushu	Japan
Kuala Lumpur	Malaysia
Kuwait City	Kuwait
Lanzhou	China
Larnaca	Cyprus
Lisbon	Portugal
London	United Kingdom

RCSM location	Country
Louisville	United States of America
Luanda	Angola
Luton	United Kingdom
Macau	S.A.R. China
Madrid	Spain
Manchester	United Kingdom
Manila	Philippines
Mauritius	Mauritius
Memphis	United States of America
Mexico City	Mexico
Miami	United States of America
Milan	Italy
Minneapolis	United States of America
Montreal	Canada
Moscow	Russia
Mumbai	India
Nanchang	China
Nanjing	China
New York	United States of America
Newcastle	Australia
Ningbo	China
Noumea	New Caledonia
Palma de Mallorca	Spain
Paris	France
Paro	Bhutan
Phoenix	United States of America
Pittsburgh	United States of America
Prague	Czech Republic
Quito	Ecuador
Rome	Italy
Sana'a	Yemen
San Francisco	United States of America
San Salvador	El Salvador
Santiago	Chile
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Seoul	South Korea
Shanghai	China
Sharjah	United Arab Emirates
Shenyang	China
Shenzhen	China
Singapore	Singapore
Sydney	Australia
Taipei	Taiwan
Tashkent	Uzbekistan
Tehran	Iran
Tel Aviv	Israel
Tokyo	Japan
Toluca	Mexico
Toulouse	France
Tripoli	Libya
Tulsa	United States of America
Tunis	Tunisia
Varna	Bulgaria
Vienna	Austria
Washington	United States of America
Wuhan	China
Xi'an	China
Zurich	Switzerland

Greener.

The Airbus A380 is built to be greener overall, not just because of its highly efficient design and new generation engines, but also thanks to a commitment from Airbus to reduce the total environmental impact of its aircraft. Airbus is the only manufacturer in the aviation industry to meet the strict ISO 14001 environmental management standards, covering all its manufacturing sites and products. Making the A380 a greener aircraft at every stage of its life cycle, from when we start putting it together to when it is finally taken apart. **Airbus A380. See the bigger picture.**

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