

FAST 29





E D I T O R I A L

Dear FAST reader,

FAST rarely has an editorial, but I felt that, in view of the dramatic happenings in our industry, that this FAST would be a good vehicle to share some information with you.

Safety in the cockpit has been a major consideration since September 11th. Airbus' engineers in Design and Customer Services have been working on a responses to several demands.

The major challenge has been to design a door that meets many conflicting demands such as the need to resist an attack and still behave correctly in case of depressurisation.

We are now finalising the design for the Phase 2 door, which has to meet both the existing and new Airworthiness Authorities requirements for certification. Service Bulletins are being prepared together with the associated kits with the aim to release them in the spring of 2002 to meet the FAA's probable embodiment deadlines. Our approach, for all our models, has been to meet this demand via a minimum cost approach by absorbing the design costs and producing the kits at a minimum price.

We are also looking at other demands:

- Video camera installations - Here we have many differing demands and will be responding with a standard basic installation that airlines can use with a choice of two equipment suppliers.*
- Transponder - We are completing the design work for this modification to be ready to respond to the rules and airlines' individual demands*
- Cockpit to Cabin Communications - The formal regulations are not yet finalised but we have started detail design work. What is certain is that it will need to be tailored to each model/airline. We will handle this through individual modifications.*

All of these modifications, which history imposes on us, will be competitively priced to minimise their cost to you, the operator.

You have my assurance of Airbus' will to help you through this period.

I wish you all, together with your families, a 2002 that is good for you personally. Professionally, I also wish that it brings the signs of industrial recovery that we all need.

Sincerely,

*Patrick GAVIN
Executive Vice President Customer Services*

FAST 29

FLIGHT AIRWORTHINESS SUPPORT TECHNOLOGY



D E C E M B E R 2 0 0 1

| | |
|--|-----------|
| AIRMAN® Simplifying and optimising aircraft maintenance Christian Frémont Christian Callay | 2 |
| The A318: Enhancing the A320 family Martin Woods | 8 |
| Bar Coding on Airbus aircraft parts <i>Benefitting airlines, maintenance providers, suppliers and manufacturers</i> Achim Krapp | 14 |
| Servicing of the Integrated Drive Generator Pascal Chabriel | 20 |
| Airbus Service Bulletins: What has changed with computerisation? Annick Pedron Jacques Padeloup | 24 |
| Aviation 100 years ago Men with a vision... | 28 |
| Worldwide Airbus Customer Services | 30 |
| In a nutshell... | 32 |

Editor: Denis Dempster, Product Marketing
Graphic design: Agnès Massol-Lacombe
Alain Fauré
Sylvie Lagré
Customer Services Marketing
Telephone: +33 (0)5 61 93 39 29
E-mail: fast.digest@airbus.fr
Telex: AIRBU 530526F
Telefax: +33 (0)5 61 93 27 67
Printer: Escourbiac

FAST may be read on Internet <http://www.airbus.com>

© **AIRBUS** 2001

The articles herein may be reprinted without permission acknowledgement to Airbus. Articles which may be subject to ongoing review must have their accuracy verified prior to reprint. The statements made herein do not constitute an offer. They are based on the assumptions shown and are expressed in good faith. Where the supporting grounds for these statements are not shown, the Company will be pleased to explain the basis thereof.

Cover illustration:
Integrated Drive Generator on A340

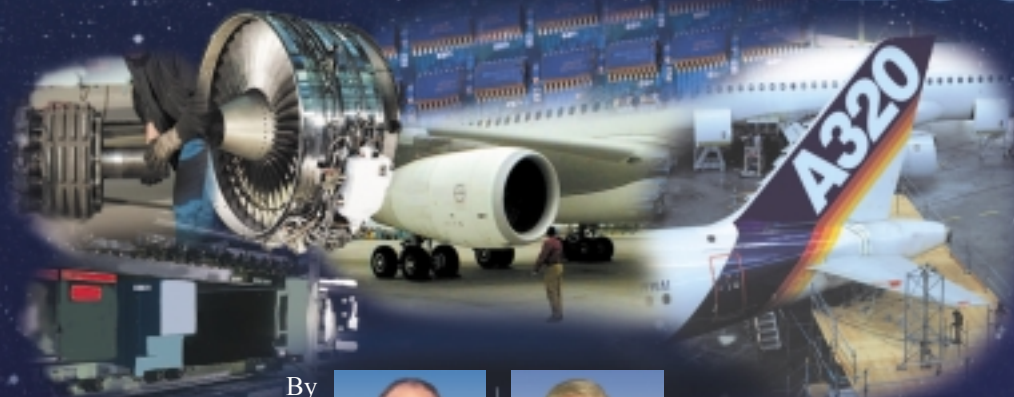
This issue of FAST has been printed on paper produced without using chlorine, to reduce waste and help conserve natural resources. Every little helps.



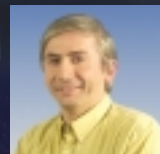
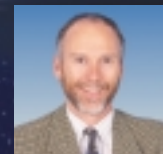
AIRMAN®

AIRMAN is a registered trade mark of AIRBUS.

2000



By
Christian Fremont
Maintenance and Trouble Shooting
System Engineering
Airbus Customer Services



in collaboration with
Christian Callay
Maintenance Software Development
Airbus Customer Services

Simplifying and optimising aircraft maintenance

The Airbus aircraft technology opens the door for innovation in the maintenance area. Indeed, the A320 Family and long range A330/A340 fleet are all basically equipped with systems recording maintenance data to be used by maintenance personnel, such as ECAM warnings displayed to the crew, fault messages recorded by the computers, engines and APU reports coming from the Data Management Unit (digital recorder). All this data can be transmitted in real time from the aircraft to a ground station. This data is considered as high value information related to aircraft maintenance.

Use of new electronic data processing (EDP) tools, capable of analysing this large volume of data coming from entire fleets, helps the airlines to manage and anticipate unscheduled aircraft events. Their use has raised high interest in aircraft line

maintenance since non-routine events are very penalising factors in daily aircraft operation.

Engine reports directly transmitted from the aircraft (down-linked) are already used by many airlines to monitor their engine parts. In the last few years, to further improve their line maintenance and engineering efficiency, they have begun to download ECAM warning and fault messages. The trend is quite clear that, due to the advance of technology on board the aircraft, to further enhance the maintenance efficiency there is a need for an on-ground maintenance software aid.

Airbus, in very close cooperation with selected airline maintenance organisations, and using in-house maintenance expertise, has developed its own ground based maintenance software aid: **AIRMAN®** (AIRcraft Maintenance ANalysis).



AIRMAN® concept: e-trouble shooting

The Airbus fly-by-wire aircraft are all equipped with data recording features such as:

- ▶ Fault monitoring and diagnostics undertaken by the Built In Test Equipment (BITE) of each system.
- ▶ ACMS (Aircraft Conditioning Monitoring System) reports.

All this data can be downloaded in real time via data-link (ATSU, ACARS) to the ground. Much of the information related to maintenance is also available on the ground, such as:

- ▶ Aircraft documentation: Trouble Shooting Manual, Aircraft Maintenance Manual, etc...)
- ▶ Airline technical notes
- ▶ Logbook data
- ▶ Aircraft delays
- ▶ Shop data
- ▶ Airbus information: Service Information Letter (SIL), Technical Follow Up (TFU).

By analysing and linking all maintenance data related to unscheduled aircraft events,

AIRMAN® provides the following:

- ▶ Real time aircraft technical follow up
- ▶ Preventive maintenance actions (trend monitoring concept)
- ▶ Analysed maintenance data available for engineering to optimise aircraft technical follow up processes.

These features further improve aircraft dispatch, simplify aircraft maintenance and cut down maintenance costs.

AIRMAN® development process

Step by step approach

The scope of **AIRMAN®** is large. The first step has been the development of **AIRMAN® 2000**, which has been defined with Air France and Sabena and tested and validated in the operational environment with these airlines and JetBlue.

The Airbus objective has been, and will be, to continuously involve the airlines in the definition of **AIRMAN®** modules. In this framework, the first "**AIRMAN®**



users club" workshop will be set up during the first half of 2002. This step-by-step approach allows the airlines to take the benefit immediately of features offered by AIRMAN® 2000 and to define future modules to meet their needs.

Development of the complete set of AIRMAN® applications has been estimated to take four to five years. Airbus will provide AIRMAN® customers with yearly releases. Figure 1 shows an example of future AIRMAN® modules that could potentially be connected to AIRMAN® 2000.

AIRMAN® 2000

Features

AIRMAN® 2000 provides the following features based on the On-board Maintenance System (OMS) data analysis.

Gate maintenance function

Whether the aircraft is at the gate, on the runway or in flight, the AIRMAN® 2000 software gives the operator direct access from a PC on the ground (see Figure 2), to information on the Current Leg Report or the Post Flight Report, at any time (see Figure 3).

AIRMAN® provides centralised access to information related to an aircraft event (see Figure 4). Once a fault message has been analysed, the AIRMAN® 2000 system provides the line maintenance operator with a direct link to the relevant troubleshooting task in the Trouble Shooting Manual (see Figure 5). Furthermore, the operator gets access to the Airbus Technical Follow-Up (TFUs) and Service Information Letter (SIL 00-028/38/41) and also to any of the airline selected documentation such as Technical notes and Engineering Bulletins.

Predictive maintenance function (Hangar maintenance)

Using algorithms based on statistical analysis, a selected fault message from the aircraft is recorded in the job list and classified as "new today", "still open" or "long lasting" item.

This feature allows the maintenance operator to set up the appropriate trouble-shooting action before the failure message leads to a malfunctioning of a system that may be reported by the crew in the logbook. By anticipating maintenance actions, pilot reports (Pireps) are reduced and thus aircraft delays. In addition, the maintenance action can be planned according to the aircraft's schedule (see Figure 6).

Data analysis feature

AIRMAN® 2000 is able to process the OMS data in order to support the maintenance teams. The results come under the form of high value-added information such as aircraft failure event concept and fault history tracking. With this feature, the operator is able to take the most appropriate action related to an aircraft event, saving time and reducing the cost of "No Fault Found" (NFF) by providing systematically "AIRMAN® post flight reports (PFR)" to justify component removals.

Figure 1
Standard interface to plug in Airbus or non Airbus modules



Figure 2
Fleet status in real time

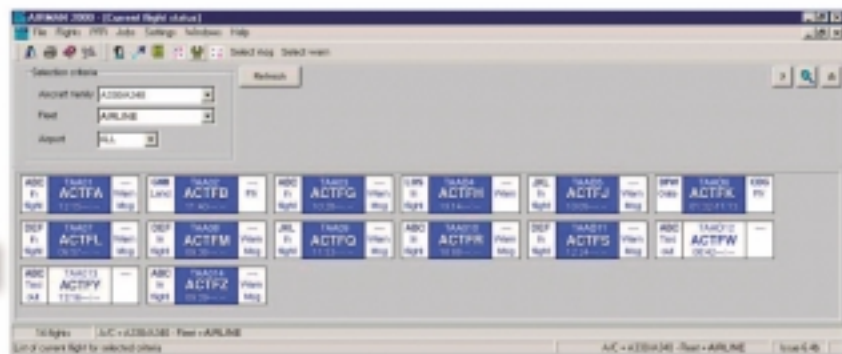


Figure 3
Hyperlink with necessary aircraft documentation

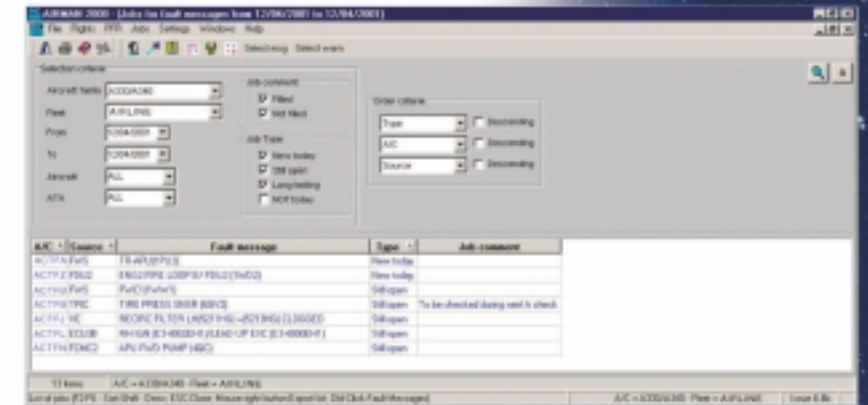
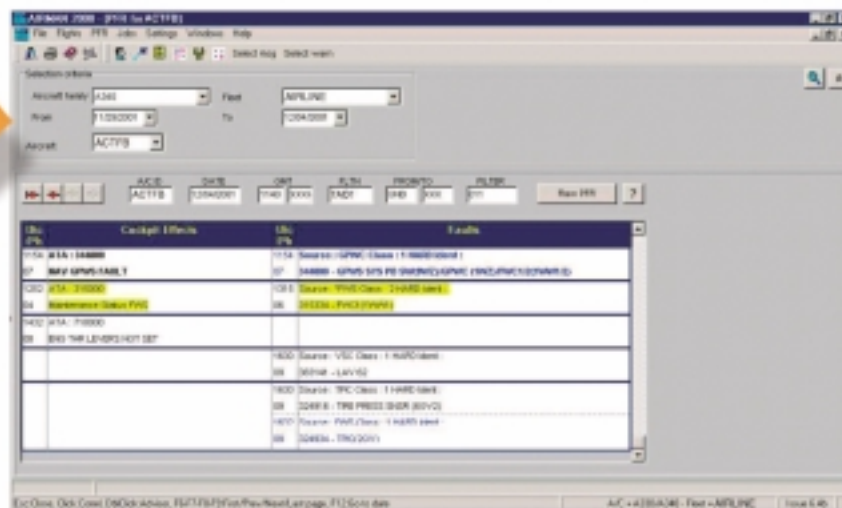


