JULY 2002

AIRBUS TECHNICAL DIGEST

FAST N°30

FAST 30

Flight Airworthiness Support Technology

Customer Services

AIRBUS

FAST 30

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AIRBUS TECHNICAL DIGEST

JULY 2002

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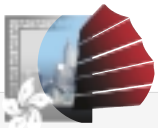
Cover illustration:
A340-600 cold weather testing, Iqualit, Frobisher Bay, Canada in January 2002

Airbus Customer Services

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

Just happened…



1ST AIRBUS FLIGHT OPERATIONS MONITORING & SAFETY DEVELOPMENT CONFERENCE

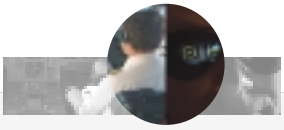
Hong Kong
12-13 March 2002
(In association with Cathay Pacific)

220 participants attended the 1st conference of this kind of which the main objective was to share flight operations monitoring concepts in order to improve proactive and reactive approaches to safety. The driving forces in this programme were operations and safety issues, in which participants enjoyed constructive exchanges and included presentations of operators experiences. This first conference was addressed mainly to the Middle East, Asia, China, Australia and Russia, and confirmed the great involvement of operators in safety approaches and moreover their wish to work closely with Airbus in implementing efficient monitoring systems.

5TH A330/A340 TECHNICAL SYMPOSIUM

Montreal, 26-31 May 2002

This very positive event was attended by 357 participants including representatives from 50 airlines and 30 vendors and feedback has shown that expectations were exceeded. Topics covered included all technical issues affecting the A330 and A340 fleet.They also included inputs from A330 and A340 operators. One of the core issues was the A340-600 flight test and maturity programme and there was also discussions on non-technical more general matters. Following tradition the event included a social evening. The next A330/A340 technical symposium will take place in 2004.



15TH HUMAN FACTORS SYMPOSIUM

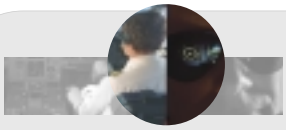
Dubai, 18-20 June 2002
(In association with Emirates)

This event welcomed a range of delegates including academics, consultants, representatives from industry and 91 participants from eigteen different airlines (mainly the Middle East). This overwhelming success was driven by the motto of safety and included sessions on situational awareness, threat and error management, Crew Resource Management (CRM) and fatigue and alertness management. Participants enjoyed much interacting with the Airbus team during Q&A sessions and feedback shows that these events highlight an evolution of our products, our brand and our communication strategy.

JAN 02 | FEB 02 | MAR 02 (1) | APR 02 | MAY 02 (2) | JUNE 02 (3) | JULY 02

Coming soon…

AUG 02 | SEPT 02 | OCT 02 (4 5) | NOV 02 (6) | DEC 02 (7 8)



16TH HUMAN FACTORS SYMPOSIUM

Singapore, 7-11 October 2002
(In association with
Singapore Airlines)

Themes for discussion will be concerned with Human Factors issues in safety, training, long haul operations, Flight Operations Monitoring, electronic flight operations. New this time will be A380 novelties. As with previous Human Factors events wide opportunities for dialogue will be created in an effort to ensure constant improvement.

1ST TECHNICAL DATA SUPPORT & SERVICES SYMPOSIUM

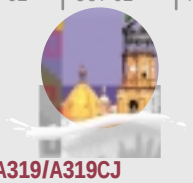
Barcelona, 9-12 December 2002

An estimated 250 delegates including 150 participants from 100 airlines are expected to attend this first Technical Data Symposium. The main objective of this event is to promote the technical data and support services including the main themes of digital services and the migration from paper todigital. The symposium will also include presentations from airlines detailing their experiences with the use of technical data.

6TH AIRBUS TRAINING SYMPOSIUM

Sevilla,
15-24 October 2002

Preparation for the next Airbus Training Symposium, which has been split into two parts for flight crew and maintenance staff, is in progress. It will provide a unique opportunity for briefing on all Airbus training programmes and facilities. Participants will include representatives from airlines, airworthiness authorities and specialised Airbus staff therefore enabling participants to share their experiences. There will also be the opportunity for participants to gain hands-on-experience of new training devices and software.



A318/A319/A319CJ A320/A321 TECHNICAL SYMPOSIUM

Puerto Vallarta
17-22 November 2002

This next Technical Symposium, one day longer than in the past, will include actual in-service issues covering the A320 programme and general interest subjects concerning the A320 family with a dedicated session for A319 Corporate Jet customers. The main themes will be structures, engines and systems with time for Q&A sessions and general topic discussions.

1ST WARRANTY CONFERENCE

Barcelona, 2-5 December 2002

Airbus is proud to announce the 1st warranty conference to which all customers operating all aircraft types are kindly invited to attend. The programme will be developed in direct contact with our customers and will include well prepared workshops and dedicated Q&A sessions.

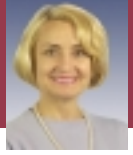
Flight Operations Monitoring program

A PROACTIVE CONTRIBUTOR TO SAFETY

Airbus Corporate vision has always included as its basic tenet:
'Flight safety first'
We are very aware at Airbus that safety is the single most important asset of our business. Corporate shareholders, customers and employees depend on it for the success of our products and for continued belief in our philosophy and knowledge. We believe that the most strategic and effective way to promote safety is to establish, maintain and develop a positive safety culture in all areas of design, manufacture and operations.

Within the frame of its Flight Operations Monitoring program, Airbus has undertaken the definition of a world standard with world safety institutions and authorities whilst working in close partnership with the market's key actors in developing industrial co-operation programs, and supporting a network of third parties using its methods and standards.

Today, Airbus is confident its program will satisfy airlines' specific needs.
Whether already equipped with a Flight Operations Monitoring program or wishing to implement such a system internally, Airbus offers a complete and efficient set of services for Flight Operations Monitoring.



Anne Fabresse, Line Assistance Director
Airbus Customer Services
Flight Operations Support and Line Assistance

FLIGHT OPERATIONS MONITORING PROGRAM

Flight Operations Monitoring
An integrated approach

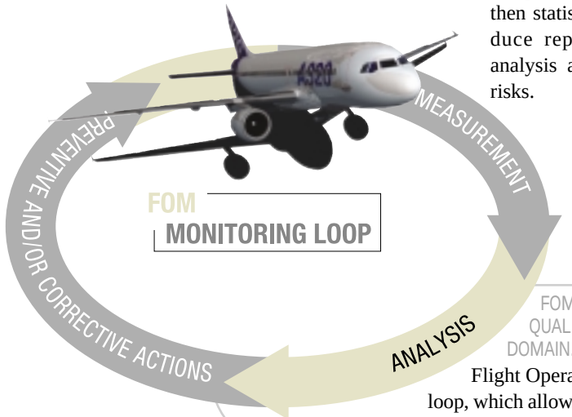
OBJECTIVE

The Flight Operations Monitoring (FOM) program implements a prevention system based on identifying accident and incident precursors. The program increases the understanding of the root causes of safety instability in the system enabling the operator to formulate counter strategies.

