

DECEMBER 2008
FLIGHT
AIRWORTHINESS
SUPPORT
TECHNOLOGY

FAST 43

A I R B U S T E C H N I C A L M A G A Z I N E

F A S T 4 3



AIRBUS

Customer Services events

Just happened

Material, Suppliers and Warranty Symposium, Cancun, Mexico June 2008

We concluded a successful symposium, which brought together 150 people from customers and major suppliers organizations. The key theme of this event was to 'Materialize our future together' with keynote speeches dedicated to:

- Reveal of the Supplier Support Rating awards,
- Airbus material management strategy,
- The new Supplier Support Conditions (SSC),
- Supplier improvement process,
- Airbus BFE and powerplant supplier policies and support,
- Optimization of the supply chain,
- What's new in warranty,
- Warranty tool developments.

To compliment the speeches, plenary sessions and workshops were held to share greater detail on specific developments and to openly exchange ideas together with customers and suppliers. The customer caucus highlighted that we delivered on our previous commitments and our ongoing initiatives were highly appreciated.

The first A380 Entry Into Service symposium Toulouse, France 1 - 4th December 2008

More than 200 people from eleven A380 customer airlines and nineteen suppliers attended the event. In a departure from the traditional symposium format, a broad range of A380 issues were debated, with one day for in-service technical subjects, one day for production and programme development issues and one day for flight operations items. With the aircraft in-service for over one year, this was an ideal time to review feedback from initial operation. All customers agreed the symposium gave them valuable feedback to prepare future entries-into-service and expect Airbus and its suppliers to maintain efforts on in-service reliability and product maturity improvements.

Airbus Training Symposium, Paris, France 1 - 4 December 2008

400 participants, 112 airlines, 32 training systems suppliers and aviation authorities expressed extreme satisfaction with the symposium. The key message was, 'Thinking about tomorrow's training; rethinking with tomorrow's technologies'. This theme, reiterated in four streams (flight, maintenance, cabin, and simulation technologies) in different presen-

tations demonstrated our commitment to safety, quality and efficiency. VP Jacques Drappier asked 'are we still training people based on aircraft of yesterday, hoping that they will learn about the aircraft of today, and will be prepared for the aircraft of tomorrow?' Technologies such as the Onboard Information System, Onboard Maintenance System, and Flight Attendant's Panel have revolutionized the way people operate Airbus aircraft and training must take this into account. He concluded that safety is non-negotiable and can be economically achieved by applying this theme.

Coming soon

A320 Family programme symposium Paris, France 4 - 8 May 2009

The A320 Family is continuing to develop and to expand. The worldwide symposium of the A320 Family programme will take place in downtown Paris in May 2009. It will gather the airline management dealing with the A320 family, fleet managers and technical pilots to share the experience of the almost 4,000 aircraft which will be in service by mid 2009. Airbus will propose a basic agenda that will be merged with customer suggestions, concentrating on fleet concerns that will be based on FAIR-ISP (Forum for Airline Issues Resolution - In Service Problems) inputs. It is planned to cover all presentations in the main session. As usual, adequate facilities will be available for side meetings. The formal invitation letters as well as the preliminary agenda will be sent in the first quarter of 2009.

The 15th Performance & Operations Conference to be held in Paris 11-15 May 2009

This is a significant milestone in our Flight Operations Support & Services activities. These events have been organized since 1980 and this event provides flight crews, operations specialists, flight operations engineers and performance specialists with a unique opportunity to constructively exchange views and information, plus increase mutual cooperation and communication. On most days, three sessions will be conducted simultaneously to cover the main flight operations themes. In addition, booths will be open daily to discuss issues and to provide demonstrations of Airbus Flight Operations' tools.



FAST

M A G A Z I N E
A I R B U S
T E C H N I C A L

FLIGHT
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Airline staff can familiarize with the Airbus manuals to maintain Airbus aircraft with the C@DETS self-tutorial courseware, see article on page 22

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Every little helps!

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Franck GERMAIN
Stéphane ADER

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Computer @ssisted Documentation
Education Tutorial System

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Initial experience from the FAIR-OPS on-line forum

Increasing airlines and Airbus collaboration on in-service fleet's flight operations issues

Nicolas PUHARRÉ
Captain Michel BRANDT

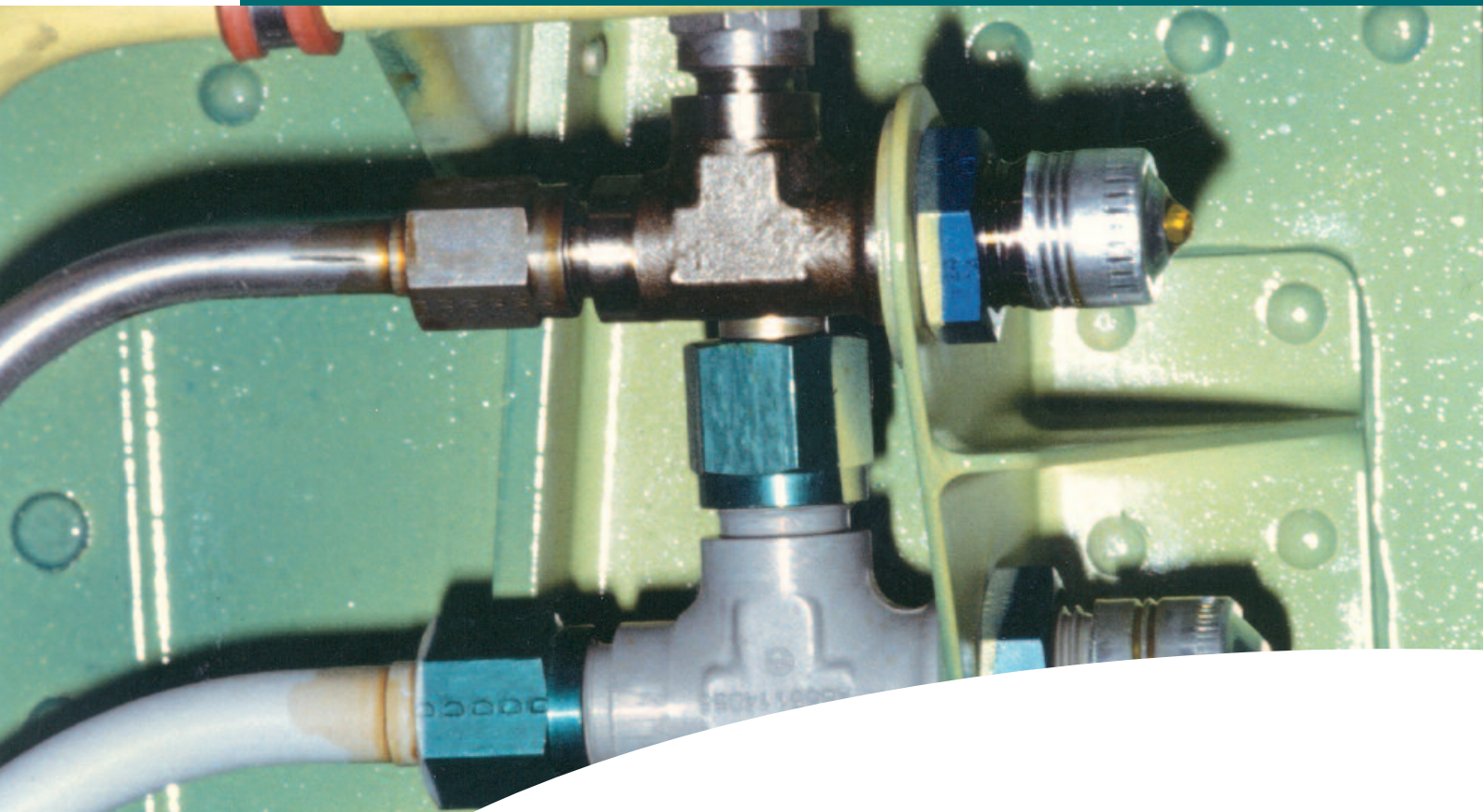
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SESAR
Part II

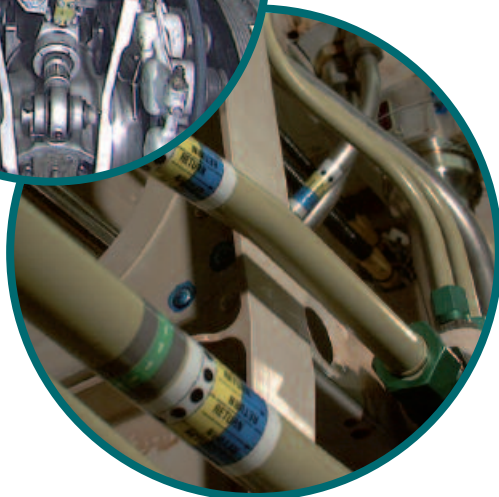
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Customer Services
Around the clock... Around the world

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Hydraulic systems



Hydraulic problems can be a source of schedule disruptions for operators.

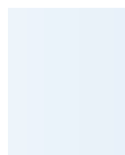
This article is in two parts with the first part describing an Airbus training course for repairing hydraulic problems on all Airbus aircraft types and the second part explaining the improvements and maintenance recommendations specifically developed for hydraulic systems on A300/A310 Family aircraft.



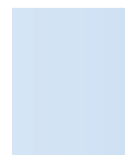
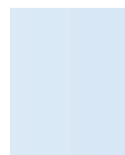
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Part 1



A training course for repairing hydraulic problems on all Airbus aircraft types

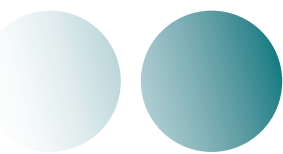
Your aircraft is scheduled to depart in two minutes and you are comfortably seated. Suddenly, a voice is heard in the cabin: 'ladies and gentlemen, this is the captain, we have a technical problem and maintenance is checking it. We will inform you as soon as possible of the result'.

Even if you don't see them, outside the aircraft maintenance technicians are already busy. The aircraft has a hydraulic leak and they have to quickly answer crucial ques-

tions such as 'is the leak within the Aircraft Maintenance Manual (AMM) limits?' or 'is there a deactivation to perform?' and many others. Then they have to make a good decision, because the longer the aircraft is delayed, the more passengers will be inconvenienced and the more expensive and problematic will be the consequences. Their decision making depends on several factors, such as: Severity of the problem, maintenance staff skill and experience and a number of others.

To help and improve the performance, knowledge, skill and decision making of maintenance technicians on hydraulic system problems, Airbus has developed a specific two days training course, applicable for all Airbus aircraft types. This article explains the course content and its advantages.





THE HYDRAULIC PRACTICES, REPAIRS AND PRECAUTIONS COURSE

The course is designed for all Airbus aircraft families and can be delivered at a customer's site, or anywhere else. The target population is maintenance certifying staff (European Aviation Safety Agency B1, B2, A, C categories, Federal Aviation Agency A&P or equivalent) and non certifying staff directly dealing with the aircraft.

The course is divided into two parts. The first day is theory with the second day being practical and on aircraft, including a repair session with kits.

DAY ONE - THEORY

Servicing recommendations is the first topic. Whether it is done at the operator main base or elsewhere, improper servicing can be a contributing factor for delays (over servicing, quantity level variation, reservoir or accumulator configuration not set...etc).

Therefore, it is essential to know or review the 'MUST DO and MUST NOT DO' during servicing.

Another maintenance duty is inspection. This is to ensure hydraulic systems; components and lines are in good condition. This is very important for prevention of hydraulic leaks. They can be certified airworthy according to the AMM, which provides criteria, limits and tolerances. What and where to check, is part of the course. Additionally, the course helps to find the damage tolerances for dispatch. Leak prevention in case of line damage is studied. In addition, videos review the basics of seal, line and hose installation.

A significant amount of air trapped in hydraulic fluid can generate substantial issues. Therefore, it is essential to know how to tackle this possible case, so the procedures to be used are part of the course.

When a leak or a problem is discovered, what we quickly want to know, are the steps to dispatch the

aircraft airworthy or/and things that can reduce a delay duration such as usage of a Fly Away Kit or when to call AIRTAC (Airbus Technical AOG Centre).

The last part of day one explains available hydraulic line repair methods. Today, for Airbus, the suppliers for on wing repairs are Permaswage and Rynglok and both of these technologies are studied.

Throughout the day participants are not passive, questions are asked and answers have to be found in the AMM. Also trainees are guided and coached by the instructor using AirN@v (Airbus electronic technical data tool). The purpose is to help them identify how and where to find necessary data for their everyday life.

DAY TWO - PRACTICAL

This is split in two: on aircraft and with repair kits. On aircraft, participants with the instructor see all the areas where there are points of interest in safety, dispatch, servicing, inspection, de-activation, test or installation.