Figure 6
Hangar maintenance
"Scheduled maintenance actions" related to unscheduled events

Figure 5

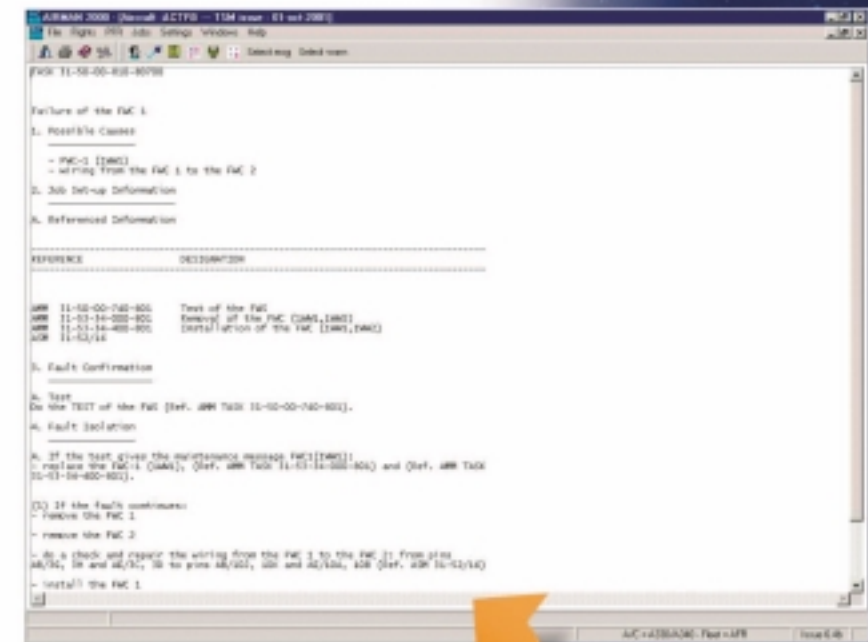
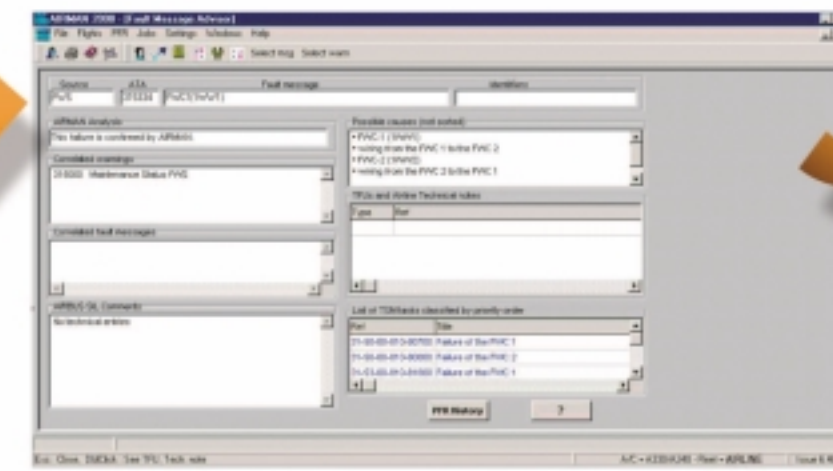


Figure 4



Engineering "transparency"

The generation of automatic reports on analysed data and records gives the airline's engineering department a clear picture of the technical status of the whole fleet at any time (see Figure 7). The feedback, from the users to Airbus in an analysed form (AIRMAN® 2000 reports), accelerates the process of continuous aircraft product improvement such as monitoring the upgrading of computers.

Figure 7



Customized features/Fleet update

The AIRMAN® 2000 system contains a broad range of useful infor-

mation for the line maintenance, the engineering and the Maintenance Control Centre (MCC).

The user package can be customized according to the user profiles and needs. This allows AIRMAN® 2000 to be fully integrated into the aircraft trouble shooting process in place in the airlines. Whenever the aircraft fleet changes, the AIRMAN® 2000 package can be electronically up-dated quite easily.

System architecture

AIRMAN® 2000 is a Client/Server application. The software is divided into three main parts:

- ▶ **The real time acquisition module (AIRMAN® 2000 RTA).** This module acquires in real time OMS data transmitted by the aircraft through an on-ground service provider.
- ▶ **The database (Oracle®).** The structure and content of the data represent years of collective experience of aircraft maintenance experts. In this database are stored data that are used by the AIRMAN® 2000 core software.
- ▶ **The core software (AIRMAN® 2000.exe).** Algorithms based on advanced technology such as "data mining" methodology,

allow the reduction of a large amount of data coming from entire fleets to the bare essentials.

The Client/Server architecture will move in the coming months to a more open architecture based on web technology. Then, main functions of AIRMAN® could be a new service available through the Airbus portal "Airbus On Line Services".

Savings from AIRMAN® 2000

A first estimation of savings brought by the use of the current AIRMAN® 2000 release was conducted in 1998 with Air France. In 1999, a second study using data coming from Sabena was performed. Both investigations led to similar results. The gain was esti-

mated (conservative calculation) to approximately 4\$US per flight hour: 2\$ coming from the gate maintenance function and 2\$ from the predictive maintenance function. The following main areas of benefit have been identified:

- ▶ **Gate maintenance function**
 - Direct access to technical documentation (TSM, TFU, airline technical notes)
 - Maintenance actions can be prepared on the ground while the aircraft is still in flight;
 - Failure confirmation based on AIRMAN® 2000 analysis.
- ▶ **Predictive maintenance**
 - Cut down the number of aircraft delays;
 - Reduction of pilot defect reports;
 - Cut down line maintenance actions.

Conclusion

AIRMAN® 2000 was officially presented in December 2000 to A320 operators during the Airbus A320 Technical Symposium. During the Le Bourget Air Show in June 2001, Air France, Finnair and JetBlue signed a contract to get AIRMAN® 2000. They have since been joined by Austrian Airlines and Emirates. Discussions are currently running with other airlines. The Airbus aircraft technology of today and its evolution tomorrow, opens the door for AIRMAN® 2000.

- ▶ Simplifying and optimising aircraft maintenance,
- ▶ Reducing aircraft ground time,
- ▶ Launching preventive maintenance.
- ▶ Reducing the maintenance cost. ■

AIRMAN® 2000

Operators who wish to have information on AIRMAN are invited to contact
 Gérard Darteyre
 Marketing Director
 Airbus Customer Services
 Phone number:
 +33 (0)5 61 93 11 39
 E-mail:
 gerard.darteyre@airbus.fr

or

David Grezes
 AIRMAN
 Marketing Manager
 Airbus Customer Services
 Phone number:
 +33 (0)5 61 93 11 47
 E-mail:
 david.grezes@airbus.fr



Technical requirements for A320/A330/A340

| Hardware requirements | Resource | | | | | | | |
|-----------------------|----------|-------------|------|-----|---------|------|----------------------|-------------------------------------|
| | OS | | | Nbr | Memory | | Type | Miscell. |
| | W95 / 98 | NT4 / W2000 | Unix | | RAM | Disk | | |
| Oracle Server | | x | x | 1 | | 3Gb | | |
| Airman Package | x | x | | n | 16-32Mb | 1Gb | PC pentium >= 166Mhz | CDROM Screen 800*600 >= 256 colours |

| Software requirements | Resource | | | |
|-----------------------|-----------------|--------|---------|---|
| | Oracle | | TPCIWEB | |
| | 7.3.4.4 / 8.1.6 | SQLNet | | |
| Oracle Server | x | x | | |
| Airman Package | | x | | x |

The A318

Enhancing the A320 Family



By Martin Woods
Marketing Analyst
A320 Family
Airbus Customer Services



The A318 is the newest member of the highly successful Airbus single-aisle A320 Family. Due to fly for the first time in January 2002, the A318 will herald the introduction of a number of product enhancements that will be introduced across the entire A320 Family. This article will look in depth into these developments.

The A318 is designed as a minimum change reduced capacity version of the A319. Its design was based on retaining the maximum commonality with the other aircraft in the A320 Family. As a result there are only four significant physical changes to the aircraft.

The most obvious physical change is the reduction in fuselage length that is a result of four and a half frames being removed from the A319 design. This has resulted in an overall fuselage length of 31.44m (103ft 2in) compared to 33.84m (111ft) on the A319.

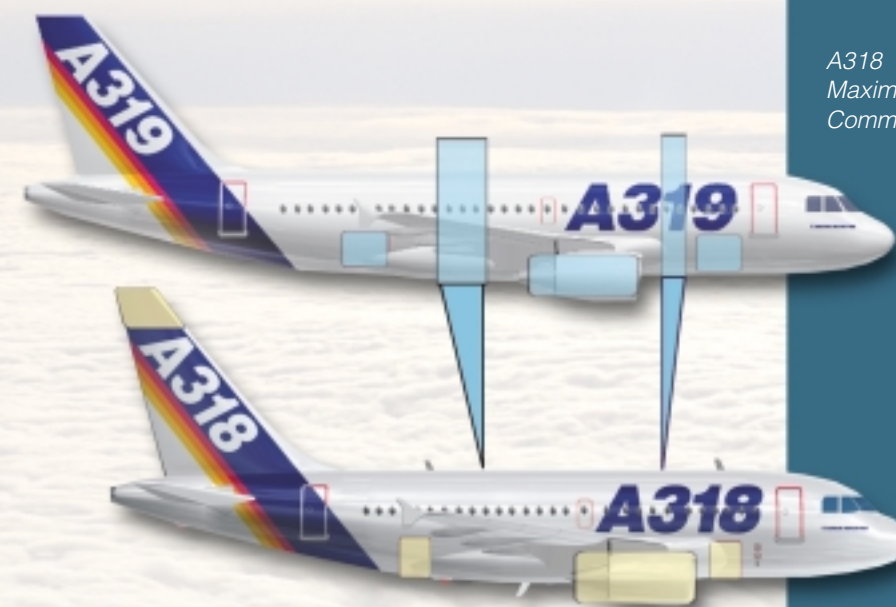
The second most obvious change is the fin tip extension introduced in order to counteract the reduced moment of the vertical stabiliser. As a result, the height of the A318 has increased by 0.75m (2ft 5in).

The A318 is offered with a choice of engines, either the Pratt and Whitney PW6000 or the CFM International CFM56-5B. The PW6000 has been designed specifically for the A318 and its missions. It will offer the benefit of low engine maintenance costs and ownership costs. The CFM engine will offer the benefits of low fuel burn and even greater commonality with the other members of the A320 Family.

Finally, the least obvious change is the reduction in the width of the cargo doors. This was done in order to reduce weight and maintain clearance between the doors and the engines. The new doors are the same height as those on other members of the A320 Family and utilise the same opening mechanisms. They are wider than those on all the B737 series and offer over 0.2 m² more bulk loading access area.

Systems developments

Within the aircraft there have been a number of new developments in terms of systems that will be highlighted in this article. These developments are due to be implemented throughout the A320 Family. The aim of these systems improvements is to introduce the benefits of new technology, with lower costs in terms of operations and maintenance.