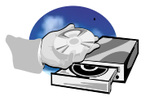
Three main steps are needed to build an FOM program:
- accurate measurement of deviation from normal operations,
- situation analysis, identification of risk precursors and of root causes,
- launching of preventive and corrective actions to improve safety.

Measurement tools & techniques

The accurate measurement of deviations from normal operations requires complementary tools and techniques in order to understand not only what deviations occurred but why deviations occurred.



FLIGHT DATA MONITORING



This approach pertains to the routine collection and analysis of flight data to provide more information about, and greater insight to, the total flight operations environment. The aim is to provide a feedback for safety management, raising to the surface errors and operational deviations that can be considered as "precursors" of accidents or incidents but which are not always directly visible.

FOQA: Flight Operations Quality Assurance is another designation for this part of the FOM system.

Flight data analysis requires equipping aircraft with specialised devices (Quick Access Recorders, PCMCIA cards, wireless connection systems…) in order to systematically capture flight data collected on the aircraft's flight data recorder.

Data is processed in a centralised ground station, in order to qualify and quantify deviations from standard operating procedures and company policies. These deviations are compiled in a database as events and then statistically processed to produce reports performing trend analysis and identifying potential risks.

FLIGHT CREW OBSERVATION

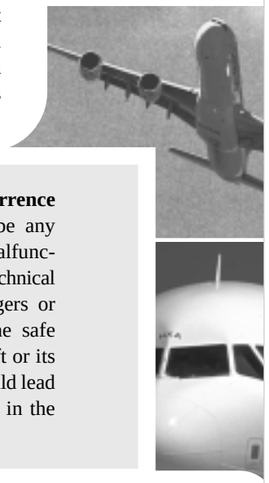
An essential part of FOM program is crew observation. It is only through actual crew observations that we can see the whole picture: the way a deviation from normal occurred, why it happened and how the crew managed the situation.

Evaluation sheets are compiled to produce statistical reports on crew performance in:
- crew resource management and communication,
- application of Special Operating Procedures (SOPs),
- use of aircraft management systems.

FLIGHT CREW REPORTING

It provides the individual crewmember or collective group with a perception of the event occurrence. Crew reporting is an essential element in establishing a diagnosis when looking for causes from symptoms.

A reportable occurrence is understood to be any incident, fault, malfunction, deviation or technical defect that endangers or could endanger the safe operation of the aircraft or its occupants or which could lead to an unsafe condition in the aircraft.



FOM RESULTS FROM THE APPLICATION OF THE BASIC QUALITY ASSURANCE PROCESS TO THE FLIGHT OPERATIONS DOMAIN.

Flight Operations Monitoring (FOM) is a continuous monitoring loop, which allows an operator to precisely follow the impact of actions launched, in order to obtain the quickest and most efficient improvements.

Mandatory and voluntary incident reporting, here we distinguish both:

The mandatory channel is obligatory; reports have to be submitted in the name of the whole cockpit crew and may be forwarded by the airline to the airworthiness authorities if safety has been significantly threatened.

In the voluntary channel, reports may be submitted at the discretion of an individual crewmember and could become invaluable information if a safety hazard and/or safety precursor was encountered, and also, if safety was imperiled it helps to understand why an event occured.

RISK ANALYSIS AND DECISION MAKING

To develop objective information, a Flight Operations Monitoring system combines data with other sources and with operational experience to enhance:
- training effectiveness,
- operational procedures,
- maintenance and engineering procedures,
- air traffic control procedures.

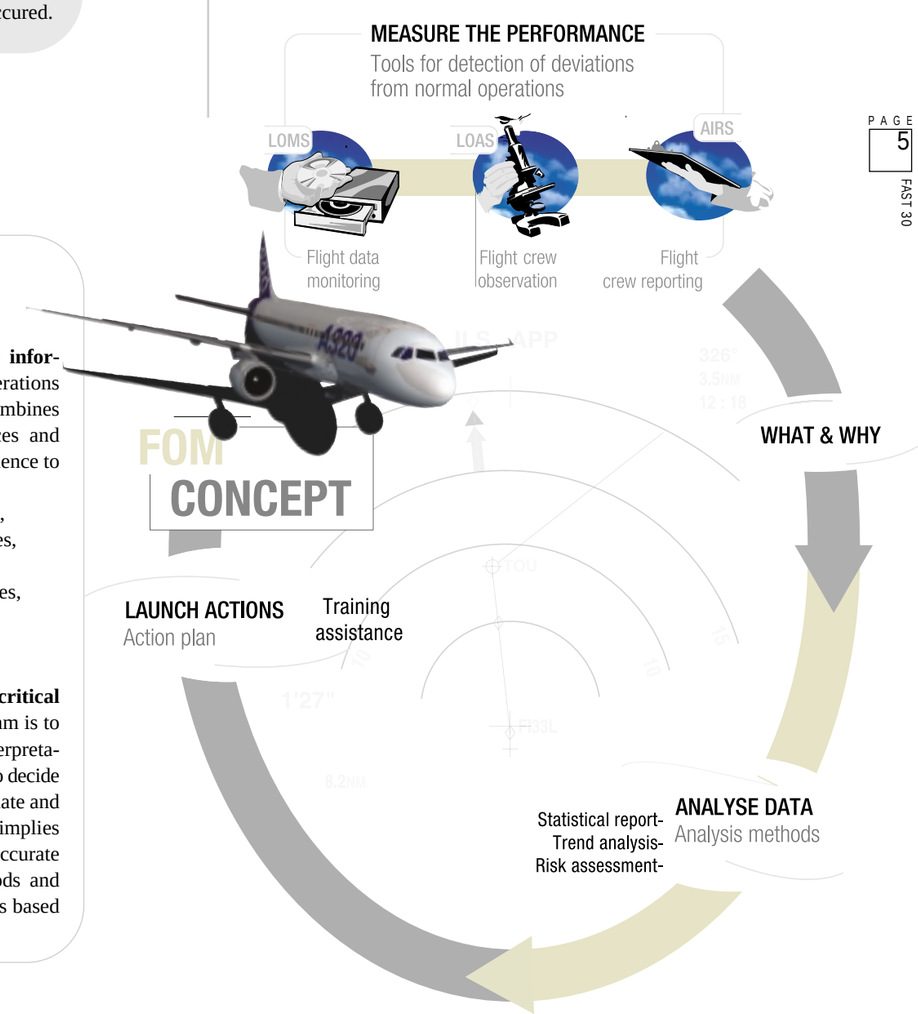
The major and most critical step of an FOM program is to perform a pertinent interpretation of the results, and to decide upon the most appropriate and efficient actions. This implies the establishment of accurate risk assessment methods and guidelines for decisions based on detected risks.