For example: Applicable to all Airbus aircraft types with lower deck cargo doors, including freighters with the main deck cargo hydraulic actuated door. During maintenance checks cargo doors are left open for long periods. Due to safety concerns, before the first closing of the door it is required to bleed the door actuators, as if this is not done the doors could slam shut due to air ingress. Therefore, this task is emphasized and the type of tool and how to perform the bleeding is reviewed.

Another example is on the A320 Family: to ensure safety on some maintenance tasks it is a good practice to isolate systems. On the Power Transfer Unit (PTU) there is an isolation coupling and during the course it is reviewed why, where and how to disconnect this coupling.

These are just two examples, but many more are covered.

If an operator has more than one aircraft type, everything is done on the first type then only the differences are covered for the other types.

Using the repair kits is the last part of the course, Permaswage and Rynglok repair kits are used and each participant must cut, clean, deburr and swage under the instructor's coaching/supervision. After the repair is made inspections are carried out.



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Conclusion

Hydraulic problems can be a source of aircraft delays and cancellations and can cause significant operational disruption for operators and their passengers. The Hydraulic Practices, Repairs And Precautions Course offers operators the opportunity to familiarize or refresh their staff with such problems and fixes and to minimize the disruptions to their operations that can be caused by them.

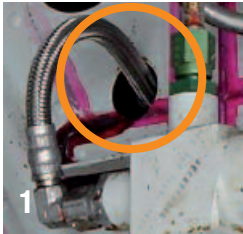
This course, applicable for all Airbus aircraft families, provides answers when working on hydraulic systems and clarifies, explains and demystifies

what is needed to fix hydraulic systems. Some courses have been run already with positive feedback, such as the following examples from operator participants: 'Course was really good, was informative for today's activities', 'It's interesting and knowledgeable and it gives me the correct information or procedures', 'Was very clear and presentation was excellent, could clear all doubts when ever raised during the course', 'We hope that in the future there will be more frequency of training information such as this, to further broaden our knowledge.'

AIRBUS

Part 2

Flexible hose inspection



- 1 Hose to structure clearance
- 2 Hose to pipe clearance
- 3 Chafing marks/braid rupture

'Thai Airways have emphasized the outstanding results achieved thanks to the hydraulic leak preventive maintenance programme put in place, which has helped to achieve and maintain low cases of hydraulic leaks.'



Mr. Charat Chimpalee
Thai Airways Engineering

Preventing hydraulic leaks on A300/A310 Family aircraft

One outcome of the A300/A310 Technical Symposium in Toulouse in 2007 was the clear indication from operators that hydraulic leaks represent one of the most significant causes for unscheduled maintenance on the aircraft. From this came the request for Airbus to assist to improve the situation. This article explains the steps taken by Airbus to help operators reduce unscheduled maintenance related to hydraulic problems.

FLEET STATUS

Leaks from the hydraulic and other related systems (such as flight controls, braking systems etc) are a main cause for operational interruptions and unscheduled maintenance actions for each of the A300/A310 Family aircraft types. The hydraulic system is regularly one of the top five identified contributors to unscheduled maintenance actions.

To understand this phenomenon and define corrective actions, Airbus began some years ago to

closely monitor all reported hydraulic leak events.

This database has been used for the development of various hardware improvements and also the provision of comprehensive maintenance recommendations for preventive maintenance. Several operators have approached Airbus individually, recommendations have been given and the results have been clearly positive. One recent feedback from Thai Airways concerned a hydraulic leak improvement plan developed in 2007, see separate box.

AVAILABLE IMPROVEMENTS

A number of improvements and modifications have been defined and a complete list is available in Service Information Letter 29-032. As experience feedback from in-service is a continual process, the contents of this SIL are periodically updated and the last revision was in October 2007.

GUIDELINES

Analysis of in-service feedback clearly shows that the rate of occurrence of hydraulic leaks increases as the aircraft ages. Consequently, older aircraft require particular attention and, generally, the main items to be

Recent improvements

Documentation SIL 29-032 updated in Oct 2007 with latest improvements

Effectivity:
A300
A300-600
A310

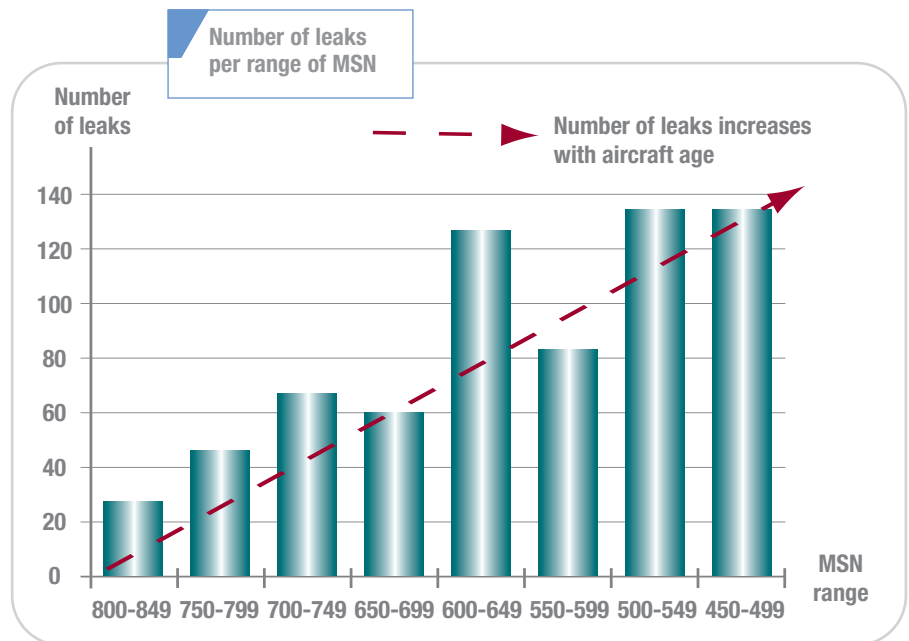


checked and the particular areas they are located in can be summarized as follows:

Items to be checked are hydraulic seals, flexible hoses and rigid pipes. The particular areas are the main landing gear wheel well, the nose landing gear bay, the engine pylon and nacelle and the wing trailing edge.

Precise and detailed guidelines and procedures have been defined for these checks. For all A300/A310 Family operators to benefit from this fleet wide experience a Visual Inspection Guide CD-ROM has been developed, which complements the Hydraulic Practices, Repairs And Precautions Course described previously in this article. Copies of this CD-ROM have already been distributed to all A300/A310 Family operators and SIL 00-032 gives contacts for additional copies. A booklet, the 'A300, A310, A300-600 Hydraulic System Maintenance Practices' has also been produced and made available to operators.

Booklet 'A300, A310, A300-600 Hydraulic System Maintenance Practices'
Available via SIL 00-032



Maintenance aids



CD-ROM Hydraulic System Maintenance Practices



FAST magazine
- number 13
- number 22

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Conclusion

Hydraulic system leaks are recognised as a significant driver for unscheduled maintenance actions on A300/A310 Family aircraft, so during the A300/A310 2007 Technical Symposium in Toulouse a review of available hardware improvements was made and a presentation was given of recommendations for maintenance practices to prevent leaks. Numerous hardware improvements have been defined by Airbus and are summarized in SIL 29-032.

Preventive maintenance is also an important factor to reduce leaks, so a visual inspection guide CD-ROM has been developed and issued by Airbus. Application of the SIL improvements and CD-ROM inspection guide has already led to improved operations for operators and, together with the complementary Hydraulic Practices, Repairs And Precautions Course described in Part 1 of this article, can bring increased benefits for operators by reducing schedule disruptions due to hydraulic problems.

AIRBUS



A300-600/A310 PMAT

A new tool for troubleshooting autoflight systems

The sophisticated architecture of Auto Flight Systems (AFS) on the A300-600/A310 causes some issues for mechanics in identifying the root cause of problems. To assist in identifying these causes Airbus and Thales have developed a tool

called the Thales Portable Maintenance Access Terminal (PMAT). This article describes the PMAT and its functions in assisting operators in performing investigations.



David MARCONNET
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PMAT development

In 2007, Airbus launched the A300 and A310 Long Term Support programme (see FAST Special A300/A310 Family April 2008) to ensure continuous support to operators. New challenges like engineering support led Airbus and its vendors to modernize the fleet by improving various different systems of the A300-600 and A310 aircraft. New features were developed for improved aircraft performance and also for improved and easier maintainability of the aircraft. The introduction of systems for improved and easier maintainability led to the development of a new tool, the PMAT, by Thales Avionics for the maintenance of the AFS. The PMAT is ideally suited for the Long Term Support Airbus is providing for the aircraft family.

PMAT purpose

AFS maintenance is ensured by the FIDS (Fault Isolation and Detection System), integrated in the AFS computers, which records and analyses the BITE (Built In Test Equipment) memory from the AFS computers. Whenever a failure is detected, the FIDS sends BITE results to the MTP (Maintenance Test Panel) located on the rear panel in the cockpit.

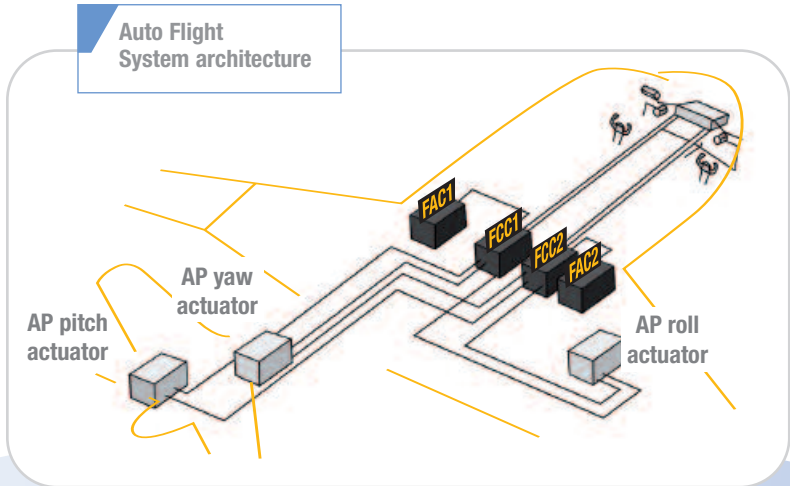
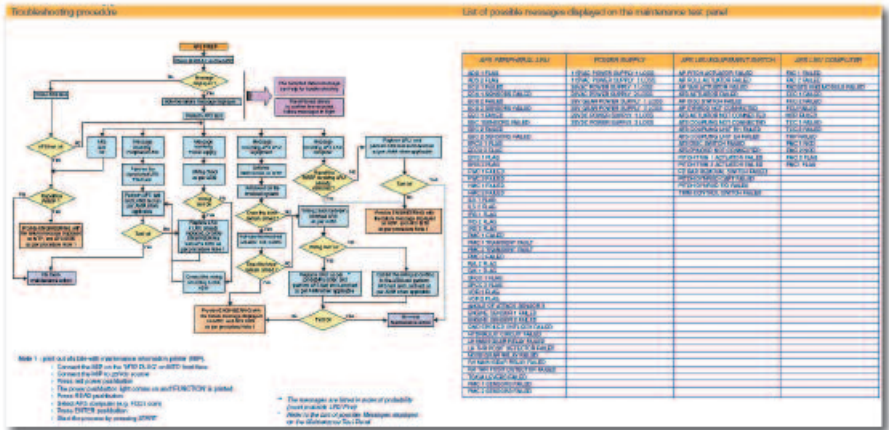
When the MTP is interrogated, it displays the failures recorded by the BITE from the last flight and can indicate the highest probability of failed components (maximum three). After this, mechanics refer to the associated troubleshooting task in the TSM (Trouble Shooting Manual) and a dedicated booklet called Aircraft System Maintenance Aids.

In some complex cases the TSM may not be sufficient and the issue could persist. In these cases the complete BITE memory,



PMAT computer and BITE access

Booklet Aircraft System Maintenance Aids



Auto Flight System architecture

which contains more information (Boolean, logic), could enable completion of the analysis of a complex failure. To access the BITE memory and enable analysis of its content, the PMAT has been designed for interrogating: The Flight Augmentation Computer (FAC), The Flight Control Computer (FCC) and the Thrust Control Computer (TCC).