A318
Maximum
Commonality

Only four significant design changes

- A319 reduced in length by 4.5 frames (2.39m)
- Cargo door width reduced from 1.82m to 1.28m
- Fin increased in height
- A choice between PW6000 and CMF56-5B engines



CIDS cabin crew features

Cabin Intercommunication Data System

In the A318 cabin a new Cabin Intercommunication Data System (CIDS) based on that installed on the A340-500/-600 is being fitted. The new CIDS will consist of three



CIDS maintenance features

primary units, the CIDS Directors, the Forward Attendant Panel (FAP), and Decoder/ Encoder Units (DEU)s.

The new system will include a new generation FAP that will have an easy-to-clean 15 inch touch-sensitive screen rather than the traditional push button interface. It will have a user-friendly graphical interface and has the capability to be used as a remote control for In-Flight Entertainment (IFE) equipment and the potential for a server for the IFE.

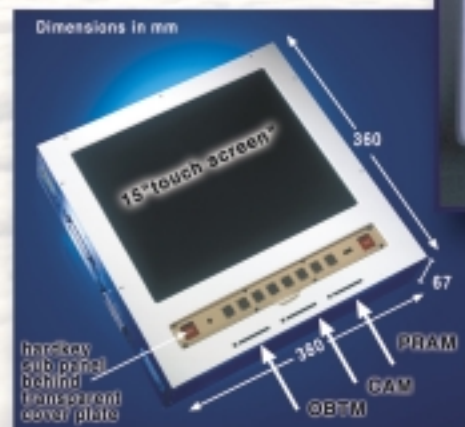
The new FAP will integrate the Programming and Test Panel (PTP) and the Cabin Assignment Module (CAM) functions that were previously separate units in the CIDS. The cabin staff will therefore be able to control all cabin related tasks from the FAP.

The CIDS Directors will also incorporate a number of functions that have previously required the use of separate control units. They will replace two control units – the Vacuum System Control (VSC) unit for the lavatories and the Smoke Detector Control Unit (SDCU).

The new system will include half the number of DEU type As, the interface between the Passenger Service Units (PSUs) and the directors, of the old system. This will further reduce the spares and maintenance cost for these components.



New touch screen Flight Attendant Panel (FAP)



New user interface

Hardware concept Touch screen FAP

LED Reading Lights

In the cabin the traditional bulbs used in the Passenger Service Unit reading lights are to be replaced by Light Emitting Diode (LED) lighting. The new LED reading lights will have over thirty times the life of traditional light bulbs. LED lighting is more power efficient, creates less heat and will cost less to maintain.

| Equipment | Pre Mod Quantity | Post Mod Quantity |
|---------------|------------------|-------------------|
| Director | 2 | 2 |
| PTP | 1 | 0 |
| FAP | 1 | 1 |
| CAM | 1 | 1 |
| DEU-A | 20 | 10 |
| DEU-B | 3 | 3 |
| Reading light | 100 | 100 |
| Ballast unit | 80 | 80 |
| SDCU | 1 | 0 |
| VSC | 1 | 0 |
| PRAM | 1 | 0 |

As can be seen from the table, the new CIDS will eliminate the requirement for many separate units, simplifying spares requirements, speeding fault rectification and reducing costs.

LCD Display Units

The A318 flight deck will incorporate the new 7.25 x 7.25 inch LCD Display Units that are to be fitted throughout the Airbus "fly-by-wire" product range and these will supplant the previous standard Cathode Ray Tube (CRT) units. They will provide greater flexibility for future developments as they feature new open architecture software, they will have improved graphical representation, they will be more reliable and have improved readability in adverse conditions. The LCD screens represent the latest standard technology and their use in the A320 Family will further enhance the family's reputation for representing the state of the art in the single-aisle market. These LCD screens will also be common with those being installed on the Airbus long-range wide body family.



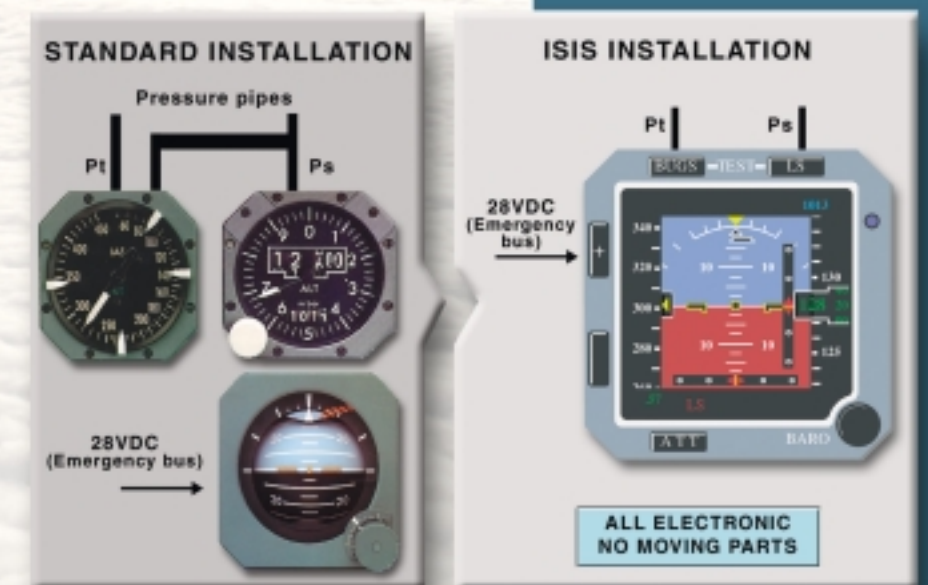
Display units LCD displays

Integrated Standby Instrument System

Integrated Standby Instrument System (ISIS) will also be standard on the A318 and the A320 Family.

The ISIS will replace the analogue standby instrumentation – the Standby Horizon Indicator, Standby Altimeter and the Standby Airspeed Indicator. These three separate units will be replaced with a single LCD display unit that will provide all the standby displays. ISIS will have the advantage of replacing three less reliable mechanical units with a single more reliable line replaceable unit, it will be easier to maintain and has an integrated ILS display. As a result ISIS will have maintenance costs of approximately a fifth of the total of the three units it replaces.

ISIS technical presentation



Flight Data Interface Management Unit

The Flight Data Interface Management Unit will integrate the functions previously carried out by the Flight Data Interface Unit (FDIU) and the Data Management Unit (DMU). The DMU is the heart of the Aircraft Integrated Data System (AIDS) and collects and processes data from the various aircraft systems. These functions will be combined with those of the FDIU that supplies the Flight Data Recorder (FDR) with critical flight parameters and system data, to form the Aircraft Reporting and Monitoring System (ARMS).

Alternate Braking System – Brake By Wire

Another innovation on the A318 will be the introduction of a new alternate braking system. This will replace a traditional low-pressure hydraulically operated system with an electronically controlled one. An Alternate Braking Control Unit (ABCU) will be installed in the air-

craft. This will result in the deletion of a number of units associated with the current system such as the master-cylinders, reservoir, brake dual distribution valve and automatic selector valve. In addition, servo valves used in the current system will be replaced by Direct Drive Valves (DDV) that will have a leakage rate ten times lower.

The ABCU will offer more efficient alternate braking control. The alternate braking system will be segregated from the normal braking circuit, braking pressure will be limited in order to avoid tyre burst, and the ABCU will be capable of monitoring and selftesting.

Enhanced Electrical Power Generation System

The A318 will be the first aircraft in the A320 Family to offer the new Enhanced Electrical Power Generation System (EPPGS) as standard equipment. The EPPGS entails a new control system, Integrated Drive Generator (IDG) and Quick Attach/ Detach Adaptor (QAD).

The control system for the EPPGS will be streamlined from six control boxes to just three units. This will see the integration of the Auxiliary Power Unit Generator Control Unit (APU GCU) and the Ground Power Control Unit (GPCU) into a single unit, the Ground and Auxiliary Power Control Unit (GAPCU). In addition the Electrical Generator Interface Units (EGIU) and Generator Control Unit (GCU) will be integrated into two GCUs. The six units of the previous generation control system will be integrated into a system employing only the three control units - two GCUs and one GAPCU.

Pre Mod

EGIU1 GCU1 APU GCU
GPCU GCU2 EGIU2

Post Mod

GCU1 GAPCU GCU2

The A318 and subsequently, the A320 Family, will have an interchangeable EPPGS control system with the A340-500/-600. The Integrated Drive Generator will be fully interchangeable between both the PW6000 and the CFM56 engines of the A318. There will be two specific QADs, one for the A320 Family with CFM56 engines and another for A320 Family with IAE or PW6000 engines or A340 with CFM56 or Trent 500 engines.

The new units in the EPPGS will cost less than the current units and will be more reliable therefore delivering a direct maintenance cost benefit of at least 10% to the airlines.

Conclusion

The A318 will be the latest addition to the successful A320 Family and will continue the Airbus tradition of continuous product development and enhancement within the A320 Family. As with the A319, A320 and A321, the A318 will offer airlines the benefits of the:

- most comfortable single aisle cabin
- latest technology
- richest standard specification
- commonality
- best operational capability
- high residual values
- lowest operating cost.

The A318 will be the vehicle for introducing a number of system enhancements that will be introduced in the other members of the family and these will offer the airlines greater capability with better reliability at lower cost – a step towards the Airbus goal of Setting the Standard in offering the customer more.■



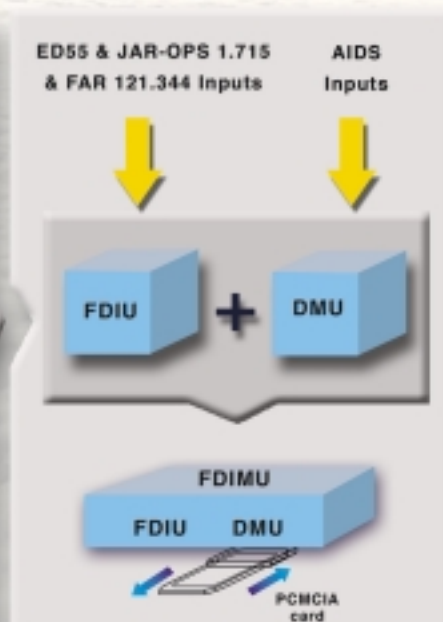
*EPPGS: Electrical Power Generating System

Enhanced Electrical Power Generation System

A318 ARMS (AIDS + FDR)



Combined box FDIU (Flight Data Interface & Management Unit) with PCMCIA interface



- Best single aisle cabin
- Best technology
- Richest specification
- Largest family benefits
- Best operational capability
- Highest residual value
- Lowest operating cost

A320 Family values maintained

BAR CODING

Airbus decided in 1998 to implement bar coding on aircraft parts in accordance with ATA Spec. 2000, Chapter 9, "Permanent Bar Code Parts Identification" (PBCPI). This is a first step on all Line Replaceable Units (LRUs) in the new A340-500/-600 and A318s and all LRUs in A320s, A330s and A340s in production. Parts suppliers and engine manufacturers have been requested for their commitment and support of this initiative. The introduction will be done progressively, beginning mainly with avionics computers.

The final goal is to bar code all the aircraft equipment except where technically impractical.

ON AIRBUS AIRCRAFT PARTS

Benefitting airlines, maintenance providers, suppliers and manufacturers



By Achim Krapp
Reliability
Engineering Support
Airbus Customer Services



Why bar codes?

Bar codes are used today by a large variety of industries such as warehouses, automotive and pharmaceutical industries. Their benefits are obvious: they identify an article and provide selected information such as origin, properties and price.

This information is coded in order to provide a maximum of data on a small surface and make it *machine-readable*.