Flight Operations Monitoring
An integrated service

Based on Airbus methods and expertise, built through close teamwork with its operators and with world safety institutions, the Airbus FOM support offers a broad range of scalable, modular software tools, data and methods as well as operational services adaptable to each airline's needs.

abbreviations

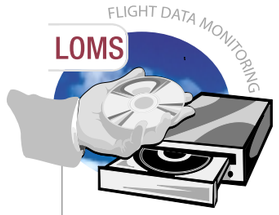
FOM	FLIGHT OPERATIONS MONITORING
LOMS	LINE OPERATIONS MONITORING SYSTEM
LOAS	LINE OPERATIONS ASSESSMENT SYSTEM
AIRS	AIRCREW INCIDENT REPORTING SYSTEM
LOSA©	LINE OPERATION SAFETY AUDIT
FOQA	FLIGHT OPERATIONS QUALITY ASSURANCE
SOP	SPECIAL OPERATING PROCEDURES
FDM	FLIGHT DATA MONITORING



FLIGHT OPERATIONS MONITORING PROGRAM

FOM tools

Airbus proposes a range of tools to airlines who are not already equipped. These tools have been designed to be the most operational-oriented possible. Solutions to ease analysis and decision-making process.



LINE OPERATIONS MONITORING SYSTEM

It is a measurement, analysis and reporting software tool processing the aircraft flight data. It automatically provides statistical reports on flight operation performance and potential risks assessment. LOMS integrates the Airbus flight profiles and can be applicable to the whole fleet of the operator.

Currently LOMs is being merged with the Flight Data Monitoring software from **Teledyne called FLIDRAS**. The new system will be available in 2003

TELEDYNE CONTROLS

LINE OPERATIONS ASSESSMENT SYSTEM

It covers the following domains of flight operations:
- cockpit crew operations,
- operations Support,
- cabin operation,
- operating environment.

LOAS uses the University of Texas Data Collection Methodology for some aspects of crew operations assessment. This methodology is called "LOSA©*" (Line Operation Safety Audit) and is based on threat and error management which is considered by the Airbus specialists in Human Factors and by many other world specialists as the most efficient means for identifying risk precursors.

LOAS has been designed to be a stand-alone system, used by an operator to perform crew observations.

A generic tool that an operator can customise from the evaluation forms to the key word dictionary and to the desired set of reports.

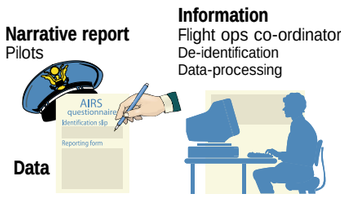
*LOAS© copyright the University of Texas at Austin 2001

AIRCREW INCIDENT REPORTING SYSTEM

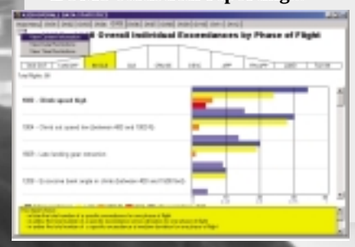
It is part of the BASIS Safety Information System developed by British Airways. It can interface with existing BASIS modules.

Further to flight data analysis and crew performance, **AIRS allows a voluntary crew report** which will enable the operator to understand why some deviations have occurred and will give rise to relevant recommendations.

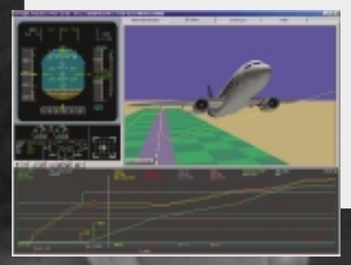
From data to trends and lessons learned



LOMS statistical reporting...



LOMS integrated flight animation...



LOAS data process in 3 stages...

FOM methods and data

METHODS

FOM Handbook
Airbus, in cooperation with Cathay Pacific, Air France and Aeroconseil, has developed standard methods contained in the FOM Handbook, which describes the Flight Operations Monitoring concept and provides guidelines to successfully implement such a process within airlines.

Safety and FOM training course
In addition to the FOM Handbook, Airbus has developped a one week Safety and FOM training course, dedicated to the safety and flight operations managers and those responsible for FOM in the airlines, as well as those in the regulatory authorities.

DATA

Flight profile specifications
Because the accurate definition of the deviations from normal operations is a key element for a comprehensive flight data analysis, Airbus proposes its flight profile specifications, to be integrated in any Flight Data Monitoring system.

A flight profile is the set of references to which the flight data is compared in the Flight Data Monitoring process. Each time the flight data deviates from a reference value, an event is triggered. The flight profile includes parameter filters, additional parameter computation, and event detection algorithms. On a scale of risk, deviations from the standard flight profile are classified into three severity levels allowing risk assessment of events and trends as a basis for remedial actions to be implemented:
- low severity: green
- medium severity: amber
- high severity: red.

(see graph below)

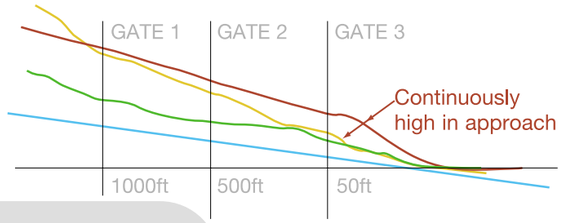
The severity levels have been set to ensure compliance with the flight operations regulations, the aircraft limitations and the Airbus standard procedures.

The events and deviations have been defined by operational and flight engineers and have been validated during specific flight tests. They are finalised and validated through thousands of flights in partnership with some Airbus operators. The events triggered could be single punctual events (around 100 are monitored).

As well as potential risk situations resulting from the combination of single events, the following situations are currently monitored.
(see table below)

The standard flight profiles are implemented and operational on LOMS.

Airbus provides operators with the specifications of the standard flight profile related to all the configurations of the aircraft.
Having the specifications available allows the Airlines to programme them in their own flight data management system.