Interface menu

Symptoms

Line	Word	Rk	Flag	Variable	Variable description	Reference	Value
CDM	3	9	(C)	BFD	SOFTWARE FB ENGAGE CONDITION	1: OK	D
CDM	4	5	(C)	BFRSOPM	GLOBAL FB FAW	0: FAW	D
CDM	4	11	(C)	BFRRS	IRS DOWN FAW	0: FAW	D
CDM	4	12	(C)	BFRALFA	ALPHA FAW	0: FAW	D
CDM	5	4	(C)	BFRVFR	VOR FAW	0: FAW	D
CDM	6	7	(C)	BFRFBFW	FD FAW	1: OK	D
CDM	1	1	(C)	BFRFCM	PROFILE MODE	1: ACTIVE	0
CDM	1	2	(P)	BNDLOCOM	OPPOSITE LOC N.C.D	0: N.C.D	1
CDM	1	3	(P)	BALHLD	ALTITUDE HOLD MODE	1: ACTIVE	0
CDM	1	4	(P)	BVSFD	VERTICAL SPEED MODE	1: ACTIVE	0
CDM	1	5	(P)	BFLARE	FLARE	1: ACTIVE	0
CDM	1	6	(P)	BPTCHGA	PITCH GO-AROUND MODE	1: ACTIVE	0
CDM	1	7	(P)	BPTCHTD	PITCH TAKE OFF MODE	1: ACTIVE	0
CDM	1	9	(P)	BWACH	MACH HOLD MODE	1: ACTIVE	0
CDM	1	13	(P)	BVDRSEL	NAV SELECTOR DN VDR	1: VDR SELECTE	0
CDM	1	14	(P)	BSPD	SPEED MODE	1: ACTIVE	1

Interface snapshot decoding

PMAT is easy to use

The PMAT comprises a laptop PC, a cable and a connector that can be plugged into the MTP front face to directly dump the BITE (hexadecimal coded data) for each of the FCC, FAC or TCC command (COM) or monitor (MON) channels. This dump is normally for the maintenance/engineering of operators, but can also be used by Airbus Customer Services Engineering and Thales Avionics support for supporting analysis.

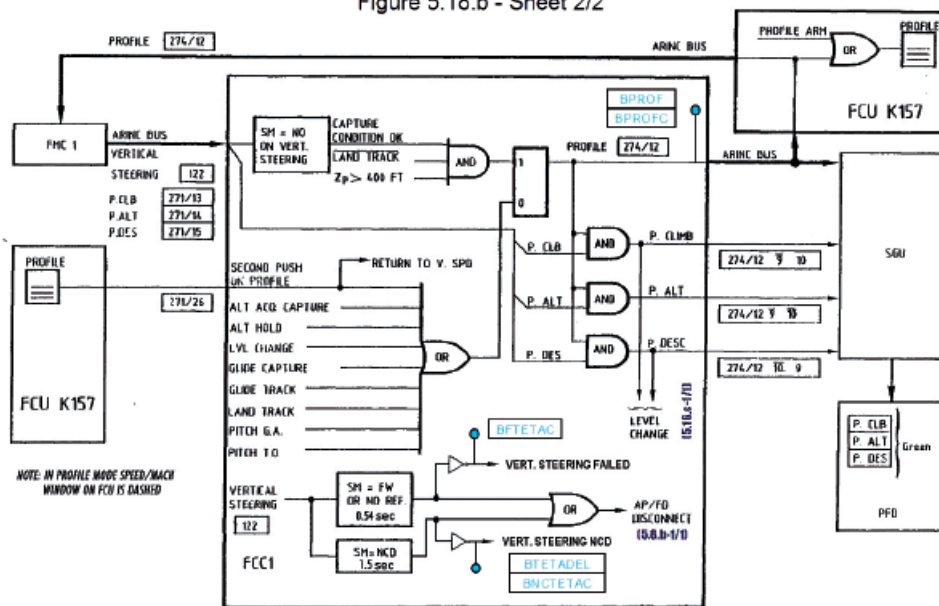
When data is dumped, software in the PMAT is used to analyse the numerous hexadecimal or binary BITE snapshots. This software is called Thales Troubleshooting data Translating Tool -ST³- and has been developed to handle (entry/consulting) and decode BITE dump snapshots from A310/A300-600 aircraft.

Interface logic drawing

5.18.b - PROFILE Mode Engage Logic : (Cont'd)

INHIBITED ON A300-600ST

Figure 5.18.b - Sheet 2/2



The software extracts the results of BITE records for the last 62 legs performed by the aircraft. The status of each logic point monitored by the BITE is displayed in binary format. Each point that is declared 'false' (not operative) is highlighted as well as other points of logic.

To complete the analysis, the PMAT provides plain English information, and even logic drawings of the subject computers. This information can be directly used by line maintenance to focus its investigation on the origin of the failure.



► A300/A310/A300-600

The PMAT is manufactured by Thales Avionics in collaboration with TechSAT. To purchase or loan it operators must contact Thales Avionics directly who will supply either the Troubleshooting Data Translating Tool (ST³) to install on a PC, or the PMAT ready to use (Laptop + software installed). Contact addresses are as follows:

**Technical Support Manager
Thales Avionics Aerospace**

Services Worldwide

18, avenue du Maréchal Juin
BP 49

92362 Meudon-la-Forêt
CEDEX FRANCE

Email :

michel.dalicious@fr.thalesgroup.com

And...

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Conclusion

To provide assistance during complex troubleshooting the PMAT has been developed to supply advanced technical information for AFS investigation. The tool is easy to use and has proved its efficiency in numerous cases in service and furthermore has allowed fixes to be found for recurring issues that have existed over periods of several months.

The PMAT is well suited as an element of the Long Term Support that Airbus is providing for the A300/A310 Family to ensure that the level of support for these aircraft is as good as that of the other Airbus aircraft families (see FAST Special A300/A310 Family April 2008). The PMAT is referenced in the Aircraft Maintenance Manual and can be purchased by contacting Thales Avionics.

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Future Air Traffic Management

A step change in aviation's efficiency, safety and environmental impact

Nobody will have failed to notice the accelerating drive to attain greater efficiency in the airline industry challenged by increased air traffic, oil price rises and environmental concerns. Regional fragmentation and the limitations of the current Air Traffic Management (ATM) system represent a

major obstacle for more efficient operations today, and sustainable growth of air transport tomorrow. This article explains the current and future situation for ATM, SESAR and NextGen and Airbus solutions to enable operators to comply with and benefit from future ATM requirements.



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ATM development programmes have been established, such as SESAR (Single European Sky ATM Research) in Europe and NextGen in the USA. They are aiming to provide effective solutions that can meet the widely agreed performance targets, in particular for eco-efficiency and significant cost reductions, as well as further enhanced safety levels on a global scale. How can a potential double or triple increase of traffic by 2020 (see figure 1) be managed when major airports already suffer from congestion today due to inefficient processes and outdated infrastructure? The renewal of the ATM system and the introduction of a new operational concept are mandatory to maintain seamless air transport.

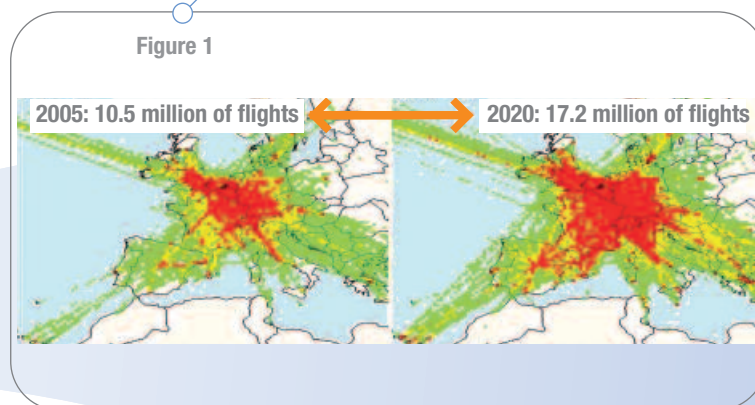
To ensure interoperability of new implementations on a global scale, ICAO (International Civil Aviation Organization) can play an important role in making sure that what is being agreed upon in SESAR and NextGen can be extended globally by being relayed on to other regional ATM development and deployment initiatives that are under way, for example, in India, China, and the Middle East. The success of all these ATM programmes is essential for operators and for Airbus, with a direct effect on performance requirements. Therefore, Airbus is anticipating the future of ATM in the design of new aircraft. In addition, to provide full benefit to operators, Airbus has and will continue to invest in the design of high-performance retrofit solutions for its in-service fleet.

Airbus ATM vision

ATM will evolve towards network-centric operations with a complete air-ground integration. The new operational concept will be centred on the execution of a commonly agreed 4D trajectory (four-dimensional trajectory including time) with minimum ATC (Air Traffic Control) constraints, which is shared amongst stakeholders through System Wide Information Management (SWIM). Operators of Airbus aircraft will fully take advantage of this concept through enhanced Communication, Navigation and Surveillance (CNS) capabilities onboard the aircraft around the following three axes:

- ▶ **More precise and optimized aircraft navigation** - the ability to fly more efficient 3D (three-dimensional) and finally 4D (including time dimension) profiles with increased precision and performance accuracy,
- ▶ **More autonomous aircraft** and further reduction of risks - the ability to operate more independently of ground infrastructures, in lower equipped airspaces and remote airports, and with increasing situation awareness, in dense traffic areas and under all weather conditions,
- ▶ **More communicative aircraft** - the ability to participate increasingly in collaborative decision-making (CMD) with airport and airline operations as an integrated part of the ATM network.

Airspace congestion in Europe in 2005 and forecast by 2020



What are SESAR and NextGen?

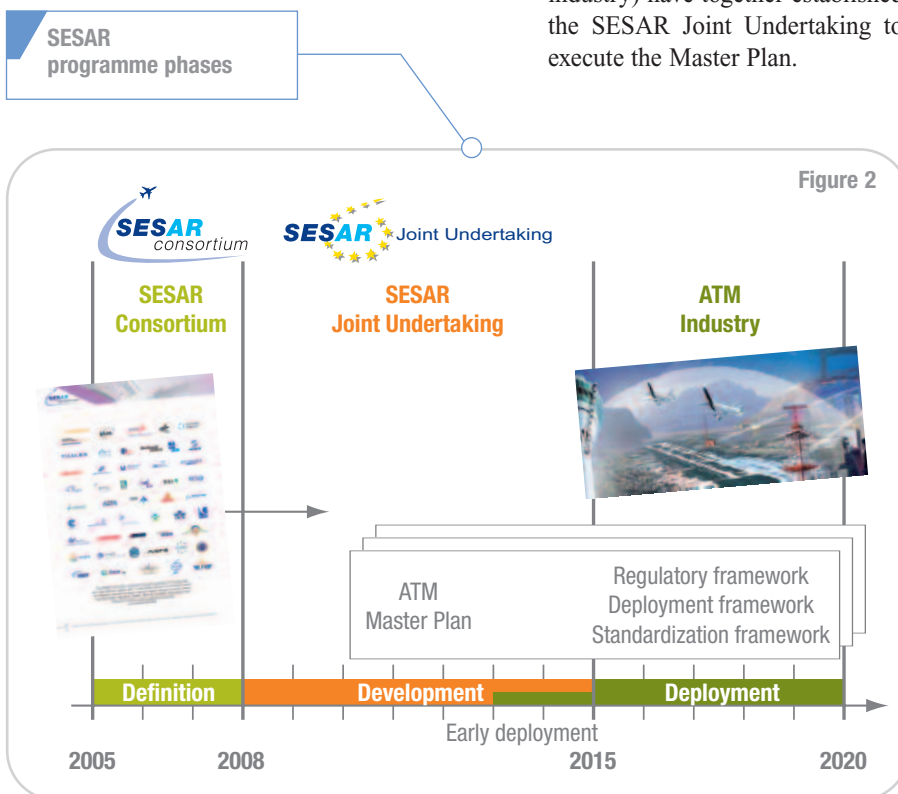
Both SESAR and NextGen are ATM development initiatives targeting a wide-ranging transformation of today's aviation in safety, capacity, and environment. There is a great deal of commonality between the NextGen and SESAR goals and the respective target concepts. Airbus is completely committed to transatlantic cooperation on ATM. Nevertheless, the approaches and funding schemes remain different. Whereas NextGen is focussing on purchasing and the step-wise rollout of specific technologies, SESAR is based on the implementation of a new operational concept following an overall agreed Master Plan (MP). In the USA, the Joint Programme Development Office, including the FAA (Federal Aviation Agency), is the leader for NextGen. In Europe, the European Commission, Eurocontrol, and the ATM industry (airspace users, Air Navigation Service Providers -ANSP-, airports, manufacturers and supply industry) have together established the SESAR Joint Undertaking to execute the Master Plan.

SESAR concentrates all European development efforts and funding into one organization, the SESAR Joint Undertaking (SJU), of which Airbus is a founding member. The development work started in 2008 under the responsibility of SJU executing the Master Plan agreed by all ATM stakeholders. SESAR has been organized in three phases: The Definition, Development, and Deployment phases (see figure 2).

The Master Plan is the result of a two-year definition phase completed in March 2008 that involved members of the entire air transport community in the SESAR consortium. It was composed of 29 companies/organizations and 21 associated partners (airspace users, air navigation service providers, airports, supply industry and staff associations). Airbus was one of the key players heading the consortium's project directorate in charge of coordinating the work of all companies and partners involved in the project.