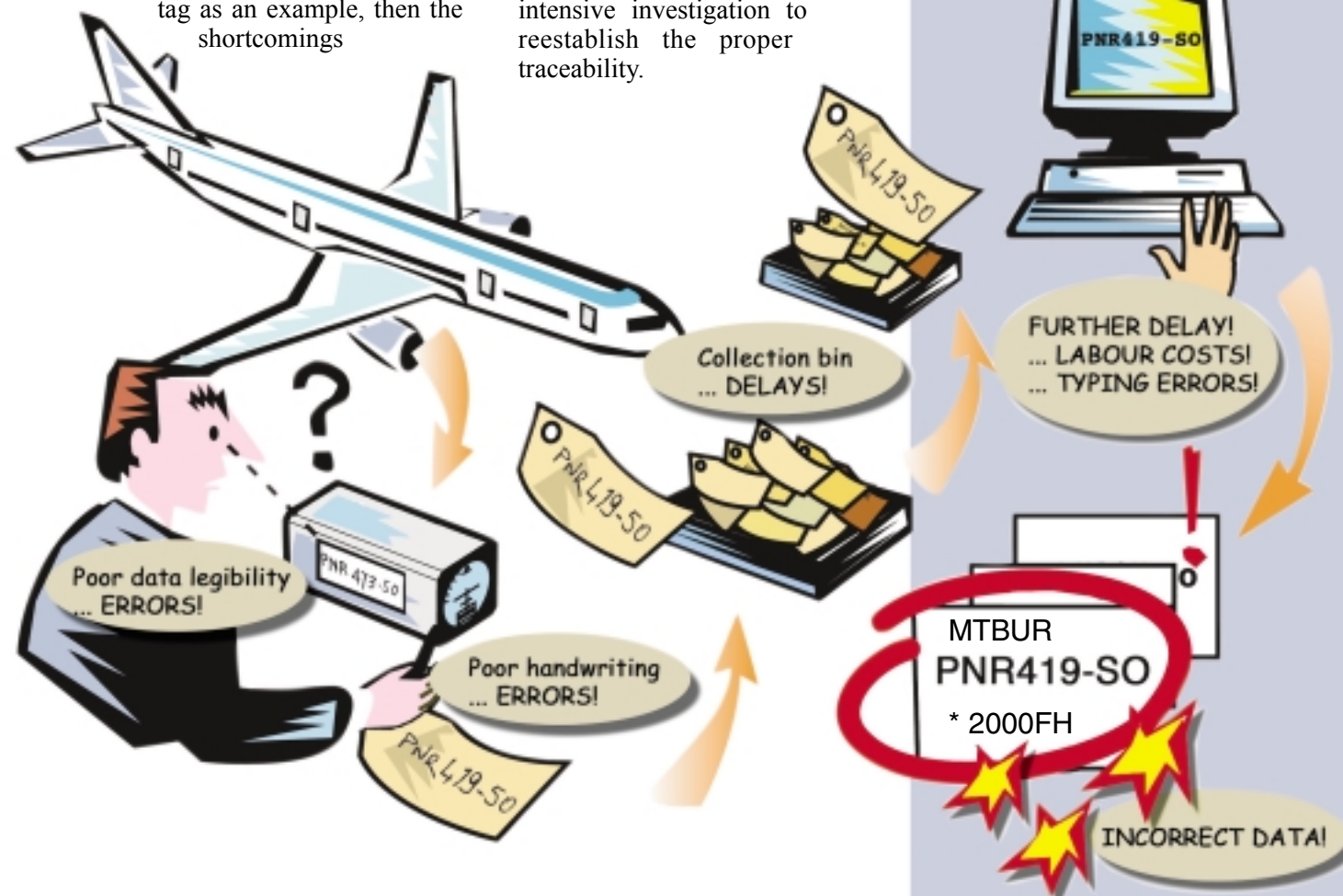
Bar codes in aviation

Apart from shipping and receiving labels, the aviation industry makes very little use of the bar code. Even today, the majority of airlines are still not using the benefits of its application for proper part identification and automated data recording. The various steps for part tracking and traceability are still managed by manual data recording.

If we look at the maintenance domain and take the processing steps of a component removal tag as an example, then the shortcomings

of manual marking and recording are obvious:

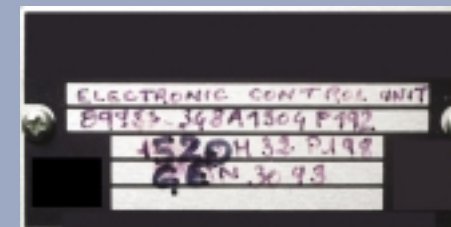
- ▶ At component removal, the data plate has to be read. Here already is the risk of incorrect data transcription due to the poor legibility of the data, which are sometimes stamped, vibro-engraved, and in the worst case handwritten!
- ▶ Next step is the manual transcription of the data to the removal tag. Here again potential errors due to the individual hand writing (is it a "1" or a "7", is it a "5" or a "S"?), not to mention the usual omissions of zeros and dashes.
- ▶ Collection of removal tags, transport to a typist in the Technical Record Department with a certain delay.
- ▶ Manual keying in of the data into the database with a delay of several days, even without the week ends! Keying in of data represents an additional source of errors. Industry experience reveals that on average 20% of the keyed-in data sets do not correspond with the origin part identification and necessitates a labour intensive investigation to reestablish the proper traceability.



*Illegible part numbers...
An industry-wide problem!*



Stamped label



Handwritten label

Bar code capture is virtually error free! Concerning the labour cost of automated data capture, it can be reduced by over 90% when compared to manual recording and keying!

Similar examples can be found in any manual data transaction process across the maintenance or material domain and each shows the amount of time, labour and money wasted just to get incorrect data with an unacceptably long wait.

However, a few airlines decided some years ago to use the bar code technology in a similar way to the other industries. They marked aircraft parts with bar codes incorporating customized information, also the bar code types (symbology) were chosen independantly. Nevertheless, the part identification became *machine-readable* avoiding the shortcomings as explained above.

But in recent years, the business environment of airline maintenance

and material management changed. There is more and more subcontracting for repair, pooling of spares, outsourcing of maintenance, etc. As a consequence, the other business partners could not process the customised bar codes, thus the benefits of the code application were limited.

This led the airlines to develop an international bar code standard in order to permanently mark aircraft parts for better identification. The ATA accepted this challenging task and formed a Bar Code Task Force with representatives from airlines, part manufacturers and airframe manufacturers, including Airbus.

The outcome resulted in the Spec.2000, chapter 9 PERMANENT BAR CODE PARTS IDENTIFICATION (PBCPI).

ATA Specification 2000 Chapter 9 - PBCPI

This industry standard with its latest revision (Issue 2001.1, 9th Revision) fulfills the specific part marking requirements of the aviation industry:

- ▶ Identification of a part from cradle to grave" by a "unique identity" concept.
- ▶ Use of linear bar code (128 or 39 symbology), mainly for data label or plate marking.
- ▶ Use of a two-dimensional matrix code, mainly for direct marking for parts with limited marking space.
- ▶ Applicability for new and in-service parts, serialized and non-serialized.

To identify a new serialized part, the specification recommends to bar code three major data elements:

1. **Manufacturer Cage Code (MFR)**
2. **Part Serial Number (SER)**
3. **Part Number (PNR)**

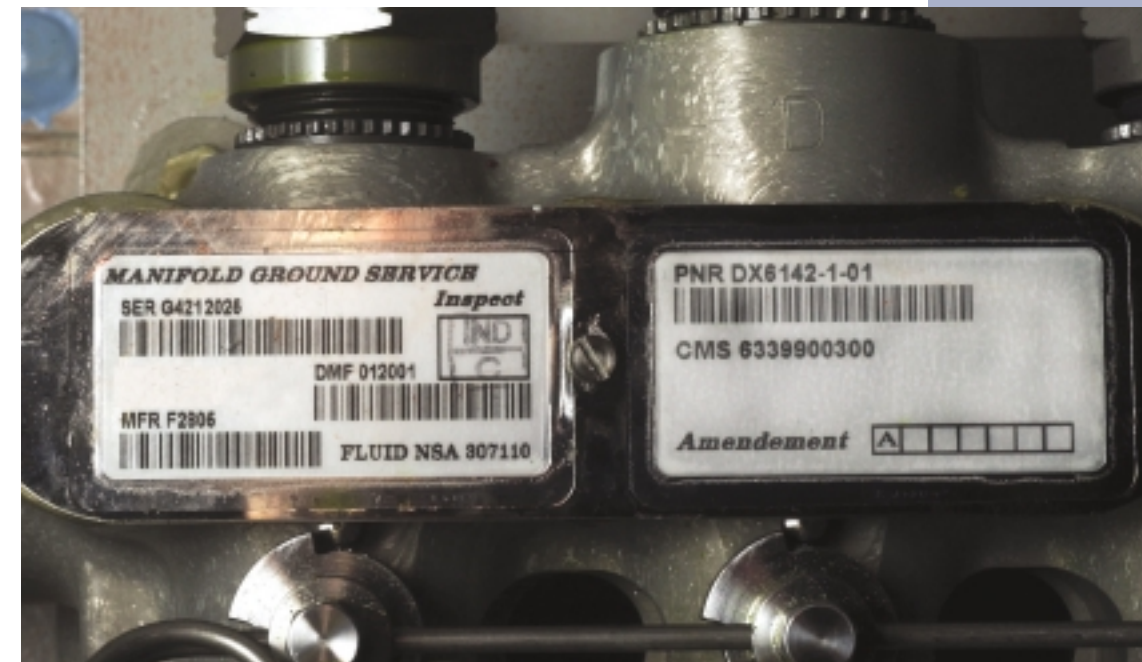
A fourth data element is conditional and required by Airbus, the **Date of Manufacture (DMF)**.

In fact, the "unique identity" is formed by the combination of the MFR and the SER.

The SER has to be unique within the manufacturers cage code, and this is an important prerequisite to comply with the specification. This is because the industry traditionally used the PNR/SER combination to uniquely identify a part. However, whenever a modification affecting form, fit or function is applied, the authorities require a new PNR to be assigned. This breaks the PNR/SER relationship, thereby presenting problems for the owners, users, and repairers to track and trace the part. The MFR/SER combination has to remain constant during the life of the part and therefore both elements should be marked on one common label or data plate affixed to the component for its entire life.

But what about the PNR? It may be on a second label to easily allow changes. In this way, the "unique identity" (MFR/SER) is not affected (see photo above).

The specification. also provides standardized marking solutions for in-service parts. So, the owner of a



part, say an airline, can mark the parts they have in their inventory or which are installed in the aircraft of their fleet.

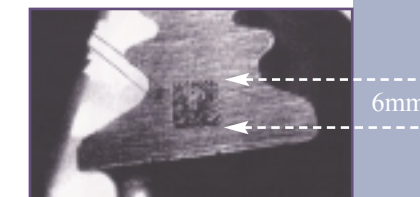
The two-dimensional (2D) matrix code represents one of the latest marking technologies and was included in the specification in 1999. Here the data are condensed into a small matrix of dark and light cells containing binary codes and error correction capabilities. This makes the coded data redundant and ensures readability even if scratches have damaged the matrix surface.

Further significant advantages are:

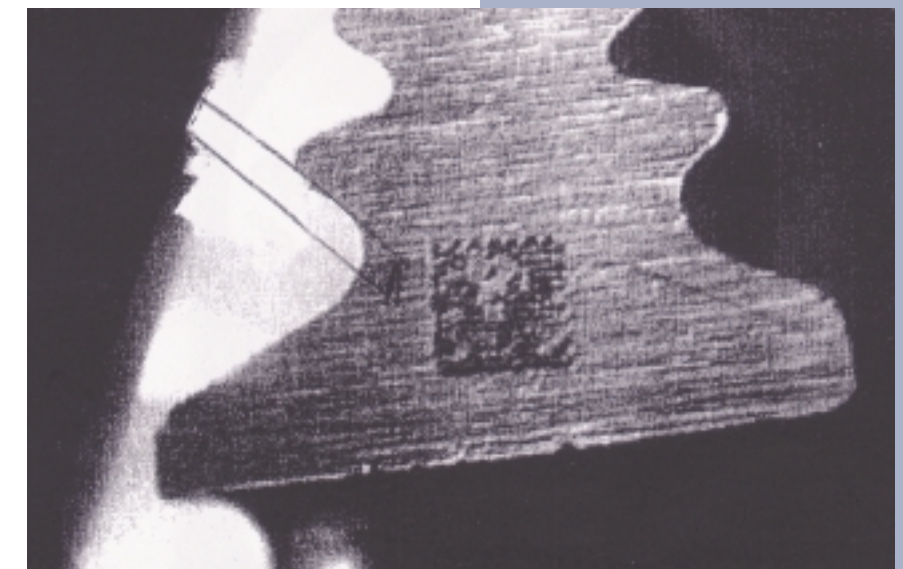
- ▶ 100 times more information than linear bar codes in the same space.
- ▶ Readable from any angle.
- ▶ Only requires 20% contrast (good on shiny or dirty surfaces, linear bar code needs 80% and more).
- ▶ Scaleable, square or rectangle.
- ▶ Marking by any type of print device (Inkjet, thermal transfer, chemical etch, etc).
- ▶ Direct marking of parts in harsh environment by dot peen or laser etch (see turbine blade right).