Monitored situations

Continuously **low** during final descent	Over rotation at take off	Low energy situation in approach
Continuously **slow** during final descent	Under rotation at take of	High energy situation in approach
		Late offset in short final
Continuously **high** during final descent	Low energy take off	Poor braketing on final
Continuously **fast** during final descent	High energy take off	Roll oscillations prior to flare
Continuously **steep** during final descent	Tail strike risk at take off	Wing strike risk at landing

FLIGHT SAFETY FIRST

FLIGHT OPERATIONS MONITORING PROGRAM

FLIGHT SAFETY FIRST

Airbus services

FOM ASSESSMENT

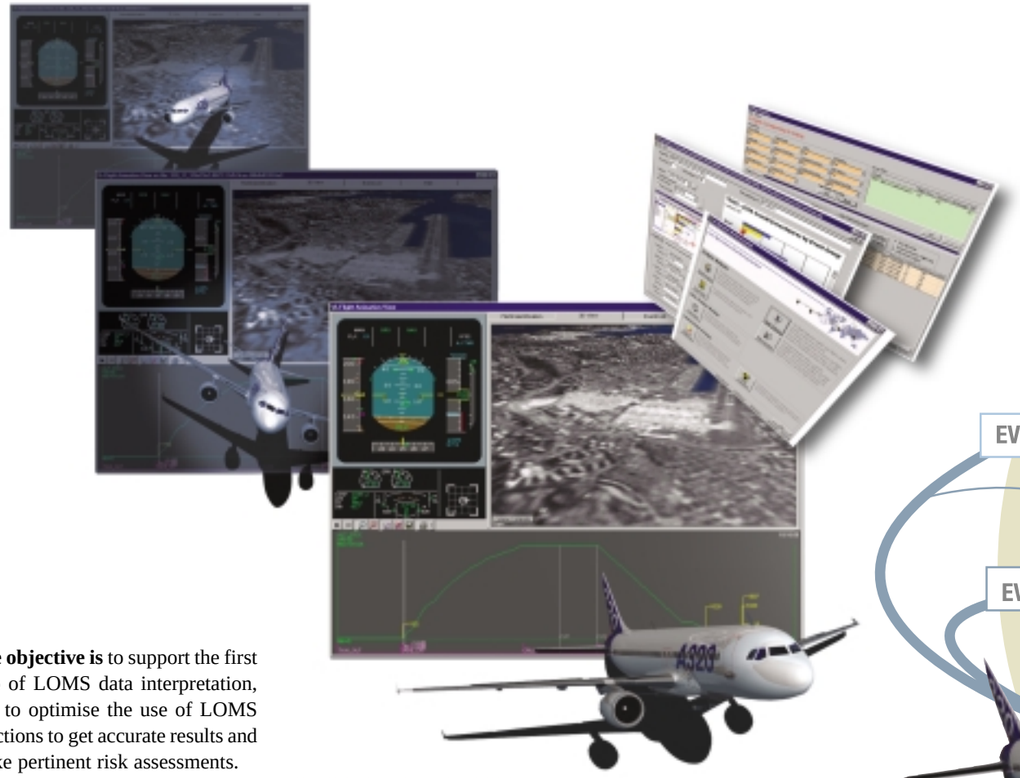
The FOM Assessement gives a clear picture of the current FOM system in an airline, reviewing the organisation methods and tools in place.

FOM assessment activities:
- review of the airline's Flight Operations Monitoring and safety policy,
- study of the company organisation and skills for FOM:
  - methods and means for Flight Data Monitoring
  - methods and means for airline incident reporting tools
  - methods and means for crew observation,
- review of risk assessment and and reporting process,
- organisation of the communication on lessons learned and on the impact of actions taken.

FLIGHT DATA MONITORING (FDM) ENTRY-INTO-SERVICE

After two or three months of data processing with LOMS (at least 200 flights are required), or any other FDM system on which the Airbus flight profiles are implemented, Airbus proposes specific services.

Five day on-site support
This on-site service performed by an Airbus FOM engineer and by an Airbus pilot experienced in FOM includes:
- detailed presentation of the flight profiles,
- assistance for the first flight data analysis,
- assistance to detect and cancel false events,
- interpretation of statistical reports,
- customisation of key values.



The objective is to support the first step of LOMS data interpretation, and to optimise the use of LOMS functions to get accurate results and make pertinent risk assessments.

This assistance is directed towards the airline pilots and analysts who are participating in the FOM program. This service is highly recommended to the operators implementing LOMS as their first Flight Data Monitoring tool.

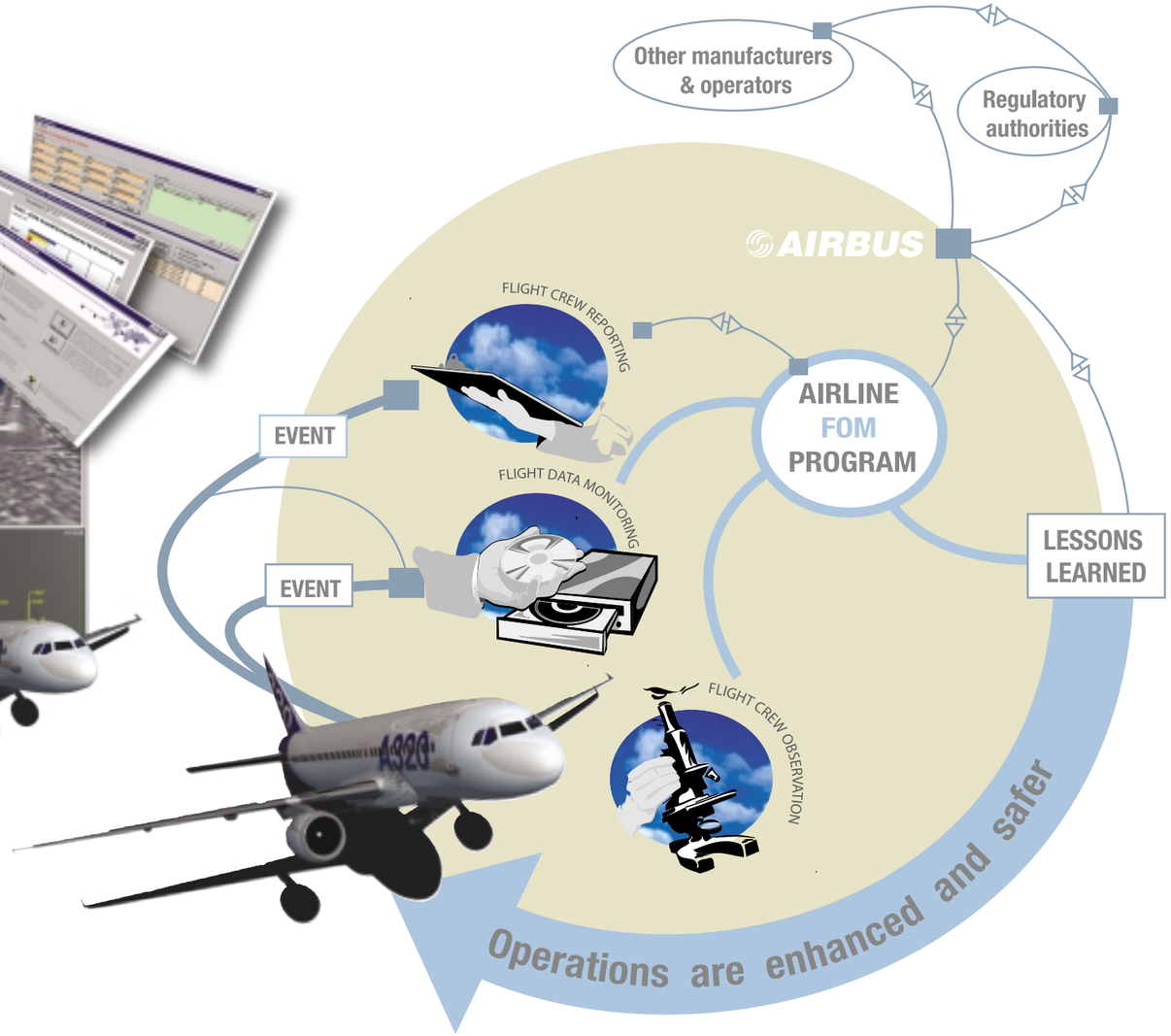
FOM OPERATIONAL SUPPORT

For a smooth and efficient implementation of the FOM program the operational support is highly recommended and is tailored according to the FOM assessment results.