Airbus will remain a key player in the subsequent development and deployment phases and will provide the necessary R&D (Research and Development) for new aircraft ATM capabilities. In addition, Airbus has been selected by the SJU to perform the Industrial Support function of the programme development phase. This function involves provision of a common systems-engineering framework for all partners and management of technical consistency at system-of-system level (integrating all systems throughout the ATM value chain, which includes the aircraft being part of a network exchanging data with ground systems, satellites, and other aircraft).

SESAR has the full support of the European parliament and council; therefore, if necessary to reach the expected targets, it may be decided to impose implementation through mandates (some are already scheduled for Implementation Package IP1).



However, it is widely recognized on both sides of the Atlantic that appropriate incentive schemes and an associated policy for early equipment installation should be developed to secure necessary investments.

To reach the new ATM capability levels required to accommodate the expected traffic growth and to meet agreed performance targets, SESAR foresees a stepwise deployment approach with three Implementation Packages (IP1 to IP3) over the next decade (see figure 3):

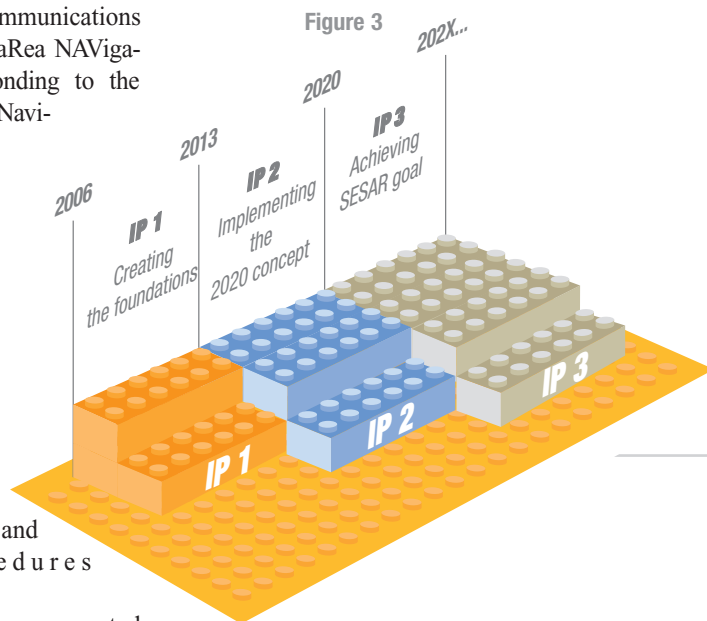
- IP1: From now until 2013 is building on the ongoing European ATM initiatives creating the basis and foundations of the ATM vision,
- IP2: 2013-2019 will deliver a wide information sharing environment, the driver for improved efficiency of the ATM network,
- IP3: 2020-202X will introduce the most advanced features of the SESAR Concept of Operation, aiming to achieve the SESAR performance goals in the long term. The longer term goals of SESAR comprise: Enable three times the capacity, cut cost by two, enhance safety levels by factor ten, and minimize environmental impact of flights up to minus ten percent compared to the 2005 baseline.

Level 1 will be reached with completion of IP1 realizing the baseline for future evolutions with Controller Pilot Data-Link Communications (CPDLC), Precision aRea NAVigation (PRNAV) responding to the respective Required Navigation Performance (RNP), Ground Based Augmentation System (GBAS) for CAT I operations, and improved Airborne Traffic Situational Awareness (ATSAW) providing benefits for SURface (SURF), Visual Separation in Approach (VSA), and In-Trail-Procedures (ITP) operations.

Levels 2 and 3 are expected to be realized with completion of IP2 by 2020 including improved aircraft-airport communications using high speed wireless gate links (WiMax), higher precision with Satellite Based Augmentation System (SBAS), and more autonomy using an Airborne Separation Assistance System (ASAS) for spacing between aircraft. It will see the first applications based on shared 4D trajectories as well as improved GBAS allowing for CAT II and III operations. After 2020, IP3 will finally deliver level 4 & 5 capabilities. They will bring operations based on full 4D contracts and enable ASAS self-separation.

SESAR Implementation Packages schedule

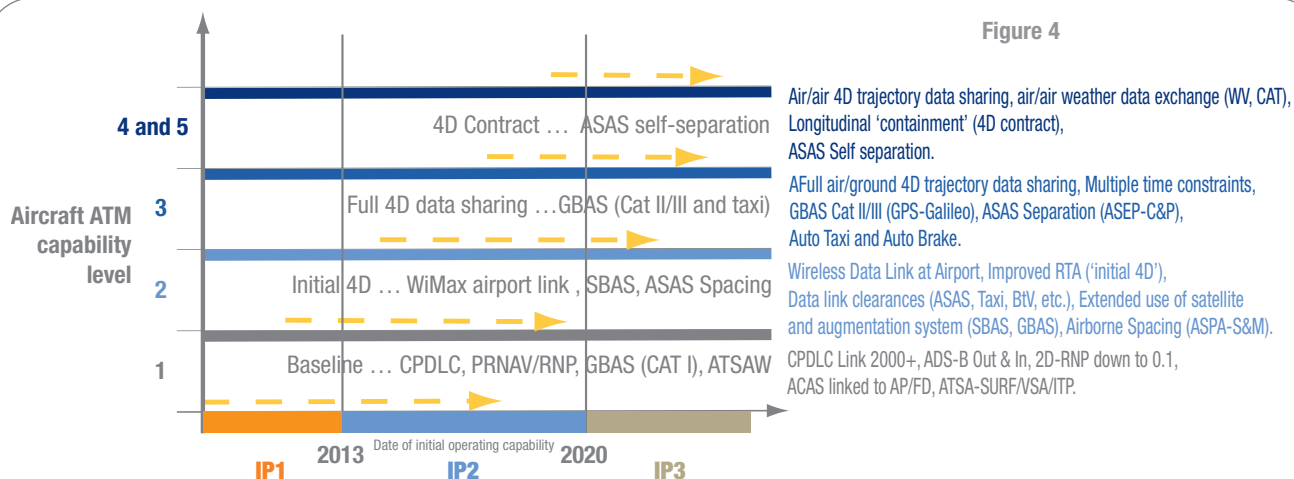
Figure 3



▶ Figure 4 shows how, with each subsequent IP, aircraft operations will benefit from increased ATM capability levels.

ATM development roadmap

Figure 4



What are the key benefits of SESAR?

The first Implementation Package (IP1) will create the foundation for the two following packages. It builds on the ongoing European ATM initiatives and serves as the basis for trajectory based operations.

IP1 is centred on reducing environmental impact and increasing ATM performance, providing benefits (including safety) for all concerned parties.

By contributing in several ways to environmental protection, SESAR can be considered as an eco-efficient project. Environmental benefits provide reductions of noise, decreased emissions and lower fuel burn thanks to optimized flight profiles, more direct routing, holding pattern avoidance, plus efficient and safe ground operations (e.g. brake to vacate, reduced taxi time). The yearly savings achieved due to the anticipated changes are estimated at 12 million tons of CO₂ (Carbon Dioxide). These estimated CO₂ savings are for Europe only with the baseline 2005 and the target being achieved in 2020 after IP2 implementation, accompanying regulatory measures and the respective institutional reforms.

With IP1 and the subsequent IP2 implemented (i.e. the results of the development phase, which is under SJU responsibility), the 2020 European ATM system will be able to accommodate nearly 17 million flights per year, a 70% increase from 2005; in any case, delays could be reduced by 40% per flight on average. As a result, significant savings can be achieved in direct and indirect costs.

Finally, safety is a key driver for the SESAR programme. The change of the operational concept towards 4D trajectories will enable pre-deconflicting of flight plans. A fully integrated ATM network centric system will enable sharing of information among all ATM actors. This will help air transport to reach new safety levels compliant with future requirements. It is obvious that any capacity increase has to be coupled with an appropriate level of safety. Each implementation package provides positive contributions to these extended safety targets.

Consequences for operators

As SESAR is backed by all stakeholders and has full political support through Single European Sky (SES) legislation, it is expected to result in a large scale and properly synchronized implementation, hence justifying the general adaptation of operators' fleets worldwide to reap the identified benefits at the earliest opportunity. All SESAR phases are profitable for the commercial airspace users operating in Europe, when all necessary investments have been made, not only on the airside, but also for an efficient ATM ground infrastructure. Thus IP1 will be able to create early revenues with a positive Cumulated Discounted Net Cash Flow, (as shown in figure 5) mainly based on fuel savings and departure delay reductions (see figure 6). The expected significant reductions on user charges will be effective after full implementation. Other factors, unaccommodated traffic avoidance and low visibility savings are less important but complete the benefit's picture. These quick wins and early revenues are important to maintain a positive momentum for the next implementation steps and secure the global benefit targeted by SESAR.



As the IP1 phase is already running, its implementation needs to be considered by all operators at this early stage. Actions are required today and these actions are not limited to SESAR with its European scope only, but have respective correspondence on a global scale, thus synchronization and coordination with NextGen is engaged. The short-term functions associated with IP1 include:

- Improved communications through Air-Ground Data Link: ATN compliant CPDLC (Controller Pilot Data Link Communication),
- Improved navigation performance: RNP (Required Navigation Performance),
- Improved situation awareness: Air Traffic Situational Awareness (ATSAW)
- Improved airborne safety net: ACAS (Airborne Collision Avoidance System).

All of these functions are considered essential for implementation of the IP1 2013 mid term concept. To minimize aircraft downtimes operators are encouraged to plan well ahead and take the opportunity of scheduled aircraft downtime. An appropriate time to embody some required avionics is the 4C check. This maintenance check generally occurs, depending on the aircraft type, every five to six years.

Solutions provided by Airbus

Airbus responses to the European Commission invitation to support deployment of SESAR's first steps are:

- New aircraft like the A350 XWB will be 'SESAR ready' covering IP1 as well as initial IP2 and some provisions for IP3,
- For in-service aircraft Airbus offers corresponding solutions and can assist operators to keep pace in a timely and cost-effective manner.

Figure 5

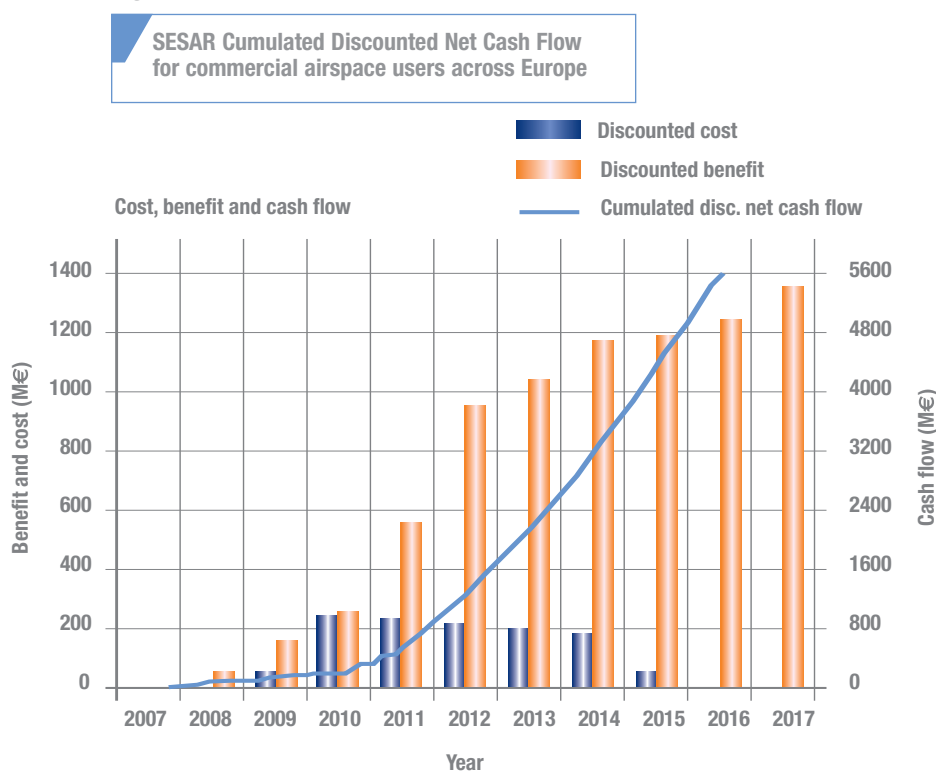
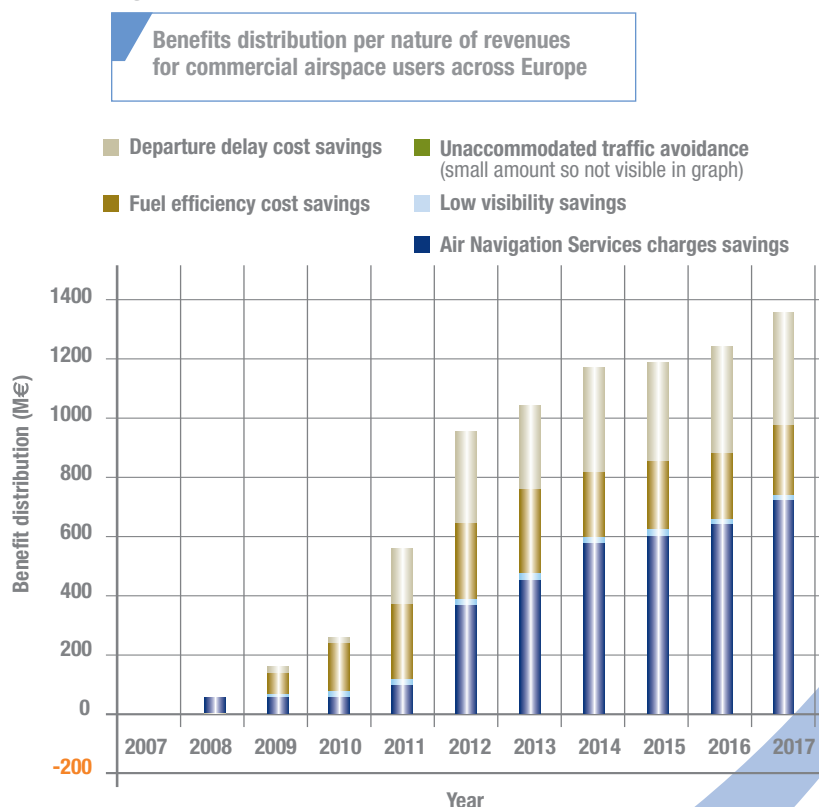