It should be emphasized that the ATA PBCPI standard is not only recognized and applied by Airbus, but also by Boeing. Both companies have frequent consultations with each other to ensure that their bar coding requirements towards the suppliers are identical.

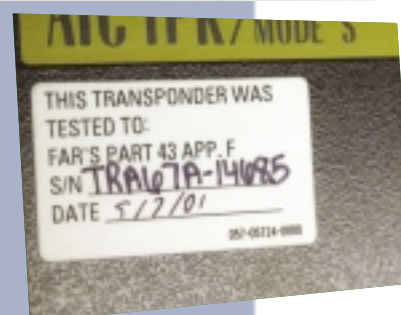
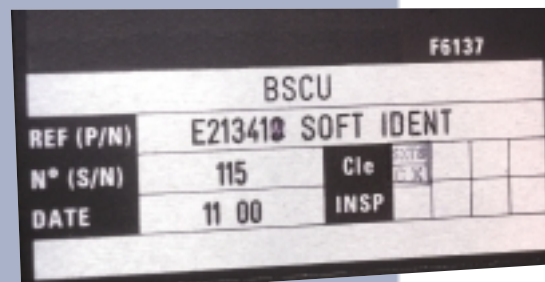
ABD and Spec. 2000 compliant bar code application for new parts



The two-dimensional (2D) matrix, an example of standardized marking solutions



Illegible part numbers...
An industry-wide problem!



Spec. 2000 compliant bar code application for in-service parts



Airbus requirements

The complete bar code requirements of Airbus from suppliers, concerning the data label layout and its bar-coded information are stipulated in the ABD100. 2.9, "Configuration Management". Cross references are given in the General Conditions of Purchase (GCP) 2000.

Benefits for airlines and maintenance providers

Airlines requested Airbus to implement the PBCPI on aircraft parts in order to benefit from these advantages.

Accurate data and their timely availability will improve the quality of key functions in the material and maintenance domain such as:

- ▶ Component tracking and pooling,
- ▶ Configuration control,
- ▶ Reliability performance monitoring,
- ▶ Trouble shooting,
- ▶ Spare parts ordering.

Furthermore, improved life cycle traceability will reduce the number of parts which are out of service because the certifying documentation does not match the part (Suspected unapproved parts).

However, to profit from the bar code application, some preparations for its utilization have to be done. Systematic scanning of data should be included in the maintenance and material processes. Software should be adapted to allow real time data monitoring and management. The future user should keep in mind: Bar Codes do not track parts, computer programs track parts!

Furthermore, on the airframe and engine parts, the two marking technologies as recommended by the Spec.

2000 will be applied. Thus, parts are marked either with the linear or the two-dimensional Matrix code. The point here is that the linear bar code readers used today are not able to read the two-dimensional Matrix code.



1-D linear bar code



2-D data matrix

On the other hand, a two-dimensional reader is able to read both, the linear and the two-dimensional Matrix. This should be taken into consideration when new equipment has to be purchased.

Benefits for maintenance

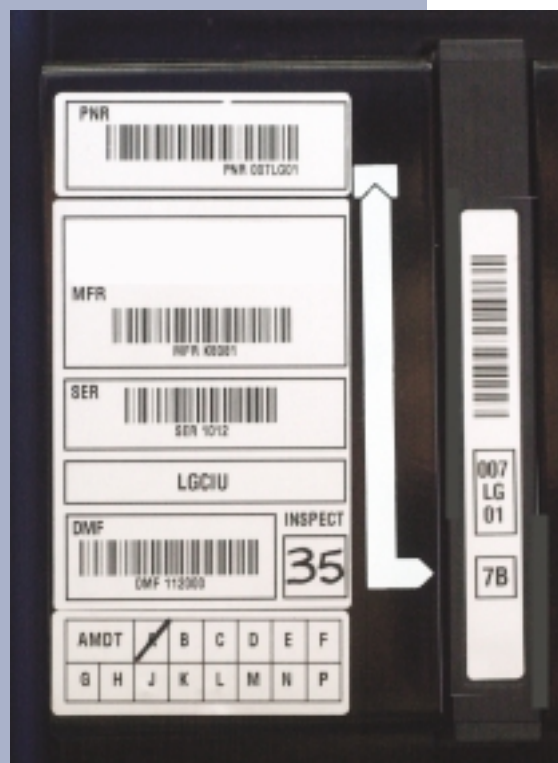
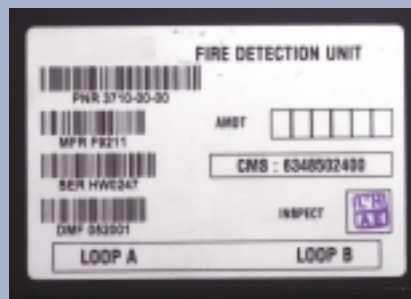
The permanent bar code on parts should be considered as just one element in a chain of bar coded articles. An "overall bar code concept" as operated by some airlines includes data capture of all the important transactions in the maintenance domain. This starts at the beginning of the job with the operator's ID badge, uses task and finding cards, captures the aircraft zone where the job is done, registers the tools used and the parts replaced as well as the consumption of hardware, and monitors the aircraft configuration.

Captured data are transmitted wireless via Local Area Network (LAN) and downloaded in almost real-time into the databases. The management programs on the computer screen display the chronological sequence of actions as well as the status of the maintenance check, time and labor costs spent by aircraft system, the jobs still to do and the real inventory of the stock.

OVERALL BAR CODE CONCEPT IN MAINTENANCE



ABD and Spec. 2000 compliant bar code application for new parts



Benefits for suppliers and manufacturers

Engine manufacturers, in particular Rolls Royce and Pratt & Whitney committed to the requirements of Airbus and started the implementation of the two-dimensional and linear codes to mark LRUs and internal engine parts such as small turbine blades.

CFMI/SNECMA and MTU pioneered the development of quality standards for the Direct Part Marking technology, a sensitive issue for highly stressed engine components, refer to: "IAQG - Data Matrix Coding Quality Requirements for Part Marking".

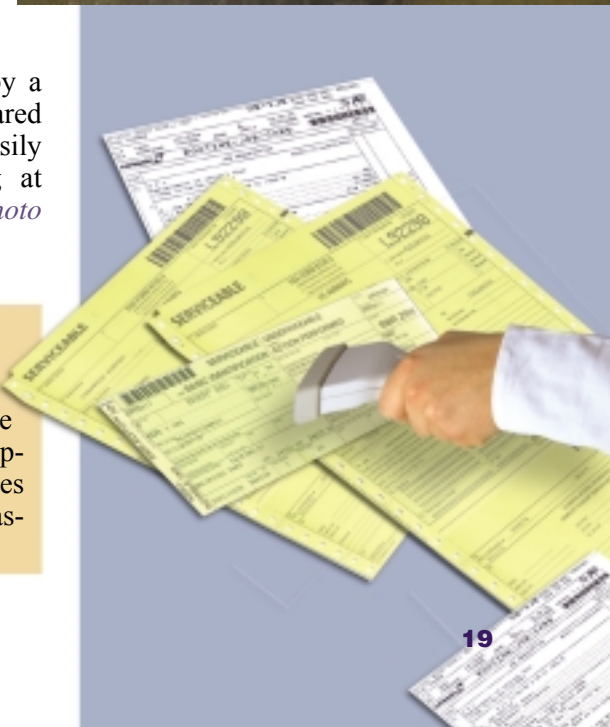
According to the manufacturers, the benefits of the application are not only on the maintenance and

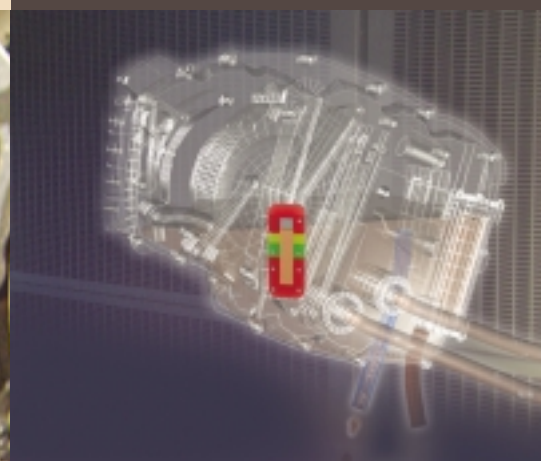
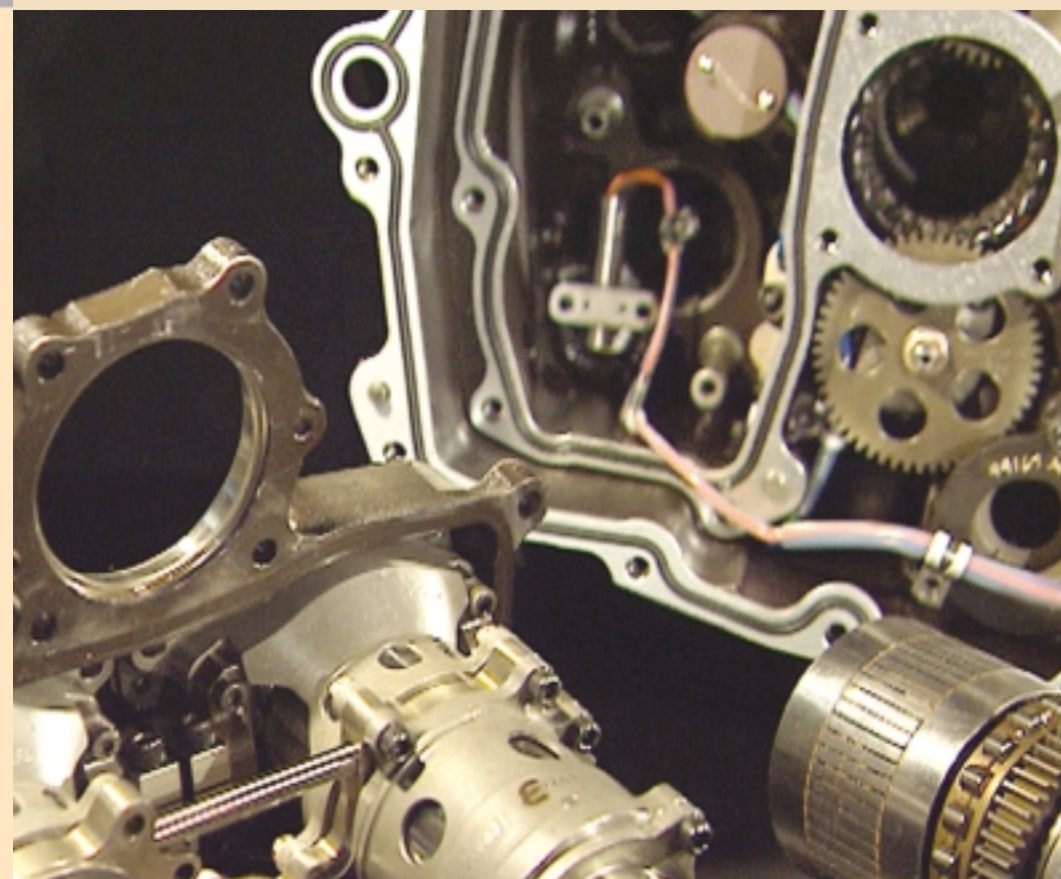
overhaul side, but also at production where they help to improve the quality processes. At the automated part marking, the part identification is recorded instantly by the relevant software, which generates an error-free production document. Thus, the cases where the production documentation does not match the final product (production escapes) are substantially reduced.

The labour cost of the marking process itself is reduced by a factor of up to 20 when compared to manual marking. This is easily understandable when looking at manually marked parts (see photo above right).

Conclusion

Airbus listened to the requirements of their airline customers and implemented a standard *machine-readable* part identification in close corporation with the ATA and other manufacturers. This initiative represents a further step towards the application of automated processes and thus contributes to reduction in labour costs and time while increasing quality. ■





Like blood in a human body the oil is the key component of the IDG



*By Pascal Chabriel
Electrical Power Generation System
Engineering
Airbus Customer Services*

Airbus in-service experience indicates that the Integrated Drive Generator servicing procedure may not always be strictly followed. This situation can lead to incorrect oil level settings, subsequent

equipment damage and electrical system malfunction. Because things are done better when they are fully understood, this article serves as a reminder of how the IDG oil system is filled during the servicing.



Oil The key component of the of IDG

The IDG provides electrical power to all aircraft systems, and therefore its reliability is of the utmost importance. It consists of a generator and a constant speed drive (CSD). The CSD converts the variable input speed of the engine into a fixed rotation speed for the generator. Thus the generator is able to provide a fixed frequency to the aircraft electrical network.