THE FOM OPERATIONAL SUPPORT BENEFITS FROM THE CLOSE SUPPORT OF ALL AIRBUS OPERATIONAL AND TECHNICAL EXPERTISE

FOM engineering assistance performed by an FOM engineer: the assisting engineer helps the airline Information Technology department, Operational, Safety and Maintenance departments with the design and implementation of the process and techniques needed to support the Flight Operations Monitoring program.

FOM pilot assistance provided by a pilot experienced in FOM: the assisting pilot helps in the observation and interpretation of flight data. He or she also discusses the FOM program with the pilot community so that they agree and support the decision making process and the implementation of adequate corrective and preventive actions.



Conclusion

The Airbus policy on a comprehensive FOM package should make a lasting contribution to the installation of safety cultures by its customers.
The packaged approach of the Airbus FOM makes more sense than a modular one as it adds value to the management of potential risks. It is well aligned with contemporary safety initiatives seen at ICAO and at the Flight Safety Foundation.

Airbus FOM provides an integrated approach to inject lessons learned from:
- several other safety methods and means,
- both airline and manufacturer's experience,
- risk assessment activities and safety performance metrics based on measurements of safety performance and real operational performance data.

CONTACT DETAILS

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AIRBUS

RADIO FREQUENCY IDENTIFICATION FOR TRACKING TOOLS

Radio Frequency Identification
for tracking tools

Chips are all around us!!!
A new wave of smart chips has invaded the earth! In everyday life, the new chip technology has been applied in a variety of industrial, administrative and leisure fields: on credit cards, in our car keys (as a central locking function) and in the automotive industry where it is used to organise car production by retaining all the relevant specifications for a car ordered by a customer.

Former Vice-President of Airbus Materiel Support, Peter Kloepfer, decided in collaboration with a research institute to use the chip technology in order to optimise its tool-loan process.

The Radio Frequency Identification (RF/ID), able to store and retrieve essential data for high value, high usage items, which require close tracking, recently found a new application within the aircraft industry. Airbus decided, in collaboration with a research institute, to use the chip technology to optimise its tool-loan process.

This article explains why and how the RF/ID was introduced into the Airbus tool-loan process and how it can improve the tool-loan service for its customers as well as providing improvement in other areas of logistics management.

Michael von Sparr, Director Vendor Materiel
Airbus Customer Services
Materiel Support and Services

Tool-loan service in Airbus

While the major part of Airbus' tool business is concerned with selling tools and GSE (Ground Support Equipment), a significant part of the business deals with leasing tools. Airbus stocks tools and GSE for structural and other modification programmes, retrofit programmes, incidents or other repairs, and periodical checks.

WHY LEASE TOOLS?

Very expensive or rarely used tools are the most commonly leased by Airbus.

Advantages in leasing instead of buying:
- customers can avoid capital investment and eliminate redundant stock,
- the tools may be expensive and needed once only,
- the Airbus tool-loan service is reliable (98-99% tool availability),
- as tool quality requirements increase to the same level as GSE, Airbus takes care of calibration, repair and test reports, which means lower costs and less administration.

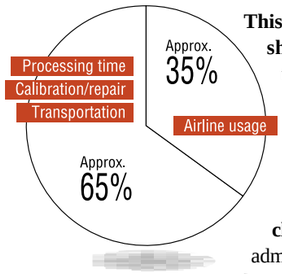
WHO LEASES TOOLS?

Maintenance centres, not airlines are the biggest tool loan customers. This may, in part, be explained by the reasons above and partly because the variety of customers managed leads to a need for a wider range of tools.

HOW DOES THE TOOL-LOAN SERVICE WORK?

Tool-loan process in 8 steps

1- The customer places a loan order for a tool with Airbus.
2- The freight forwarder collects the tool and sends it to the customer.
3- The customer uses the tool.
4- The freight forwarder collects the tool and sends it back to Airbus.
5- Airbus inspects the tool.
6- The freight forwarder collects the tool and sends it to the repair shop/calibration shop.
7- The tool is repaired/recalibrated.
8- The freight forwarder collects the tool and sends it back to Airbus again.



This model clearly shows that the tool is actually utilised in only 1 of 8 steps in the process.

It becomes clear how easily administration time and paperwork build up through each step in this long process. In fact, during the entire process, the tool will be used by the customer for just 35% of the time. The remaining 65% is processing time taken up by administration, transport, repair and calibration, resulting in an average run time of 58 days for each loan.

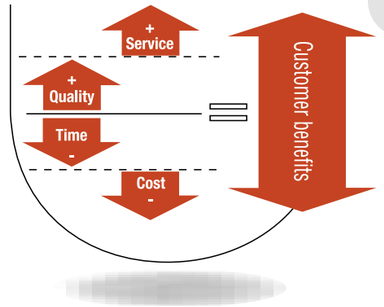
Due to Airbus' previous efforts to optimise tool-loan process, tool availability was already high, but it was clear that the process still had a very long Turn-Around-Time (TAT) which could be further improved.

DEVELOPMENT OF TOOL LOAN BUSINESS

Before 1996, Airbus loaned tools to around 20 customers but this increased rapidly to over 100 by 2000. Currently, around 3,500 loan orders are processed each year by Airbus, covering over 7,000 individual tools. Approximately 30% of tools are on loan from the stores at any one time. This large increase in business added further impetus to the necessity for further optimisation of the process.

LOAN SERVICE OBJECTIVES

- Supply chain optimised
- Process more transparent
- High quality level verification
- Added value for customer through data use



New goals were defined as tool availability became more reliable. Other factors and issues in the process came under the spotlight:
- reduce TAT, so increase availability with reduced inventory,
- reduce paperwork,
- increased data security, quality and consistency for safety and efficiency,
- possession of all relevant data at any time,
- earlier decisions on repair,
- ability to use integrated forwarders.