Figure 6



Upgrade solutions for Airbus aircraft

Airbus proposes a wide range of upgrade solutions to operators to retrofit their fleet. For the ATM changes ahead, the Airbus operator can choose to implement the following main airborne ATM solutions:

- FANS (Future Air Navigation Systems) flight deck upgrade,
- Performance-based navigation and high precision in approaches: P-RNAV up to RNP AR (AR means Authorization Required, also referred to as Special Aircrew & Aircraft Authorization Requirements -SAAAR-) with a potential navigation performance accuracy down to 0.1 Nm where necessary,
- ATSA-SURF (Aircraft Traffic Situational Awareness-Surface)/ATSA-VSA (Visual Separation in Approach)/ ATSA-ITP (In Trail Procedure) supported by ADS-B,
- ACAS linked to AP/FD (Auto Pilot/Flight Display).

FANS (FUTURE AIR NAVIGATION SYSTEM)

Provides the respective data link capabilities to the cockpit. It includes the implementation of new communication tools (data link processing and display). The replacement of voice communications by digital transmissions allows more efficient ATM and also reductions in communication errors, VHF congestion, and pilot/controller workloads.

FANS B is the Airbus solution to ATN compliant CPDLC Link 2000+ in areas of high congestion in Europe. It will be mandatory for new single aisle aircraft in 2011 and for all in-service single aisle aircraft in 2015.

FANS introduces two new main display components enabling viewing of all necessary additional information: ATSU (Air Traffic Service Unit) and DCDU (Data-link Control & Display Unit), plus additional information accessible through the Multipurpose-Control & Display-Unit (MCDU) (see figure 7).



FANS cockpit implementation

Figure 7



1 ATSU ATC attention getter

2 DCDU

A340 cockpit

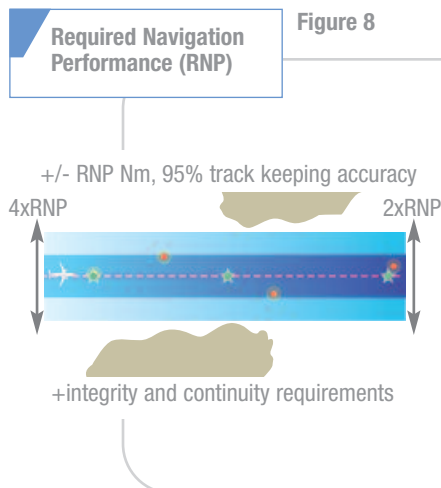
P-RNAV/RNP AR

Is an aircraft navigational capability that offers complete instrument-guided navigation. It allows operation of specific procedures/routes using the aircraft's autopilot and Flight Management System (FMS), in fully automated guidance mode. Thus, it keeps the aircraft trajectory within precise airspace containments (horizontal and vertical) as illustrated in figure 8.

This type of procedure is particularly suited to areas where operations are limited by terrain, infrastructure availability or airspace constraints (such as parallel, converging or adjacent airport operations). Flexible flight paths allow the aircraft to be flown around obstacles, or restricted noise areas, even on final approach, whilst keeping the most direct routing possible. P-RNAV/RNP AR provides real benefits in track miles and fuel savings at many airfields and major hubs. Additional fuel saving benefits are realized when RNP AR is combined with Continuous Descent Approaches (CDA). All Airbus aircraft equipped with FMS2 and GPS (Global Positioning System) can fly P-RNAV/RNP approaches and the respective required procedures.

ADS-B

Is a technology where the aircraft broadcasts position, altitude, velocity and other parameters automatically. It includes surveillance, like radar, but offers more precision and additional services, such as weather and traffic information. ADS-B requires the equipment with adequate transponders (Mode S 1090 MHz). In return, ADS-B provides air traffic controllers and pilots with much more accurate information to help keep aircraft safely separated in the sky and on runways.



Today, the ADS-B Out function is certified for all Airbus aircraft. ADS-B Out will become mandatory very soon and is necessary to be SESAR IP1 compliant. In the next step (starting 2009), Airbus will certify ADS-B In, bringing additional benefits to Airbus operators allowing them to receive and display traffic information onboard as shown in figure 9.

ATSAW (THE AIRBUS SOLUTION TO ADS-B IN)

Enhances the flight crews' knowledge of the surrounding traffic situation, both in the air and on the airport surface. It improves operational flexibility, increasing the airspace capacity and ensuring flight safety. Three ATSAW applications provide significant benefits:

- Application 1 (ITP): Enhanced flight level change (ATSAW combined with CPDLC) will allow reducing longitudinal separation to 20 Nm (compared to 80 Nm today) when changing flight levels during In-Trail-Procedures in oceanic airspace,
- Application 2 (VSA): Enhanced visual separation in approach,
- Application 3 (SURF): Enhanced traffic situational awareness on the airport surface.

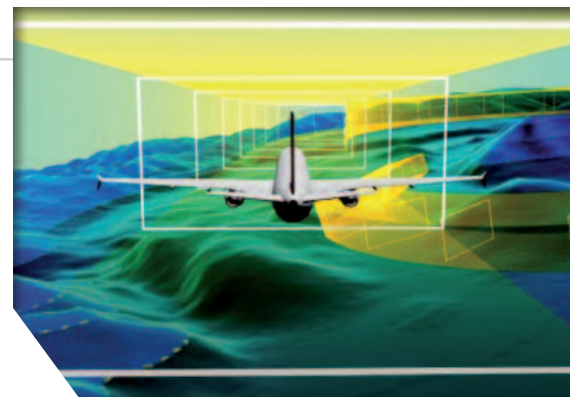


Figure 9

ADS-B In and Out principle

Air Traffic Situation Awareness (ATSAW)

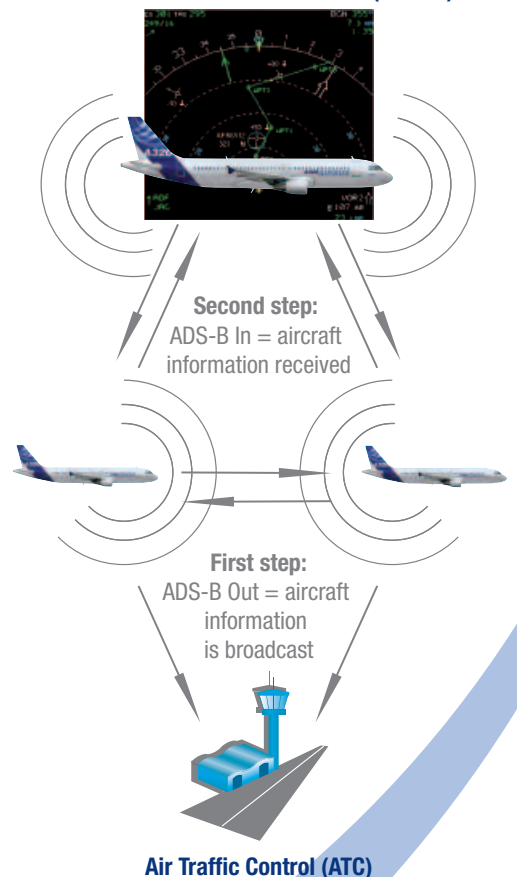


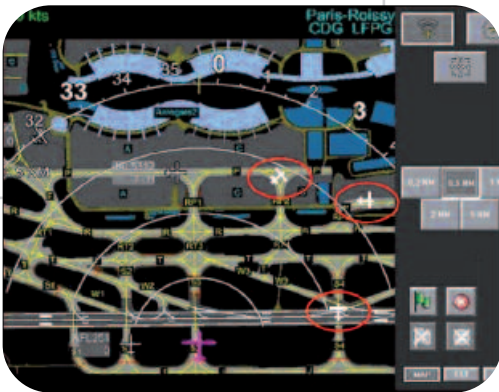
Figure 10

Cockpit Display Traffic Information (CDTI)



Figure 11

Moving Map with traffic information



The principle is to permanently provide updated traffic information received via ADS-B In. The main traffic information is the position, direction, relative altitude and vertical speed tendency of the aircraft. This information is presented to the pilot using the Cockpit Display Traffic Information (CDTI) screen. Figure 10 shows an example of VSA (whereas in general a full circle instead of the arc will be displayed for ITP).

ATSAW SURF is used to improve safety at airports. Here, aircraft and vehicles information is displayed on an airport moving map (see figure 11). This application will be very useful in high density areas and applicable on runways and taxiways to anticipate risk of collision.

A cost effective solution for the A320 Family

As SESAR targets the European airspace at 2020, many of the A320 Family will be concerned. With IP1, the implementation phase has already started, thus it is time for operators to consider making their fleet ready for the next generation of ATM.

Airbus ready-made In-Service Enhancement Package (ISEP) provides the key elements for an

avionics foundation for A320 Family aircraft to bring those needing it to current-day standards. By serving as a platform for the above-mentioned functions, ISEP bridges the gap in capability and performance. It was specifically designed as an 'all inclusive' package with cost savings, revenue generation and environmental aspects in mind. As such, it not only helps Airbus operators to align with the SESAR IP1 requirements but it also enables further benefits in the airlines' everyday business.

Figure 12 gives an overview of all the ISEP components and functions.

For the time being:

- ADS-B Out and FANS B are fully certified for the A320 Family,
- RNP AR is certified to 0.1 Nm in approach. Missed approach and departure figures will be confirmed in 2009,
- The certification for ATSAW in flight is expected in mid 2009.

By implementing the ISEP core package, operators can not only profit from performance benefits directly linked to the SESAR IP1 requirements but they can also achieve important benefits in safety, security, environmental aspects and economy.





Figure 12

ISEP components

- 2 x FMS2 (Flight Management System second generation)
- 2 x MCDU LCD (Multi-Purpose Control Display Unit Liquid Crystal Display)
- 2 x MMR ((Multi Mode Receiver) (ILS + GPS))
- 3 x ADIRU (Air Data Inertial Reference Unit)
- 6 x EIS2 (Electronic Information System) LCD
- GPS antennas
- ATC EHS (Air Traffic Control Enhanced Surveillance)
- ATSU (Air Traffic Services Unit)
- VDL mode 2 (VHF Data Link mode 2, which enables faster transmission of data)
- DMC (Display Management Computer)
- 2 x DCDU (Data Communication Display Unit)
 - ISIS (integrated Standby Instrument System)
 - FDIU ((Flight Data Interface Management Unit) (replaces FDIU + DMU))
 - CFDIU (Centralized Fault Display Interface Unit)

- Components for low RNP
- Components for FANS B
- Components for ATSAW

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Conclusion

The combined effects of airspace congestion, environmental concerns and fuel prices are drivers recognized by different initiatives worldwide and in particular by the SESAR and NextGen programmes. Airbus is preparing for the future of ATM with the entry into service of new aircraft and provision of high-performance upgrades for in-service aircraft. Airbus Upgrade Services is fully committed to ensuring that solutions are available in time to allow airlines to align with the requirements of today

and the future. With solutions such as RNP AR allowing reduced track miles, it can provide operators with the means to realize fuel savings, thereby reducing costs and emissions. Air Traffic will grow further and efficient ATC communications are key for safe operations in crowded airspace. This is recognized by the requirement for CPDLC Link 2000+ (FANS) and ADS-B. To enable timely installation, now is the time for operators to consider scheduling of embodiment to maximize the benefits associated with these initiatives.