Like blood in a human body the oil is the key component of the IDG. It is used for cooling and lubrication but it is also a hydraulic fluid used by the CSD to mechanically regulate the rotation speed of the generator. The reliability of the IDG and its efficiency depends on the cleanliness and the correct quantity of oil.

Servicing procedure Keep the oil clean

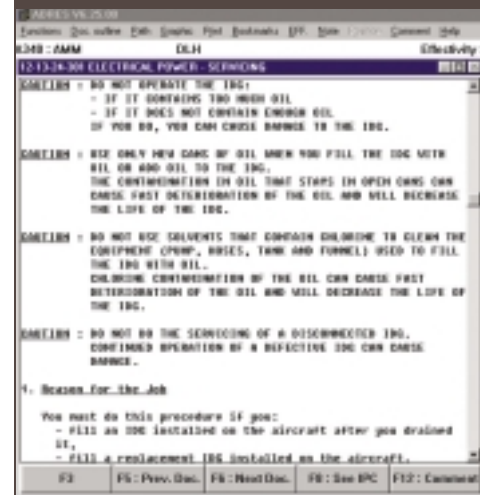
The IDG servicing procedures of the Aircraft Maintenance Manual (AMM) give some precautions ensuring the cleanliness of the oil.

The contamination of oil with water, chlorinated solvent or dust can cause premature filter clogging, excessive wear of the IDG and overheating conditions.

Excessive water in the oil will accelerate hydrolytic degradation with resultant increase in acid content that attacks the magnesium/dichromate housing and forms a gel that invisibly plugs filters. Oil contamination with water can occur during storage or during the servicing of the IDG. Oil containers, pumps, funnels and other dispensing equipment should be kept in a clean and dry environment. Also it is preferable to use a new can of oil when servicing the IDG.

Excessive Chlorine in the oil will increase the acid content. With a small amount of water in the oil, it can hydrolyze to form a corrosive acid, which will attack magnesium and copper within the IDG. Care should be taken to prevent entry of chemical solvents into the IDG. For example pressurized solvents should not be directed on the vent or check valves of the IDG. Disposable filter elements should not be cleaned as filter media will retain solvent. Also the external IDG oil cooler should not be

The IDG servicing procedures of the AMM give some precautions ensuring the cleanliness of the oil



Never use a can that has been already opened when servicing the IDG!

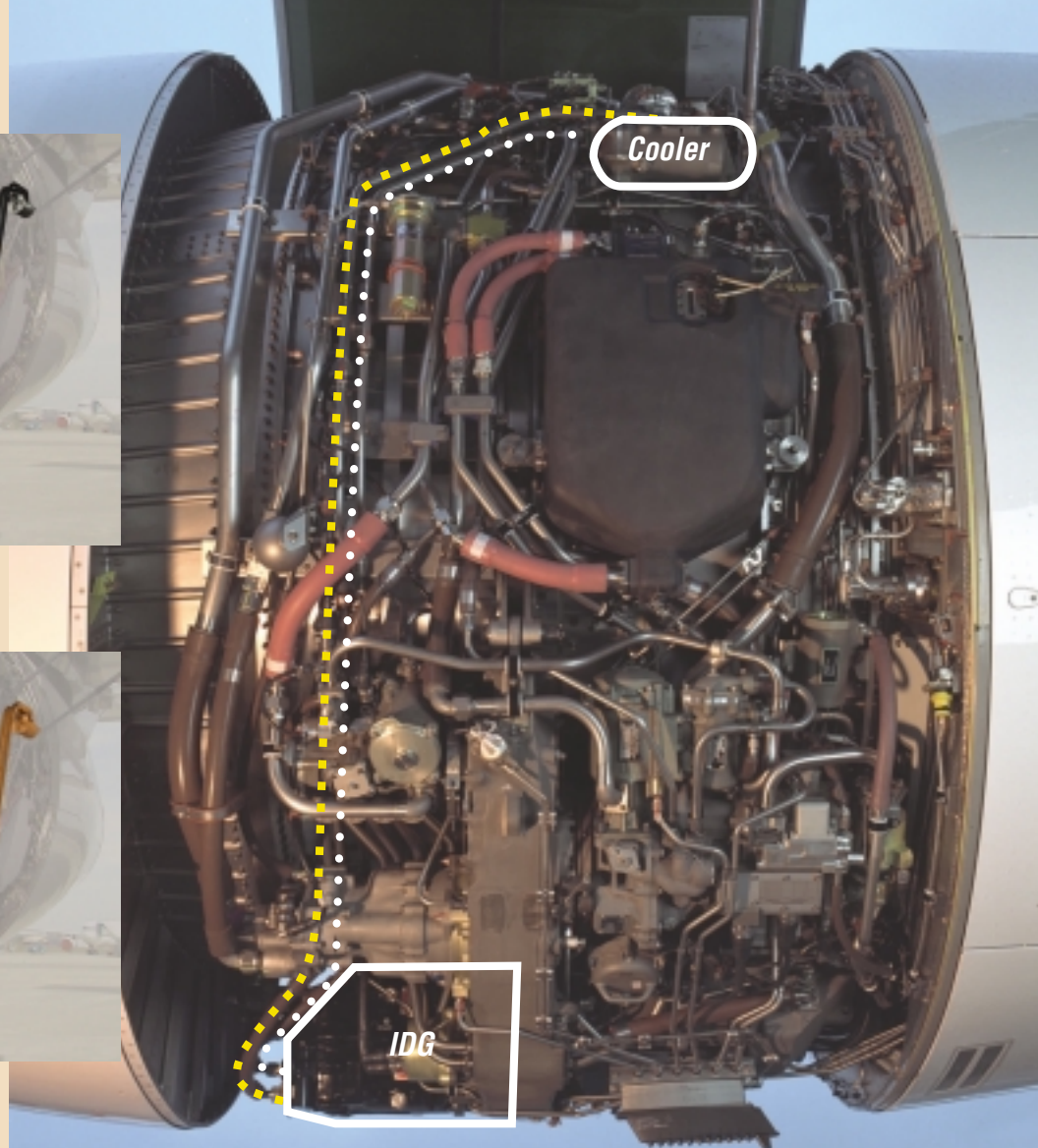




The oil circulates outside the IDG, into the cooler...



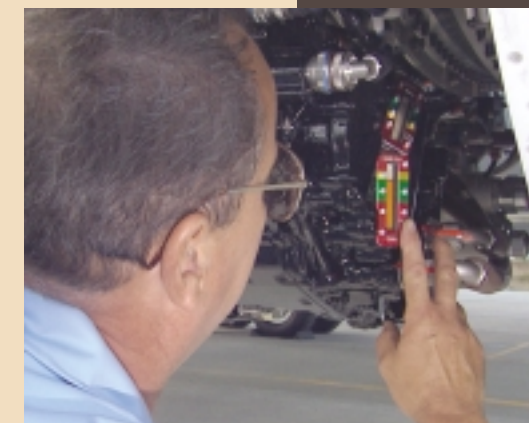
... and comes back into the IDG.



The optimum oil level is at or near the top of the green band.



The top of the overflow stand pipe corresponds to the top of the green band of the sight glass



Check the oil level after servicing

flushed on the aircraft as solvent residue will be trapped in the cooler.

Expel air pockets

During servicing the oil is pumped through the IDG pressure fill port. It goes through the IDG filter and exits the IDG into the external circuit, circulates into the cooler, flows through the external circuit again and comes back into the IDG case. Once the oil level exceeds the top of the overflow stand pipe it flows outside the IDG through the overflow drain port.

The servicing procedure is designed to fill all the cavities of the circuit with oil, expelling air pockets and thus setting the optimum oil level.

Set up the optimum oil level

The oil level is controlled via the sight glass. The optimum oil level is at or near the top of the green band. IDGs have an overflow stand pipe

that drains oil during the servicing to establish proper oil level. The top of the overflow standpipe corresponds to the top of the green band of the sight glass

If there is too much oil in the IDG the operating temperature increases. This equipment is more affected by overfilling due to a high-speed generator rotating in the case. High temperatures are reached faster along with reduced IDG reliability and potential IDG disconnection in flight.

A low quantity of oil may be at the origin of low oil pressure and electrical frequency fluctuations. The use of the generator may be lost in flight. Underfilling has other effects such as accessory gear wear and reduced IDG reliability.

On the A330/A340 there is a sensor that monitors the IDG oil level thus avoiding the requirements of a regular oil level check. If the oil level is near the bottom of the green band, low oil level detection may be generated during aircraft ground

operation due to the aircraft pitch angle variations (e.g when the aircraft is loaded or towed with the nose gear lifted) leading to additional burdens for the maintenance and flight crews.

Check the oil level after servicing

When the servicing is complete the engine must be dry motored or run at idle for at least two minutes to allow the oil to circulate through the system and ensure that every cavity of the oil system is properly filled with oil.

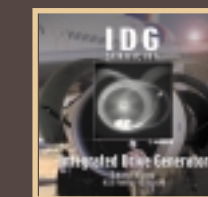
After the motoring the oil level must be allowed to settle down for five minutes. Then the oil level sight glass must be checked again to ensure that the oil level is at or near the top of the green band.

The oil level may be slightly above the top of the green band due to thermal expansion. In this case the acceptable level is within the yellow band above the green one.

However the oil level may have dropped due to the presence of air in the system before the motoring. In this case the servicing should be resumed.

Airbus has produced a film that illustrates in a user-friendly manner how the oil system is filled during the servicing. In addition to the current Aircraft Maintenance Manual (AMM) procedure, the film provides an overview of the IDG oil distribution and explains, using 3D animation, how the oil level is set inside the IDG. The film is available on a CD-ROM with an interactive mode, allowing easy navigation inside the IDG servicing presentation. It also contains a "Virtual Servicing" section which allows the viewer to fully understand what is happening inside the IDG system during replenishment of the oil.

For procurement details of the CD-Rom "IDG SERVICING" Ref 953.0616/01 refer to SIL 00-032.

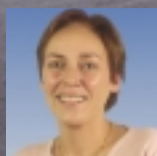


Conclusion

The AMM procedure must be strictly followed to ensure proper servicing. This is a key factor in ensuring a smooth and long IDG operating life. It contributes to the operational reliability of the aircraft, removes unnecessary workload and reduces maintenance costs. ■

AIRBUS SERVICE BULLETINS

What has changed with computerisation?



By Annick Pedron
SB Method, Process and Quality
Group Manager
and



Jacques Padeloup
SB Department Manager
Airbus Customer Services

Some years ago, in FAST number 13, an article presented a project of Service Bulletin (SB) digitalisation with the introduction of SGML at the SB author's workstation. The intention at that time was to reduce the production time, standardize the SB format, further improve the quality and prepare for the future. Looking at past achievements, the SB Computerisation (SB COMP) application, built "step by step", has allowed the implementation of more than just the initial basic objectives. It anticipated to a certain extent, the evolution of technology.



AUTOMATION

The full chain of the SB production process has been automated up to the dispatching to customers (with digital media), including on-line access. Actually, SB COMP provides digital services (SB under PDF and SGML formats) to AOLS (Airbus on-line services) for Airbus customers.

Every year the application brought major improvements to the SB process.

- 1993: SB writing automation on the basis of SGML and DTD standards.
- 1995: SB life-cycle follow-up in a centralized database from launching to dispatching.
- 1996: SB on-line consultation for all Airbus users involved in the process.
- 1997: Automation of paper and floppy production. It was the first time that digitized SB were proposed by Airbus to its customers.
- 1998: SB validity (expressed in MSN, also called "effectivity") computation, providing adequate follow-up of validity changes and giving the right information at the right time. The number of SB revisions for "effectivity" changes has drastically decreased.
- 1999: Automatic interface implemented between SB COMP and AOLS to provide SB as a digital product and on-line access to the customers.
- 2000: Automation of SB validation and approval within Airbus. This module coordinates actions by the different participants in this process, saving time while improving the overall quality of this validation and approval.