From this analysis it was clear that a more transparent system was required, allowing greater access to relevant data and clearer instructions that required less human intervention at each step (i.e., to make the process as automatic as possible).

abbreviations

RF/ID
RADIO FREQUENCY IDENTIFICATION

GSE
GROUND SUPPORT EQUIPMENT

TAT
TURN AROUND TIME

ERP
ENTERPRISE RESOURCE PLANNING

MRO
MAINTENANCE REPAIR ORGANISATION

BOM
BILL OF MATERIAL

SMS
SHORT MESSAGE SERVICE

LRU
LINE REPLACEABLE UNIT

OEM
ORIGINAL EQUIPMENT MANUFACTURER

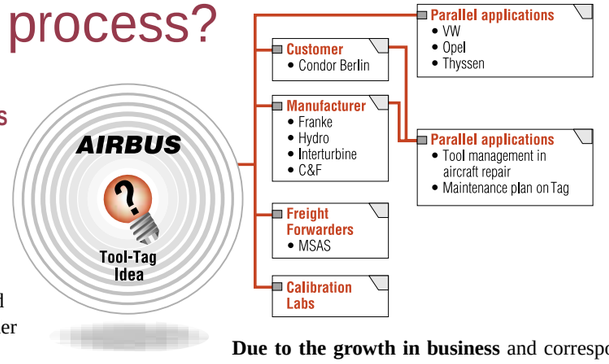
EMI
ELECTRO-MAGNETIC INTERFERENCE

RADIO FREQUENCY IDENTIFICATION FOR TRACKING TOOLS

How can the Radio Frequency Identification* improve the tool-loan process?

CHIP DEVELOPMENT IN THE AIRBUS TOOL-LOAN PROCESS

Airbus Materiel Support was approached by the Fraunhofer Institute, a research company, who analysed the logistics system supply chain and recommended the use of a data tag transponder chip.



*Radio Frequency Identification - RF/ID

Due to the growth in business and corresponding need to improve the whole process, this chip was seen as a possible way to optimise the supply chain. Thus a research project was initiated and, as the project grew, several partners from the supply chain became involved.

WHAT IS CONTAINED ON THE RF/ID?

OWNER - PART NUMBER - SERIAL NUMBER
MANUFACTURER - VENDOR - ORIGINAL RECEIPT NUMBER - MANUFACTURING DATE - DESIGNATION
LENGTH/WEIGHT/HEIGHT - NET/GROSS/TARE
N° OF UNITS - ORIGINAL RECEIPT DATE
LAST RECEIPT DATE - ORIGINAL CERTIFICATE
LAST CERTIFICATE - PERIODIC CHECK CODE - PERIODIC CHECK INTERVAL
TEST LABORATORY - LAST CHECK - NEXT CHECK - TOOL SET

READING & INPUT DEVICES

Chip technology allows secure data to be carried on the tool, instead of on paper documents.

Two types of data loaded:

- **Static**
  Permanent data
  i.e., part number, serial number, date of manufacture, manufacturer.
- **Dynamic**
  Variable/modifiable data
  i.e., date of last inspection, etc…

Before the tool is loaned out for the first time, Airbus inputs the static and initial dynamic data on the chip. The chip then follows the supply chain to customers, forwarders and workshops, each of whom are able to read, depending on their access rights, the part of the chip which holds information relevant for their business.

In order to read or change the dynamic data, all that is required is a computer and reader, ideally a standard handheld computer, such as those already used for reading bar codes, and a reader pen. A standard interface can be attached to any computer, e.g. handheld, PC or laptop to download the chip's data into the company's main computer system. The same computer and reader pen can be used to write data on the chip (by those who have the authority). Text typed into the computer is transferred to the chip through the reader pen held against the chip.

WHICH TOOLS ARE GIVEN CHIPS?

Over 16,000 Airbus tools are available for loan, out of which around 3,000 (plus their respective boxes, if applicable) are equipped with a chip. These tools have serial numbers and require close tracking and will often need repairs and/or calibration. They are typically very expensive and many have special boxes that require special shipping instructions. Other smaller tools such as drills or pins that are loaned as part of a package are not included. Chips are attached to tools (and their respective box) by simply drilling a hole in the surface and gluing it in a location where it avoids damage.

TOOL CHIPS AND BOX CHIPS

CHIP USE ON TOOLS
- Tool identification/ manufacturing data
- Quality data (calibration)
- Life cycle information

CHIP USE ON TOOL BOXES
- Identification/manufacturing criteria
- Tool box information (dim., weight, n° of boxes, vol., etc.)
- Transportation data (tracking & tracing of transport units, AWB, PO-#)
- Tool management information (storage place)

What are the advantages of using the Radio Frequency Identifcation?

PAPERWORK/ADMINISTRATION

Improved certificates/quality
Any tools being transported require volumes of paperwork, e.g. paperwork for customs, inspection certificates, quality certificates and sometimes test reports.

- **Certificates**
  They are often lost through customs etc, which means delays as the end user may not know how to use the tool, whether it has been properly inspected and so will have to delay the process as they search for the lost information.
- **Quality**
  Quality data, calibration certificates and quality assurance papers could be put on the chip.

Ease of administration
- Receiving and shipping information.
- Addresses for calibration shops, repair shops, freight forwarders available instantaneously.
- Tool box chip.

The chip holds information needed by forwarders, but not necessarily always available from any paper work attached (if not lost!). This includes the weight and dimensions, which speeds up processing time, especially if several boxes are being sent, as the boxes no longer need to be opened (which sometimes requires cranes), measured or weighed. The data held on the chip also allows automatic generation of shipping lists.

Ease of use
Handheld computers and wireless technology are widely used throughout industry, especially for reading bar codes.

DATA QUALITY

Avoiding misidentification
The data is always clear and reliable and never out of date – one does not need to decipher illegible handwriting, or try to read through grease or oil smears.

Traceability
A complete history of the tool can be recorded and kept in a databank and the life cycle can be tracked. The last changes made, as well as when and by whom can be followed, which is especially important when dealing with safety-related tools which must be manufactured by certain approved companies.

Repair data tracking
The chip can be used to improve repair as well as loan management by including the repair order on the chip. Allowing the forwarder to transport the tool direct to the appropriate repair shop.

Data security
To assure secure data, each user is issued with a user ID card and has certain read/write access rights, on top of which the chip can be made password protected.

Also, any transfer of data is encrypted so if any extra information is sent, e.g. by email in the future, it will be safe. This secure data transmission also ensures that the correct tool is used for the correct job, a great advantage as Enterprise Resource Planning (ERP) systems are not usually connected, making it difficult to verify this sort of information quickly.

COMMUNICATION

The current user can communicate with users further along the supply chain by writing e-mails or other messages with handling instructions etc. If there has been a problem, this can also be communicated, thus speeding up troubleshooting during repairs or inspections.