C@DETS

Computer @ssisted Documentation Education Tutorial System

New improvements to the self-tutorial courseware for familiarizing users with Airbus maintenance and engineering Technical Data

C@DETS (Computer @ssisted Documentation Education Tutorial System) was first introduced in 1995 to support Airbus customers' efforts to:

- Train their staff in the efficient use of maintenance and engineering technical data,
- Increase the efficiency of their maintenance activities.

Since C@DETS introduction thirteen years ago, Airbus Technical Data has undergone tremendous advances in the way technical data is supplied to Airbus operators. Paper and microfilm have been replaced by digital documentation and the use of AirN@v Family allows advanced navigation and hyper-linking. These advances in technical data delivery to Airbus operators have generated a need

to train end users in its application, even if the structure of the technical data manuals remains the same. To promote, support and facilitate Airbus operators in the task of familiarizing personnel involved in aircraft maintenance and associated activities with the advances in technical data, Airbus re-designed and produced a new version of the computer based tutorial system C@DETS, which was introduced at the end of 2006. Since this introduction C@DETS has been improved with new functionalities. This article advises on C@DETS availability within Airbus operator maintenance and engineering organizations and explains the new functionalities of the latest version.



Boris PLOTEAU
 Technical Data
 Airbus Customer Services

Description

C@DETS provides a series of self-explanatory modules describing the philosophy and content of each technical data manual.

Animations make the modules user friendly and audio messages help the trainee to understand the content of each slide.

The module shows in easy steps how to navigate within and between manuals (see figure).

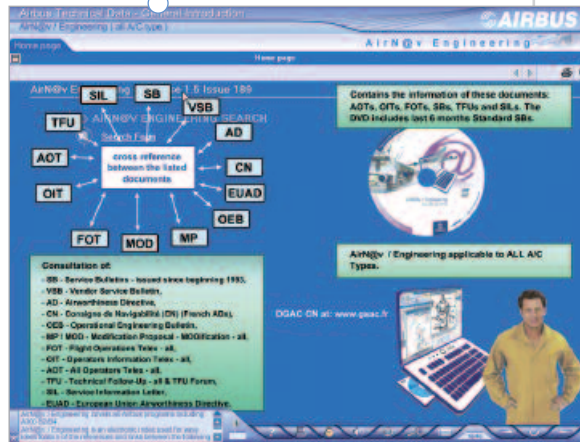
C@DETS has been developed in association with the Airbus training department, providing commonality of user interface and an identical approach to training. Some C@DETS modules are integrated in Airbus training department courses.

For example, the FIN (Functional Item Number) module is included in the A380 General Familiarization course. The list of manuals module is included in the A320 family, A330 and A340 maintenance training courses.

The courseware is applicable to all Airbus aircraft. Major differences between aircraft types are highlighted where applicable.

All C@DETS modules dealing with AirN@v Family products have the same AirN@v 'look and feel' (see example in figure).

Technical Data general introduction module



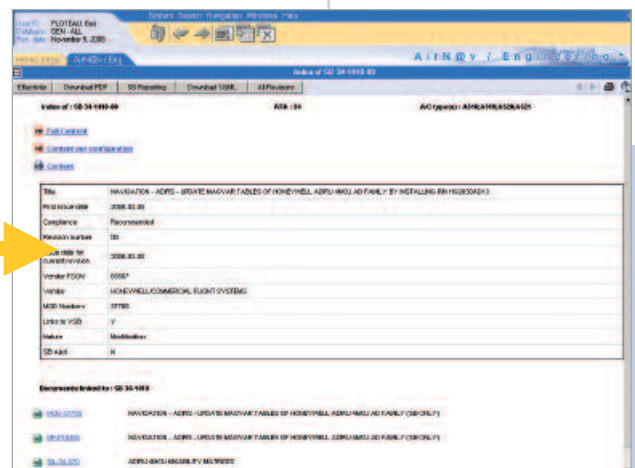
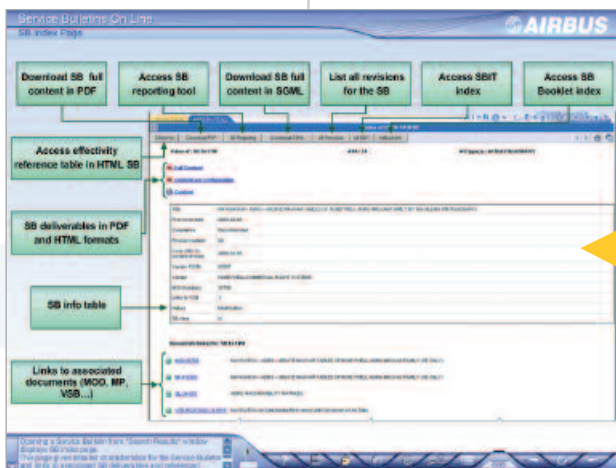
C@DETS covers the following main topics:

- ▶ General information on Airbus Technical Data.
- ▶ AirN@v family products.
- ▶ Maintenance manuals:
 - Aircraft Maintenance Manual (AMM),
 - Illustrated Parts Catalog (IPC),
 - Power Plant Illustrated Parts Catalog (PIPC),
 - Trouble Shooting Manual (TSM),

- Wiring Diagram Manual (WDM),
- Aircraft Schematic Manual (ASM),
- Aircraft Wiring Manual (AWM),
- Aircraft Wiring List (AWL),
- Electrical Standard Practices Manual (ESPM).
- ▶ Repair manuals:
 - Structural Repair Manual (SRM).

- ▶ Engineering manuals:
 - Technical Follow-Up (TFU) and Service Information Letter (SIL),
 - Service Bulletin (SB),
 - Drawings.
- ▶ Shop manuals:
 - Component Maintenance Manual (CMM).
- ▶ Operational manuals:
 - Master Minimum Equipment List (M MEL),
 - Configuration Deviation List (CDL).

C@DETS Service Bulletin on-line module versus AirN@v / Engineering



Features

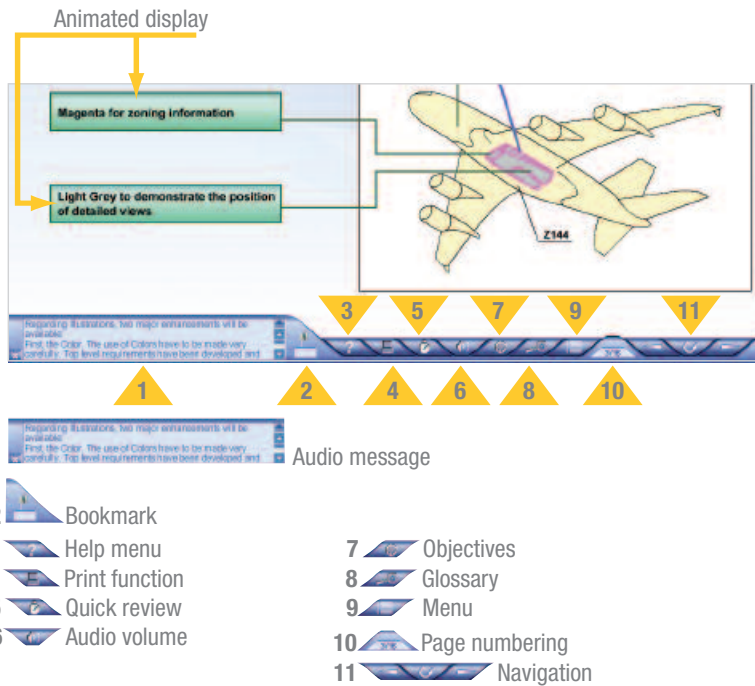
C@DETS courseware uses the latest web technology and comes with features such as:

- Being AirN@v Family oriented, C@DETS reflects the latest AirN@v features,
- User-friendly including help function. No specific training is needed to use C@DETS,
- Direct access to each specific training module from its home page. The trainee can select the module they want to perform,

- Offers 'stand-alone' and 'stand-up' teaching modes. In stand-up mode, an instructor can present the modules,
- Audio messages. The audio messages help the trainee to understand the slides,
- Print capability by module or page,
- Possibility to add personal notes on printed pages,
- Glossary of terms.

The following screenshot shows the main possibilities to navigate within a module.

Description of the C@DETS icons



► **AirN@v Family** is the standard solution for advanced consultation of Airbus Maintenance & Engineering technical data, as delivered by Airbus. It includes six data packages: Maintenance, Engineering, Repair, Workshop, Planning and Associated Data.



Where can C@DETS be found?

It is available on-line in AirbusWorld and off-line on CD-ROM.

The CD-ROM is revised one time per year. It is part of the Airbus Technical Data package delivered to the Airbus operator.

The access on AirbusWorld enables the Airbus operator to have the latest evolution of C@DETS between two CD-ROM revisions. C@DETS modules can be downloaded from AirbusWorld.

AIRBUSWORLD

DIRECT ACCESS

The courseware is available on AirbusWorld from the portlet: My On-Line service.

ACCESS FROM THE MAINTENANCE AND ENGINEERING COMMUNITY

Some C@DETS modules are accessible from the pages of the Maintenance & Engineering community in AirbusWorld.

This allows direct access to appropriate information in Airbus manuals through C@DETS in the context of given airline business processes.

For example, from the community Maintenance and Engineering – Perform line maintenance on aircraft, access is available to the MMEL (Master Minimum Equipment List) and the C@DETS MMEL/CDL (Configuration Deviation List) module that shows how to use these manuals.

C@DETS is also available from the documentation centre of the Maintenance and Engineering community.



C@DETS home page on AirbusWorld



Download

My on-line services

Direct access to the module

Link to C@DETS module from Maintenance and Engineering community



Link to C@DETS MMEL/CDL module

Access to C@DETS via Maintenance and Engineering documentation centre



C@DETS

► **AirbusWorld Maintenance and Engineering community** Introduced end of March 2008, this community on AirbusWorld enables users to navigate quickly and easily in accessing

information, documentation and services, which are organized by business process; in line with airlines' maintenance & engineering activities.

C@DETS CD-ROM



C@DETS Learning Management System



The modules visited are shown with an eye

CD-ROM

The C@DETS CD-ROM has an auto run function that automatically launches the Home page.

In addition, the CD-ROM includes a .txt file that explains how to install all the C@DETS modules on a server or computer.

The module layout in the CD-ROM is exactly the same as AirbusWorld, except that the LMS (Learning Management System) is only available on the CD-ROM.

The LMS permits end-users to see quickly which modules they have visited.

They can also reset the follow-up tracking or keep it until the next use of the courseware.

Future

Airbus plans to integrate C@DETS in the new Airbus e-learning library within the coming year.

This integration will bring more commonalities between Airbus e-learning tools and will allow C@DETS to use the latest e-learning technologies. C@DETS will be also located in the same platform as other Airbus training courseware.

► **Airbus e-Learning Library**

This new library provides Web-Based Training (WBT) to customers, to give them access to an efficient self-learning solution. This is the first step of a larger e-Learning project, which ensures a good knowledge to everyone requiring it, at their own time and place. This e-Learning Library is currently open to some Airbus operators as a pilot phase.



► **Glossary:**

AD: Airworthiness Directive

AMM: Aircraft Maintenance Manual

AOT: All Operator Telex

ASM: Aircraft Schematic Manual

AWL: Aircraft Wiring List

AWM: Aircraft Wiring Manual

C@DETS: Computer @ssisted Documentation
Education Tutorial System

CDL: Configuration Deviation List

CMmm: Component Maintenance Manual (manufacturer)

CML: Consumable Material List

CN: Consigne de Navigabilité

DFPRM: Duct and Fuel Pipe Repair Manual

ESPM: Electrical Standard Practices Manual

FIN: Functional item Number

FOT: Flight Operator Telex

IPC: Illustrated Parts Catalog

LMS: Learning Management System

MMEL: Master Minimum Equipment List

MOD: Modification

MP: Modification Proposal

MPD: Maintenance Planning Document

NTM: Non-destructive Testing Manual

OIT: Operator Information Telex

PIPC: Power plant Illustrated Parts Catalog

SB: Service Bulletin

SIL: Service Information Letter

SM: Standards Manual

SRM: Structural Repair Manual

TEM: Tool & Equipment Manual

TFU: Technical Follow Up

TSM: Trouble Shooting Manual

VSB: Vendor Service Bulletin



Conclusion

C@DETS is a self-tutorial courseware on Airbus Technical Data. It was created in 1995 to give the possibility to train Airbus operator staff involved in aircraft maintenance & engineering and associated activities in the use of Airbus Technical Data. With the replacement of the paper/microfilm format by digital data, Airbus re-designed C@DETS to cover the latest software technology, such as AirN@v Family products. C@DETS is fully in line with all the current manuals and software provided in the Airbus technical data package.