THE FUTURE

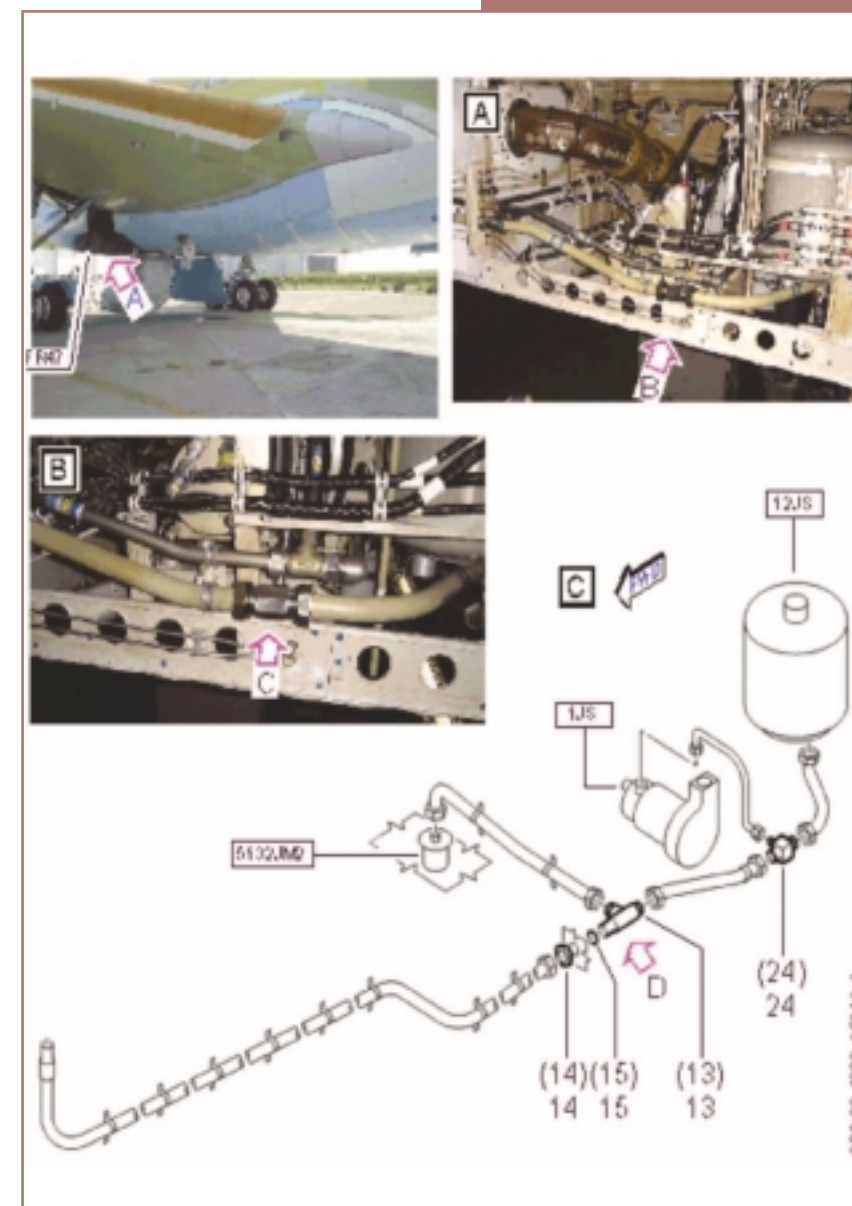
What will come next? Very soon, Airbus will introduce a kit revision indicator within the kit part number reference. This indicator will be quoted everywhere along with the kit reference, within the SB document. This will

allow the customer to order the latest kit revision.

In case a kit already delivered experiences a revision, only the additional parts will be supplied through a supplemental kit.

Last but not least, Airbus is preparing the SBs for the future. Several technologies based on the use of photographs have been tested to introduce some improvements in a medium term (within two years). The objectives of this new SB will be to reduce text and increase illustrations so as to give an easier and more accurate description of the part of the aircraft to be modified or inspected. A prototype presented during the A320 Family Technical Symposium in Seville in November 2000 was well received by the audience (see figure 1).

Figure 1
A340 SB on hydraulic systems
(SB A340-29-4054) "Modification of the blue system pipework between FR44 and FR46"
Current illustration completed with a set of photos describing access, step by step, to the area concerned by the modification.



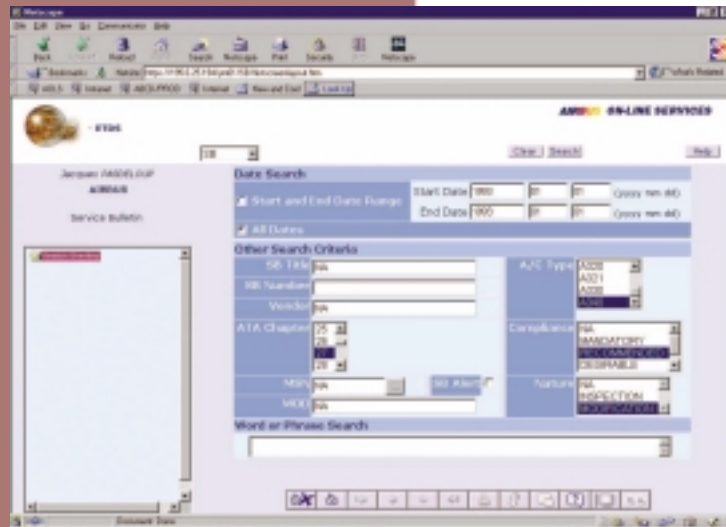


Figure 2
AOLS – Performing a search to retrieve Modification SB on ATA 27 for aircraft type A340 with compliance “mandatory”

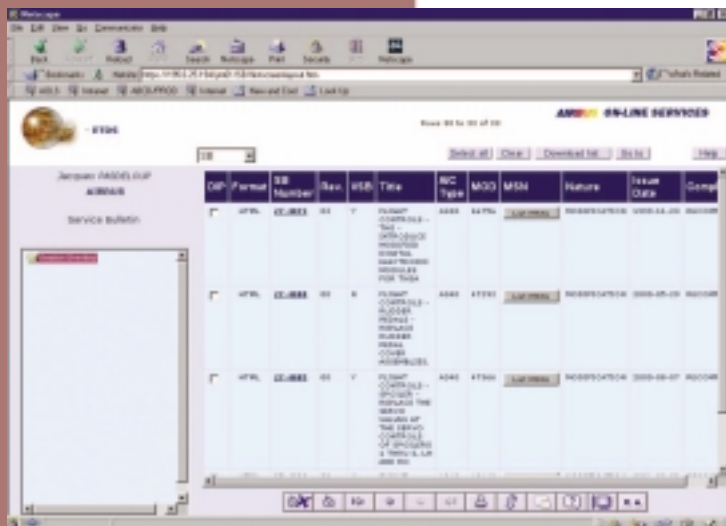


Figure 3
Search results listing SBs answering to selected criteria.

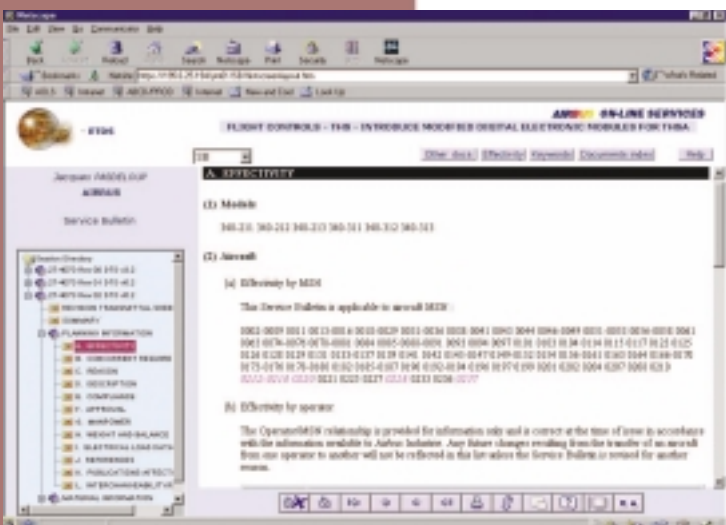


Figure 4
Clicking on 27-4023 gives access to related SB under HTML format

SB quality and technology is the subject of continuous improvement within Airbus, in order to make them easy to understand and to use.

The SBs dispatched during the week are entered in AOLS the following Monday. Access to these documents is through research criteria such as: MSN, Program, ATA chapter, text. AOLS also provides the list of associated documents, with the possibility to move back and forth between them (see figures left).

In future versions of AOLS, hyperlinks with Vendor Service Bulletins and other Tech Pub documents will be included in the SB.

Having access to the document on-line, facilitates specific tasks, such as job card preparation by allowing copying and pasting of text and illustrations. It also gives the possibility to download the file into a portable PC and to use it directly on the work site.

In the longer term, for the A380, the digitalised computer aided design (CAD) drawings will be used in the next-generation multimedia Service Bulletin. The digital drawings will provide 3-D views of the areas concerned by the modification or the inspection (see figure 5).

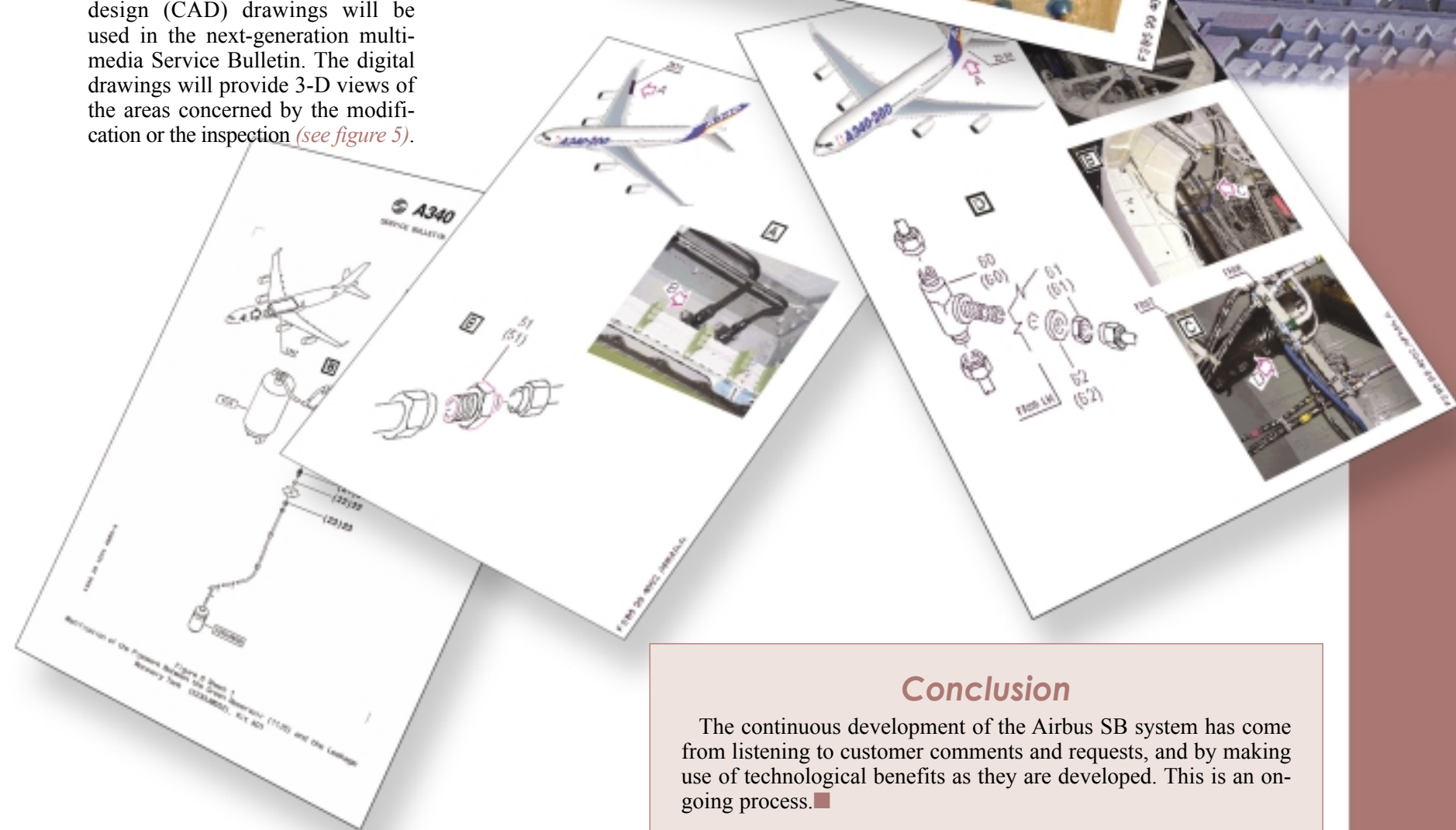


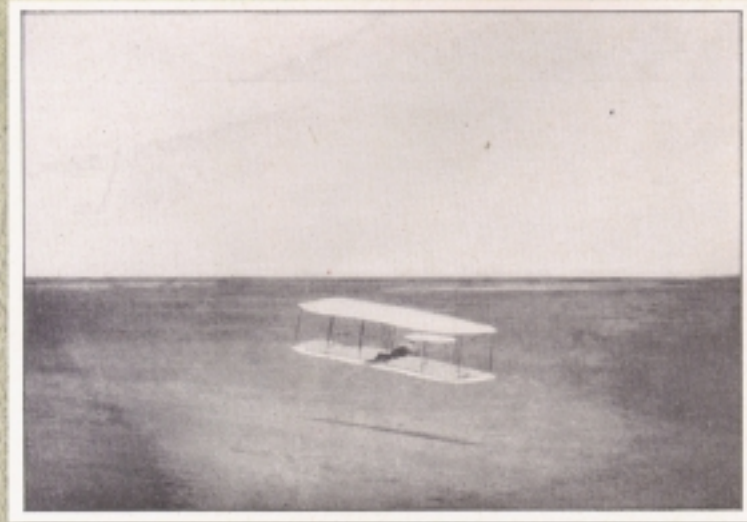
Figure 5
On screen digital view of a cleat at stringer 32 (SB A320-53-1046) with rivets to be installed (Snapshot from a film)