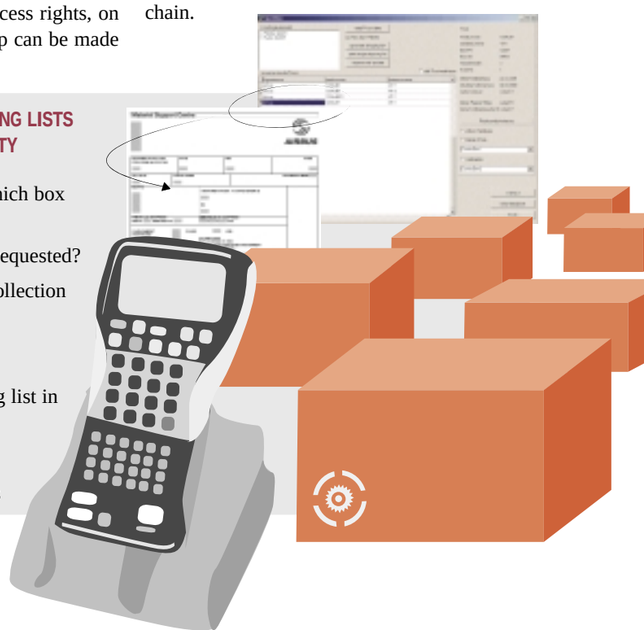
SAVING TRANSPORT COSTS

As the chip on the tool (or box) holds all the shipping information, forwarders can send the tool direct to the necessary repair or calibration shops without returning the tool first to Airbus. This removes a large, unnecessary part from the chain.

AUTOMATIC SHIPPING LISTS FOR WORKING PARTY

- Knowledge of which box for which tool
- Decision: repair requested?
- Destination for collection

- Generate shipping list in MS-WORD
- Print lists
- Mail to recipients



IN-SERVICE EXPERIENCE OF USING THE RF/ID IN THE TOOL-LOAN PROCESS

Reduction of TAT
Since the introduction of the test phase of the chip in 1998 the reductions in TAT have been dramatic. GSE TATs fell from on average 53 days in 1998 to 12 days in 2000 and Tool TATs fell from 31 to 8 days, overall a 75% reduction.

Savings in transport costs
Forwarders send tools straight to calibration/repair shops without sending them first to Airbus.

Reduction of stock level
This reduction in cycle time means that fewer tools are required to provide the same level of availability, thus less inventory investment.

Less parts blocked at goods inwards meaning increased availability

Improvement in data quality meaning less errors, less defects, etc…

Next steps

EXTEND THE USER BASE

The chip has completed its test phase with Airbus and its supply chain partners and over 3000 Airbus tools and boxes have already been equipped with a chip. The next step is to extend the application to a wider range of airline, MRO, repair shop and forwarder partners, as well as organising training for users and support for the reader.

FIND NEW POSSIBLE APPLICATIONS

Repair kits/ tools kits: list of Bill of Material (BOM) with 'Master' chip linked to data from each individual chip

New tools: customers can load data into their system and reap the same benefits for their own internal process chains.

Internet: in the future it could be possible to use a handheld computer in the same way as a PalmPilot or SMS text messages on mobile phones, allowing encrypted emails with extra information to be sent and received when required.

Vendor equipment: the one application with the greatest potential is vendor equipment (line replaceable units (LRUs), and other components that require traceability, i.e., not standard hardware etc).

Due to the higher airworthiness requirements for LRUs, the chip must undergo further chemical, temperature and electro-magnetic resistance tests for compliance, most of which have already been completed. This application is already under development with no objections from airworthiness authorities, with the traceability of items being a major benefit. Many original equipment manufacturers (OEMs) have stated they would be interested in the system once airworthiness acceptance is achieved.

Chip data

HISTORY

The data transponder chip, called RF/ID, was researched and developed by Fraunhofer Institute for factory operation and automation and eConnective AG, both situated in Magdeburg, Germany.

Originally, Fraunhofer approached Airbus Materiel Support and studied the logistics of the tooling supply chain. The chip type was chosen, a data model was created and the software for the handheld computer and PC database was programmed.

HOW TO USE

To read the chip, one requires a reader pen and computer as well as a personal ID card. This means that it is always known who last changed data on the chip. For extra security a password can be added to the chip. The chip will give the latest changes made but this data can be downloaded to a main system to keep track of the tool's history. Data can be viewed, saved and modified, depending on the access rights assigned to that particular user, preventing access to functions that are closed.

TECHNICAL DATA

The chip holds 2kB of data but will probably increase to 8kB in the future, allowing more functions.
- dimension: diameter 8mm
- data security: 10 years if not read
- temperature range: approx. 150ºC
- resistance against temperature and aggressive media
- safe from Electro-Magnetic Interference (EMI).

Handheld computers required are the same as those used currently used to read bar codes, so for many companies the only outlay will be for the smaller reader 'pen'.

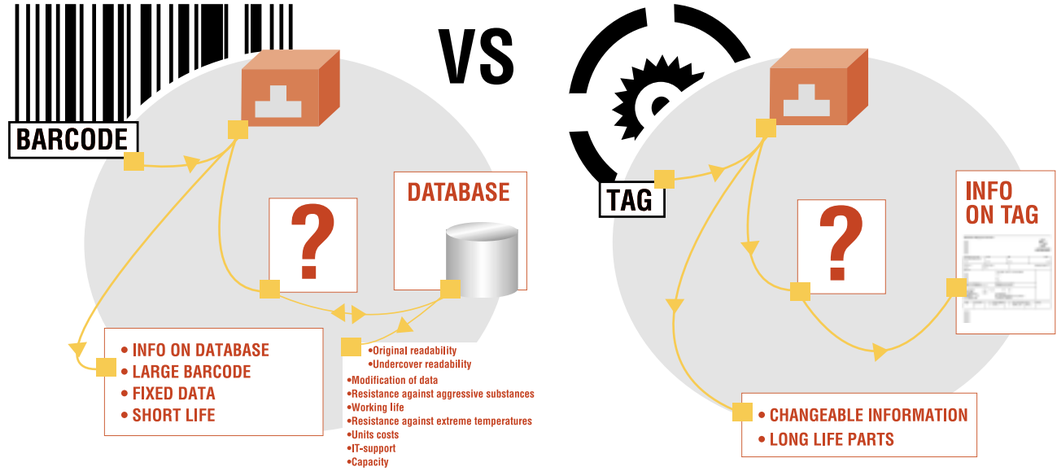
SOFTWARE

Special read/write software for this Airbus application was created for use on the handheld computer to read, write, and change data on the chip. As the software is independent it can be used with any system, allowing integration into all existing data processing systems. There is also a choice of language available, allowing greater ease of use and training.

eConnective AG
Fraunhofer Institut Factory Operation and Automation Magdeburg

Chips vs. bar codes

The chip and bar code systems have many characteristics in common – both allow immediate identification and use the same type of handheld, wireless technology to read the data. However, the two systems complement rather than compete with each other and the chip system is not designed to replace bar codes.



MAIN DIFFERENCES

The chip contains both static and dynamic types of data, while bar codes have only static.