The creation and evolution of C@DETS has enabled Airbus operators to train their staff (in classroom or in self-tutorial mode) to efficiently use the improved and enhanced AirN@v Family products and all the maintenance and engineering manuals for all Airbus aircraft. C@DETS evolution continues and its future integration in the new Airbus e-learning concept will enable enhanced functions to better manage the Technical Data training of Airbus operator staff.

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FAIR



(Forum with Airlines for Interactive Resolution)



Initial experience from the FAIR-OPS on-line forum

Increasing airlines and Airbus collaboration on the in-service fleet's flight operations issues

The size of the Airbus fleet in-service has dramatically increased in recent years and a huge amount of experience is accumulating from more than 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, which meet customers' expectations, to these key issues?

These are the main questions that led Airbus to launch a new service called FAIR (Forum with Airlines for Interactive Resolution). The first module of FAIR was for in-service problems (FAIR-ISP, see FAST 40 July 2007). Additional modules have been added to FAIR with one for the A350 XWB and one for flight operations information sharing and issues (FAIR-OPS). This article explains the status of FAIR-OPS and the benefits it offers to airlines.



Captain Michel BRANDT
Airbus FAIR-OPS co-chairman
Test Pilot
Flight Operations Support & Services
Airbus Customer Services



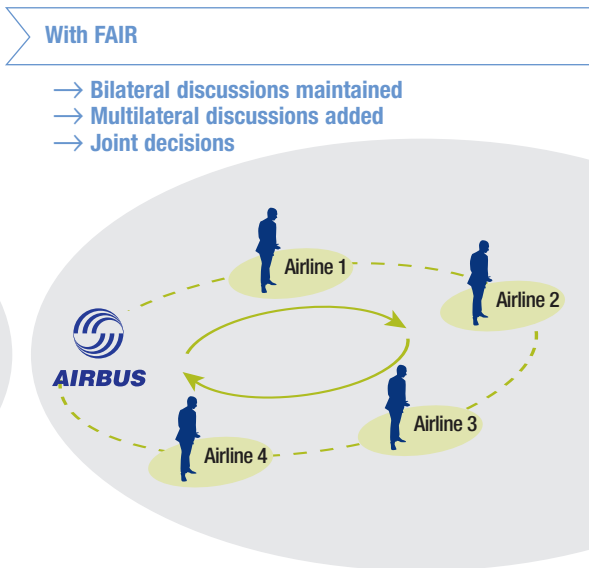
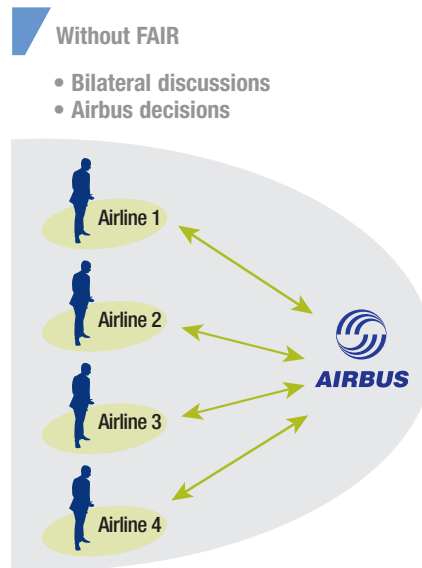
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Flight Operations Support & Services
Airbus Customer Services

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, to define the required go-forward plans.

The first FAIR forum Airbus developed was FAIR-ISP (In-Service Problems) for the Maintenance & Engineering domains. This was successfully deployed worldwide from December 2006, with more than 130 airlines connected.

Based on FAIR-ISP success, and further to strong airlines support, Airbus decided to develop FAIR-OPS for the Flight Operations & Training domains: 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 at the 15th Performance and Operations conference in April 2007, as well as during A320/A330/A340 Operational Liaison Meetings (OLM) in 2008.

Similarly to FAIR-ISP, FAIR-OPS enhances collaboration between the airlines and Airbus for the identification, evaluation, prioritization and, resolution of Flight Operations Issues (see definitions next page)

► After a six-month development with 16 airlines and an on-going 6 month pilot phase with up to 27 airlines (22nd October 2008), FAIR-OPS is planned to be deployed to the worldwide fleet in 2009. It has already met with great success during the pilot phase among the first operators using the service.

FAIR: Other FAIR forums dedicated to various support and services

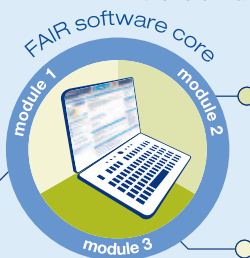
In addition to FAIR-OPS, two other forums currently exist.

FAIR-ISP (In-Service Problems), a forum for the Maintenance & Engineering domains, has met with great success since its worldwide deployment in December 2006. More than 130 airlines are connected, sharing more than 2,500 contributions on the FAIR-ISP forum, with more than 400 In-Service Problems (ISP) identified by the airlines. More than 9% of these ISPs went on to be recognized as Major ISPs (MISPs). And with the airlines help, 25% of MISPs have had solutions developed and established.

Thanks to the airlines contribution, FAIR-ISP is maturing with an average time to close an ISP of 5 months over the last year of operation.

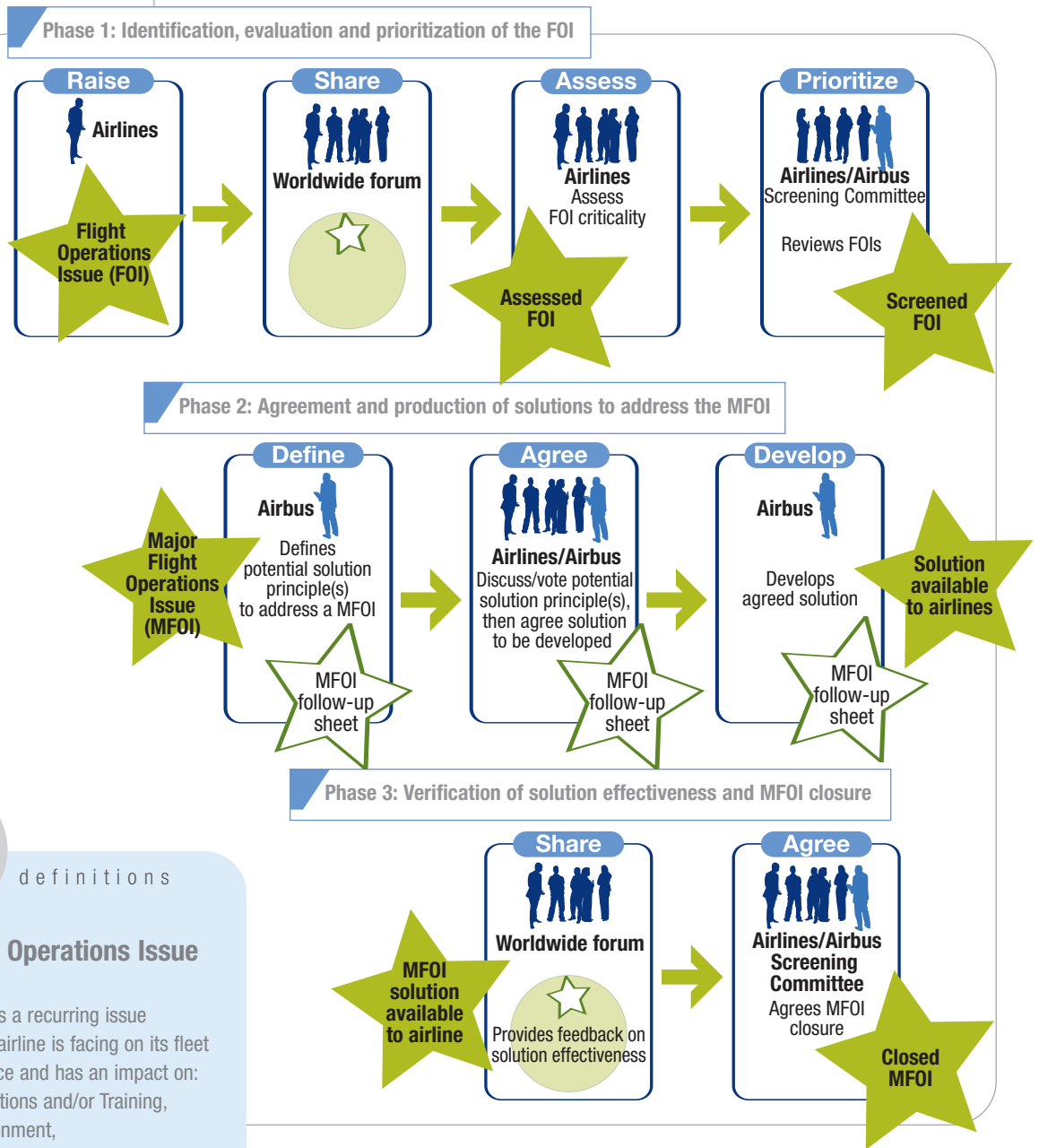
FAIR-A350 XWB is a forum that is dedicated to the Airbus A350 XWB development. It is aimed at further improving communication between A350 XWB firm customers and the Airbus A350 XWB development teams. To complement existing face-to-face A350 XWB progress reviews, and customer focus groups, the forum allows permanent exchanges.

FAIR-ISP up and running since Dec. 2006 (In-Service Problems)



FAIR-OPS Pilot Phase up and running since June 2008 (Flight Operations and Training) Full entry into service planned in 2009

FAIR-A350 up and running since Oct. 2007 (A350 XWB development)



d definitions

Flight Operations Issue FOI
 An FOI is a recurring issue that an airline is facing on its fleet in-service and has an impact on:

- Operations and/or Training,
- Environment,
- Economics,
- Airline image.

An FOI materializes with FAIR-OPS into an item that an airline will post on the on-line forum.

Major Flight Operations Issue MFOI
 A MFOI is a FOI that is classified as major because of significant impact on:

- Operations and/or Training,
- Environment,
- Economics,
- Airline image.

A subject is accepted as a MFOI by the FAIR-OPS Screening Committee.

The FAIR-OPS Process

As described previously, FAIR-OPS 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 FOI that one airline has identified is a major fleet issue, a Major Flight Operations Issue (MFOI), that needs to be resolved with a high priority (see definitions).

For this purpose, the FAIR-OPS process is split into three major collaboration phases, consisting of nine successive steps, each cov-

ering one part of the flight operations issue 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 MFOIs affecting the fleet in-service,
- Agree resolution of these MFOIs.

Roles and responsibilities

Four different roles have been defined among FAIR-OPS 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-OPS user. Reader/drafter access to the FAIR-OPS tool is controlled by the airline IT Administrator, the User Entity Administrator (UEA), who is also in charge of the AirbusWorld accounts for the airline. On airline management request, each airline UAE can create an unlimited number of FAIR-OPS reader/drafter accounts.

A FAIR-OPS 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 Flight Ops issues, comments on FOIs, replies to comments or assessments of FOIs.

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 opposite) of the airline. This draft process allows any Flight Operations, Training, or Flight Safety 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 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.

The Airbus FAIR administrator controls writers/validators access to the FAIR-OPS tool.

FAIR-OPS 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 Committee is the decision body of the FAIR-OPS process. It covers all in-service Airbus aircraft families (A300/A310, A320 Family, A330/A340 and A380) and consists of around 20 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 FOI, define FOI closure criteria, select and prioritize MFOIs, agree MFOI resolution and agree MFOIs closure. All Screening Committee decisions are based on airlines contributions (see definitions), and 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. Each Screening Committee is generally planned at least two months prior to the meeting to cope with pilot rostering constraints for some Screening Committee members.

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



definitions

Reader/drafter

Anyone who has access to FAIR-OPS can create a draft of contribution elements. The draft will be visible by all other readers/drafters of the airline.

Writer/validator

Two senior managers per airline can post contributing elements on FAIR-OPS. They can also delegate the FOI draft preparation to one of their readers/drafters, and validate their draft before posting it on the forum.

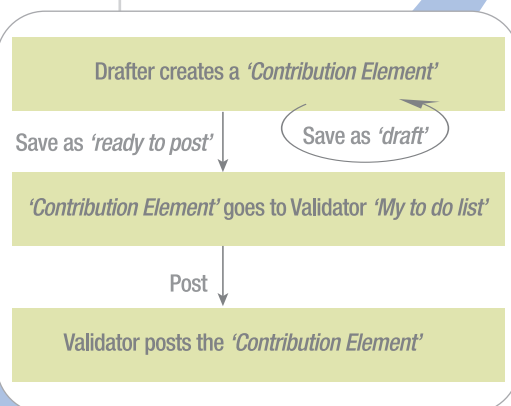
A contribution element

A contribution element may be:

- An FOI,
- A comment to an FOI,
- A reply to a comment,
- An assessment of an FOI.