Conclusion

The continuous development of the Airbus SB system has come from listening to customer comments and requests, and by making use of technological benefits as they are developed. This is an ongoing process. ■

AVIATION 100 YEARS AGO

Orville and Wilbur Wright were well into their research programme into the theory and mechanics of flight. They had built and flown bi-plane kites, which made over 1000 flights. Stability was carefully studied and measurements were made of lift and drag. The kite made in 1901 with spruce and ash spars and ribs carried a pilot lying horizontally. It flew 50 metres. All of which led to eventual success with powered flight two years later.



The end of a glide by one of the Wright brothers

First flight of Capt. Ferber on his glider no. 4 at Nice



Simultaneously in Europe some wonderful men were trying to get their flying machines airborne.

Capt. Ferdinand Ferber jumped off a five metre high scaffolding at Nice in December 1901 and flew 24 metres. He jumped off the scaffolding a few more times but the stability of his kite was "a bit uncertain" so he also built a bi-plane kite, made of bamboo.

MEN WITH A VISION...

Perhaps the most interesting and most advanced was the flying boat built in Austria by **Wilhelm Kress**. It had three wings in parallel and at different heights so that each one would be in undisturbed air. Their combined surface area was 94 square metres. The wing ribs were made of wood but all the rest of the structure was of light steel tubing.

The total structure sat on two aluminium floats with keels so that the machine could take off from snow or water. It had an elevator and two rudders, one of which was in the water.

All the surfaces were controlled from a single horizontal control column by one hand.

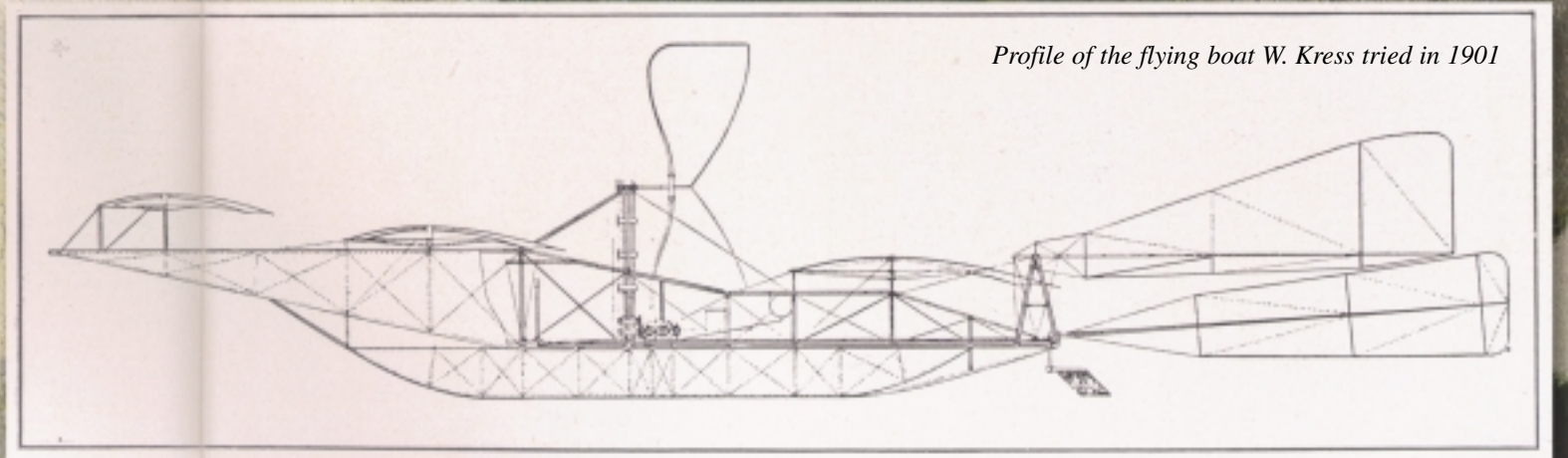
Two propellers were supposed to be powered by a 40hp motor weighing 200kg. However when the engine arrived it weighed 380kg and gave only 30hp.

In spite of this severe handicap Herr Kress tried out his flying machine on a lake. The power was enough to raise the floats significantly in the water. Unfortunately after a sharp turn the machine capsized. Herr Kress spent 20 minutes in the water, and the rest of his money rebuilding his wonderful machine.

He was then 66 years old, and broke, so he didn't try to fly again. He died in 1913.



Kress's flying boat in Austria



Profile of the flying boat W. Kress tried in 1901

CUSTOMER SUPPORT

USA/CANADA

Gérard RAYNAUD, Senior Director Customer Support
Tel:+1 (703) 834 3506
Fax:+1 (703) 834 3464

CHINA

Emmanuel PERAUD, Director Customer Support
Tel:+86 10 6456 7720
Fax:+86 10 6456 76942 /3 /4

REST OF THE WORLD

Jean-Daniel LEROY, Vice President
Customer Support
Tel:+33 (0)5 61 93 35 04
Fax:+33 (0)5 61 93 41 01

RESIDENT CUSTOMER SUPPORT ADMINISTRATION

Philippe BORDES, Director
Resident Customer Representation 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 store in Hamburg, and subsidiary stores at Frankfurt, Washington D.C., Beijing and Singapore.

Airbus operates 24 hours a day every day. AOG technical and spares calls in North America should be addressed to
Tel:+1 (703) 729 9000
Fax:+1 (703) 729 4373

AOG technical and spares calls outside North America should be addressed to
Tel: +49 (40) 50 76 3001/3002/3003
Fax:+49 (40) 50 76 3011/3012/3013

Airbus training centre Toulouse, France
Tel:+33 (0)5 61 93 33 33
Fax:+33 (0)5 61 93 46 65

Airbus training subsidiaries:
Miami, Florida
Tel: +1 (305) 871 36 55
Fax:+1 (305) 871 46 49
Beijing, China
Tel:+86 10 64 57 33 40
Fax:+86 10 64 57 09 64

WORLDWIDE AIRBUS CUSTOMER SERVICES



RCSM Location

Country

Abu Dhabi United Arab Emirates
Algiers Algeria
Amman Jordan
Athens Greece
Bangkok Thailand
Beirut Lebanon
Berlin Germany
Brussels Belgium
Buenos Aires Argentina
Cairo Egypt
Charlotte USA (North Carolina)
Chengdu China
Santiago Chile
Cincinnati USA (Ohio)
Colombo Sri Lanka
Copenhagen Denmark
Dakar Senegal
Damascus Syria
Delhi India
Denver USA (Colorado)
Derby United Kingdom
Detroit USA (Michigan)
Dhaka Bangladesh
Doha Qatar
Dubai United Arab Emirates
Dublin Ireland
Duluth USA (Minnesota)
Düsseldorf Germany
Frankfurt Germany
Guangzhou China
Hangzhou China
Hanoi Vietnam
Helsinki Finland
Hong Kong SAR China

RCSM Location

Country

Indianapolis USA (Indiana)
Istanbul Turkey
Jakarta Indonesia
Jinan China
Kingston Jamaica
Kuala Lumpur Malaysia
Kuwait City Kuwait
Lanzhou China
Larnaca Cyprus
Lisbon Portugal
London United Kingdom
Louisville USA (Kentucky)
Luton United Kingdom
Macau SAR China
Madrid Spain
Manchester United Kingdom
Manila Philippines
Mauritius Mauritius
Medelin Columbia
Melbourne Australia
Memphis USA (Tennessee)
Mexico City Mexico
Miami USA (Florida)
Mineapolis USA (Minnesota)
Monastir Tunisia
Montreal Canada
Moscow Russia
Mumbai India
Nairobi Kenya
Nanchang China
Nanjing China
New York USA (New York)
Noumea New Caledonia
Nürnberg Germany

RCSM Location

Country

Oslo Norway
Palma de Mallorca Spain
Paris France
Philadelphia USA (Missouri)
Phoenix USA (Arizona)
Pittsburgh USA (Pennsylvania)
Qingdao China
Rome Italy
San Francisco USA (California)
San Jose Costa Rica
San Salvador El Salvador
Santiago Chile
Sao Paulo Brazil
Seoul South Korea
Shanghai China
Sharjah United Arab Emirates
Shengzhen China
Shenyang China
Singapore Singapore
Stockholm Sweden
Taipei Taiwan
Tampa USA (Florida)
Tashkent Uzbekistan
Tehran Iran
Tokyo Japan
Toronto Canada
Tulsa USA (Oklahoma)
Tunis Tunisia
Vancouver Canada
Verona Italy
Vienna Austria
Winnipeg Canada
Xian China
Zurich Switzerland

In a nutshell...

Just happened...



AIRBUS TRAINING & FLIGHT OPERATIONS CONFERENCE

November 2001
Sanya, Hainan, China

The Civil Aviation Authority of China (CAAC) and Airbus held a successful Training & Flight Operations conference in China.

More than 40 senior representatives from Chinese Airlines and 20 representatives from the Chinese Authorities attended the conference.

The conference covered a wide range of topics, and was seen as "a powerful event to increase air safety awareness in China". ■

Coming soon...



1ST AIRBUS FLIGHT OPERATIONS MONITORING CONFERENCE

12-13 March 2002
Hong Kong

Organised in cooperation with
Cathay Pacific Airways

Regulations are becoming more demanding on monitoring of flight operations, which is seen as a key means for all operators to improve safety.

The objective of this conference is to share monitoring concepts to help improve proactive and reactive approaches to safety. The conference has therefore been structured to encompass the concept of monitoring of flight operations, the status of regulations and international programmes and presentations of operators' experience.

The preliminary agenda with the formal invitation will be sent in January 2002. ■



5TH A330/A340 TECHNICAL SYMPOSIUM

27-31 May 2002
Montreal, Canada

The next A330/A340 Technical Symposium will be held in Montreal from 27 to 31 May, 2002.

In changing slightly the symposium format, major issues of the programme will be elaborated with inputs from A330/A340 operators instead of responding to several hundred individual technical queries. For one of the 'keynote' items Airbus will brief the customer/operator community about the A340-600 Flight Test and Maturity programme prior to its entry into service.

As requested at the last symposium by the majority of participants, this time a four and a half day event has been scheduled (instead of three and a half) to avoid parallel sessions as much as possible.

The preliminary agenda with the formal invitation will be sent in January 2002. ■

AIRBUS AIRCRAFT SECURITY CONFERENCES

9 October 2001, Washington - 11 October 2001, Paris - 11 December 2001, Paris

Following September 11th, Airbus set up a series of conferences on aircraft security. The objectives were to examine ways to minimize risks related to the threat of terrorism in air transport and propose solutions to respond to these threats. Airbus continues to identify and investigate solutions which could be implemented in the very short term.

The main improvements are:

- cockpit door reinforcement
- installation of a video camera (to make the cabin forward area visible to the pilots)
- installation of a specific emergency cockpit/cabin communication system
- a modification linked to the ATC transponder, allowing the pilot or co-pilot to transmit a 'hijacking mode' permanently to the ground

During these conferences Airbus presented feasible technical proposals and evaluated operator's priorities. Technical definitions will be provided to meet the new FAA requirements linked to Aircraft Security enhancement. ■