► 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.

FAIR-OPS draft process



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-OPS community. Finally, the airline co-chairmen guarantee that the FAIR-OPS 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 backup co-chairman. The backup co-chairman is in turn replaced by a new backup, to be elected by the Screening Committee.

The FAIR software

FAIR has been designed by the airlines for the airlines and the FAIR-OPS tool benefits from the maturity acquired over the past two years of FAIR-ISP operations, the forum for Maintenance and Engineering.

The initial FAIR-OPS specification was worked upon in workshops with flight operations representatives from airlines already active with FAIR-ISP, and representing the fleet (geographical distribution, fleet and type of operation). They actively contributed to the customization of the FAIR-OPS tool interface to better address flight operations and training specificities.

This led to the specification of a web-based forum software, available on the AirbusWorld portal in the Flight Operations and Training communities.

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

- *All major functions* such as Raise, Contribute, 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, subjects (i.e. training, documentation, etc.),
- *Notification system*: Users are notified of new items matching their preferences. FAIR users can adjust the 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 FOI severity by filling and posting the impact assessment form,
- *Votes*: Users can voice their preferred proposed solution to a MFOI by submitting their vote,
- *Multi-criteria search*: Users can query the FAIR-OPS database with an advanced search engine combining raw text and list of values search.

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

FAIR-OPS Pilot phase status

The pilot phase has been running since June 2007 with a limited number of airline FAIR-OPS users, those who participated in the workshops for FAIR-OPS development. Its intent is to consolidate the tool and process for the flight operations and training community. Once the pilot phase airlines and Airbus have reached a consensus on the process/tool maturity (expected in 2009), the forum will be officially opened to the rest of the Airbus operators.

CONNECTION RAMP-UP

From September 2008, the FAIR-OPS forum has been gradually opened to any operators willing to actively participate in the pilot phase. The number of airlines connected since the official FAIR-OPS pilot opening in June 2008 has nearly doubled. This is evolving very quickly since September 2008 (27 airlines connected in mid October 2008).

FAIR-OPS is moving towards the success expected thanks to fruitful airline contributions. While still in a ramp-up phase, nevertheless, airline contributions keep on increasing.

The Airbus flying fleet is also well represented through a very balanced worldwide distribution of connected airlines.

FAIR-OPS SEMINAR OUTCOMES

The October 2008 FAIR seminar gathered the first FAIR-OPS pilot phase users in Toulouse. It enabled further fine-tuning of the process, drew the first lessons-learned of the pilot phase and prepared a successful entry into service.

The seminar showed that the majority of airlines connected to FAIR-OPS are mostly consulting the forum and only part of them are actively posting.

FAIR-OPS main page

To raise a new FOI, write a **comment** or perform an **assessment** on a selected FOI or MFOI.

The **selected item** may be a **FOI, MFOI** with its status

To **update** or **delete** an existing **draft** (FOI, comment/reply or assessment, depending on the selected item).

Access to whole discussion or **follow-up information** of selected item

To receive **real time email notification** of any new input being posted by other users on the selected FOI or MFOI.

To select a view of items or set the users settings or search specific items

Preview pane: Shows the content of the selected item (FOI, MFOI, comment/reply, assessment, etc...)

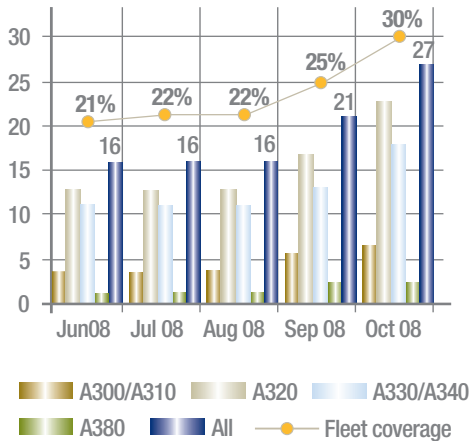
To **reply** to the selected comment

Therefore, Airbus encourages connected users to contribute more, and in particular to voice their opinion and share their experience on existing FOIs, so that Screening Committee decisions can be made better and faster.

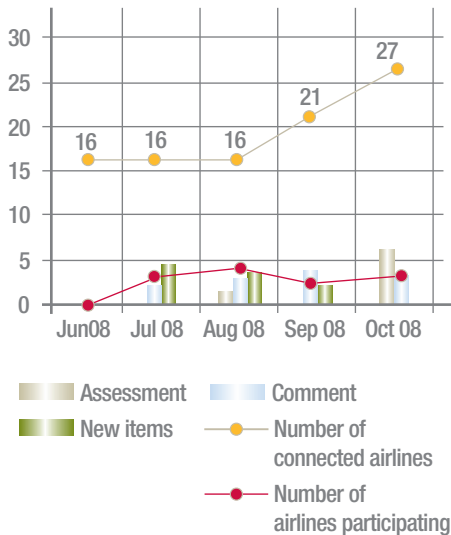
Airbus also invites all operators that have not yet joined the FAIR-OPS pilot phase community to request their connection (see how to get access to FAIR later) and nominate their writers/validators to post their contributions.

The tool interface is appreciated and considered as easy-to-use. Nonetheless, the first users requested an advanced training tool kit (step-by-step PowerPoint demonstration) easily accessible on the AirbusWorld website to rapidly promote the tool and FAIR process within their airline. This should also ensure faster contributions.

FAIR-OPS connected airlines



FAIR-OPS forum activity (Pilot phase)



WRITERS/VALIDATORS NOMINATION SET-UP

One of the lessons-learnt during the pilot phase was the difficulty for some airlines to nominate the different writers/validators and drafter/readers within their flight operations & training organizations. In some instances, it took several weeks up to three months to set-up an efficient FAIR-OPS process within the airline.

During the FAIR-OPS October 2008 workshop, airline first users considered that two writers/ validators per airline was manageable. However, they advised that the nominated writers/validators managers have a good overview of the major operational and training recurrent issue experienced by their airline. Depending on each airline organization, it might be the technical pilot of the operated aircraft type.

The second writer/validator could be the technical pilot of other aircraft types (if operated by the airline).

It could also be the flight operations engineering manager having a good overview of the issues affecting the dispatch/operational documentation/performance tools/ etc, and generally more available for continuous follow-up of the forum activity and validation of the FOIs drafted by their readers/drafters colleagues.

READERS/DRAFTERS NOMINATION SET-UP

The number of readers/drafters is unlimited within each airline. Nonetheless, to get started with FAIR-OPS, limiting the number of readers/drafters to management levels who have an overview of their fleet operations and most important issues concerning their domain of expertise, ensures that drafted items will be eligible for FAIR posting, and hence will ease writers/validators validation duty.

It also ensures an efficient flow of information to manage for the writers/validators, since they have to validate the 'Ready to post' FOI drafted by their readers/drafters colleagues, even if the tool interface is friendly enough to cope with it (specific 'ToDoList' view listing the pending action).

Forum activity

The number of posts in the forum has grown slowly in spite of the increasing number of connected operators. In early October 2008, nine FOIs in total were posted on the forum in less than four months for the three Airbus aircraft families, with 27 airlines connected.

However, very few comments were posted which does not allowed the first Screening Committee held in October 2008 during the FAIR seminar to firmly decide whether they were major or not.

However, of the nine FOIs, four were deemed as potential Major FOIs, which is encouraging and shows a good airline understanding of FAIR-OPS purpose. This should be confirmed in the coming months with the opening of the FAIR forum to all operators in 2009 and associated increasing contributions.

Airbus strongly encourages operators to participate actively in the FAIR-OPS discussions. 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-OPS

FAIR-OPS is accessible on Airbus World. The pre-requisites for access are:

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

The FAIR-OPS connection procedure is a two-step process:

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) who is in charge of the AirbusWorld accounts management. Contact your Airbus Regional Flight Operations Representative (RFOR) or 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-OPS to your organization. In case of access problems, contact your UEA.

STEP 2

▶ OBTAIN WRITER/VALIDATOR ACCESS

<p>Writer/validator access is limited to two senior managers per airline and is controlled by the Airbus FAIR administrator. The contact details of your airline writers/validators must be provided to your RFOR or CSD for transmission to the Airbus FAIR administrator.</p>	<p>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.</p>
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CONTACT DETAILS

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Conclusion

Since the opening of the FAIR-OPS pilot phase forum in June 2008, things are progressing quickly and very much in the direction expected. More than 27 operators have connected up to early October 2008 and several additional ones are connecting every month. The FAIR-OPS decision process is working as expected, with four FOIs already identified as potential MFOIs among the nine posted FOIs (early October 2008) after only a very few months of activity, with a limited numbers of active operators. Of the four potential MFOIs, three already have solutions under Airbus investigation. Based on this rate, an increasing number of MFOIs is expected in the coming months with the official opening of FAIR-OPS forum to all operators in 2009, which shows the high interest of the flight operations & training community to take part in the decision-making process. Feedback from the first airlines using FAIR-OPS 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-OPS.

The FAIR-OPS 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 prioritize 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 prioritize problems and define solutions with airlines and hence provide a better and quicker service for customers. Not all airlines are currently connected to FAIR-OPS and Airbus encourages all airlines to connect to FAIR-OPS and contribute actively to identifying, evaluating, prioritizing, and resolving the in-service flight operations issues that may impact their operations. FAIR-OPS 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.

SESAR Part II

The SESAR (Single European Skies Air transport management Research) cockpit of today's and tomorrow's airliners (see article on page 12) is a lot different to early airliners. This is the cockpit of a Junkers G 24 around 1925. Note the flight instruments and throttle controls, also an early implementation of 'fly by wire' flight controls!

Air traffic management then was mainly watching out for other aircraft and today the numbers of aircraft flying around the world at the speeds, heights and distances we find normal would have astonished the early aviators. Nonetheless, this enormous improvement in aircraft performance has brought with it problems such as air traffic congestion, which SESAR will address to bring even more efficiency and cost savings for airlines and the air traffic management system.

The Junkers G 24 had a wing-span of 28.5 metres, a length of 15.25 metres and a height

of 4.85 metres or 5.5 metres depending on modification. Its empty weight was 3,760kg; take off weight 6,000kg; maximum speed 175 kilometres per hour and range around 1,200 kilometres.

In its day it was an advanced airliner with space for nine passengers and a cabinet with a small washbasin. However, it was not so comfortable for the pilots as it had an open cockpit, which perhaps helps to explain the simple instrumentation - flying an aircraft for hours in freezing and rainy conditions

could not have been easy and concentrating on complex instruments would have been difficult. The aircraft also set an endurance record of 14 hours 23 minutes with a 1,000kg payload, which must have been a marathon for the pilots.

In 1926 Lufthansa flew with the aircraft from Berlin to Paris and commercial flights also connected Berlin and Königsberg.





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- ▲ Customer support centres
- Training centres
- Spares centres / Regional warehouses
- Resident Customer Support Managers (RCSM)

RCSM location

Abu Dhabi	United Arab Emirates
Algiers	Algeria
Al-Manamah	Bahrain
Almaty	Kazakhstan
Amman	Jordan
Amsterdam	Netherlands
Athens	Greece
Auckland	New Zealand
Baku	Azerbaijan
Bangalore	India
Bangkok	Thailand
Barcelona	Spain
Beijing	China
Beirut	Lebanon
Berlin	Germany
Bogota	Colombia
Brussels	Belgium
Bucharest	Romania
Budapest	Hungary
Buenos Aires	Argentina
Cairo	Egypt
Changchun	China
Charlotte	United States of America
Chengdu	China
Cologne	Germany
Colombo	Sri Lanka
Copenhagen	Denmark
Damascus	Syria
Dar Es Salaam	Tanzania
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
Hamburg	Germany
Hangzhou	China
Hanoi	Vietnam
Helsinki	Finland
Ho Chi Minh City	Vietnam
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
Los Angeles	United States of America

RCSM location

Louisville	United States of America
Luton	United Kingdom
Luxembourg	Luxembourg
Macau	S.A.R. China
Madrid	Spain
Manchester	United Kingdom
Manilla	Philippines
Marrakech	Morocco
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
Muscat	Oman
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
Riyadh	Saudi Arabia
Roma	Italy
San Francisco	United States of America
San Salvador	El Salvador
Santiago	Chile
Sao Paulo	Brazil
Seoul	South Korea
Shanghai	China
Sharjah	United Arab Emirates
Shenyang	China
Shenzhen	China
Singapore	Singapore
Sofia	Bulgaria
Sydney	Australia
Taipei	Taiwan
Tashkent	Uzbekistan
Tehran	Iran
Tel Aviv	Israel
Tokyo	Japan
Toluca	Mexico
Tripoli	Libya
Tulsa	United States of America
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