The chip itself is more expensive than a bar code but it is easier to change data on the chip instead of having to reprint and replace bar codes if data changes, which also requires printers to be close at hand therefore increasing introduction and maintenance costs. The chip also holds much more information.

Ultimately, the chip system is intended for high value, high usage items which require close tracking, whereas bar codes are intended for use on less expensive items, requiring much less information to be retained – e.g. for inventories etc.

One application, which would work well, is a combination of the two systems with one chip for the whole tool with all information and bar codes on the separate parts.

Conclusion

Airbus introduced the microchip to optimise its tool-loan process. The test phase completed within Airbus and its supply chain partners proved that the chip could improve tool-loan service by:
- reducing TAT, thus improving availability of tool;
- reducing administration, improving data acquisition;
- saving transport costs;
- improving data quality;
- improving tracking of tools and increasing transparency of tool-loan process.

With over 3000 Airbus tools and boxes equipped with the chip, future steps will be to extend the application to a wider range of airlines, Maintenance and Repair Organisations and forwarders.

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AIRBUS

Upgrade Services

ADDING VALUE TO YOUR FLEET

Recognising the need and the importance of upgrading in-service aircraft for customers, Airbus decided to launch a new business unit within Customer Services, called Upgrade Services, to respond to growing customer expectations on quality, lead-time and price.

1
NEED ANALYSIS

2
UPGRADE DEFINITION

3
ENGINEERING SOLUTIONS

4
KIT PRODUCTION

5
LOGISTICS WORLDWIDE

6
WORKING PARTY MANAGEMENT

7
RELEASE TO SERVICE

Gabriel Oehme, Head of Key Account Management
Airbus Customer Services
Upgrade Services

COMPETITIVE AND RELIABLE

Upgrade Services brings together a team of approximately 250 people, who were already involved throughout the company in activities to provide optional and chargeable retrofit solutions for in-service aircraft.

It delivers a wide range of services from relatively simple technical aircraft modifications, to full cabin and system upgrades, including embodiment, for Airbus passenger, freight and corporate aircraft. Wherever possible existing solutions are applied, which is generally quicker and less expensive. However, if necessary fully customised solutions may also be applied, at competitive rates.

Although, all the technical publications, documentation and competencies to provide retrofit solutions for Airbus aircraft are readily available, Airbus is clearly not the only company in the market who can offer the Upgrade Services its customers need. Even if Airbus, as the original equipment manufacturer (OEM), is expected to provide aircraft upgrades, it has to prove for every case its competitiveness and reliability in the global upgrade market.

CUSTOMISED ENGINEERING SOLUTIONS

Compared to other competitors in the market, Upgrade Services has the unique advantage of being part of the OEM and having access to all Airbus resources and competencies necessary to develop and manufacture aircraft. This provides it with a full scope of information on all Airbus aircraft delivered, including the customised options, even after delivery, due to the Airbus configuration follow-up system.

When developing solutions for its customers, Airbus can investigate the vast majority of upgrade solutions provided to its customers in the past, or in the case of new subjects, we can simply base the upgrade solution on the new development performed for current production aircraft: harmonisation or standardisation of fleets is therefore a standard activity.

But even in the case of highly customised and non-standard requests, all Airbus core competencies in Design, Engineering and Manufacturing can be involved, to provide an appropriate solution.

DEDICATED RESOURCES

Even as an integrated part of the OEM, Upgrade Services has a certain level of autonomy, as it is equipped with necessary resources to perform a majority of upgrade activities and the application of solutions is under the full responsibility of Upgrade Services.

It has technical specialists for all ATA chapters, a highly qualified team of experienced engineers, service bulletin authors, dedicated kit management capabilities and the full delegation for airworthiness approval and responsibility for product integrity for its upgrade solutions.

As Airbus does not want to compete with its airline customers, working parties for embodiment of upgrade solutions are subcontracted to third parties.

KEY ACCOUNT MANAGEMENT

Besides the technical teams and specialists, Upgrade Services also has a dedicated commercial project management team, the Key Account Management. It is the customer interface of Upgrade Services and is responsible for the overall project management. It interacts directly with the customers for business acquisition and for the overall management of business implementation.

Dedicated key account managers are involved from the beginning of the project to delivery for service, and will be available at all times for questions or further requests from the customer.

Conclusion

The new Upgrade Services business unit has been launched by Airbus to help customers to project and increase the residual value of their fleets. It delivers a wide range of services from simple technical aircraft modifications to full cabin and system upgrades for Airbus passenger, cargo and corporate aircraft. Embodiment of the upgrades will be performed exclusively by third party organisations.

CONTACT DETAILS

For further information please contact the Customer Support Manager responsible for your airline or contact our regional offices

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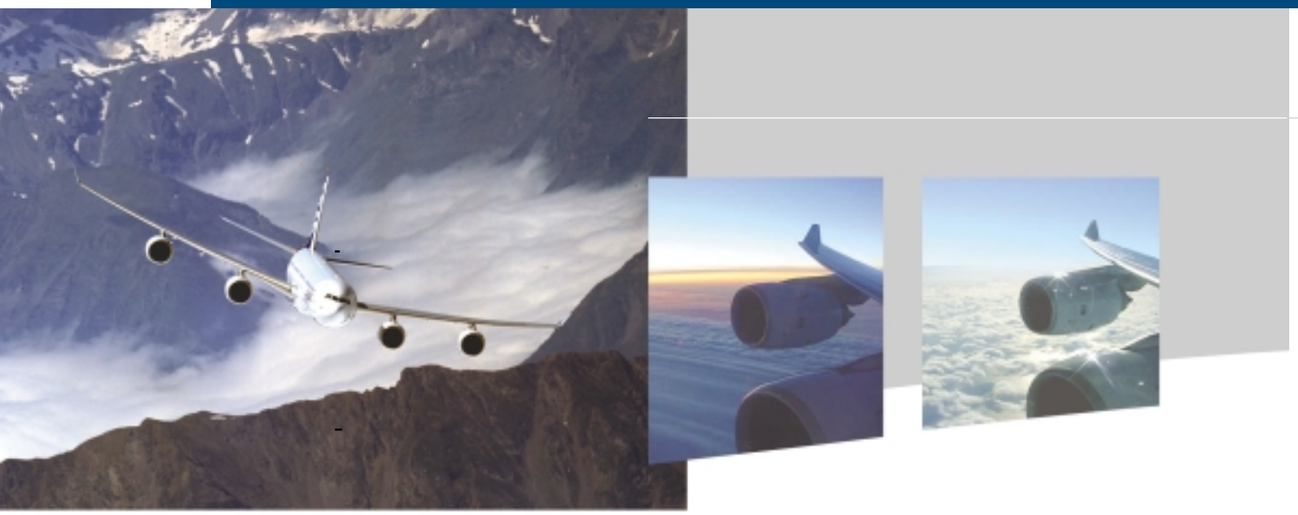
North America/Canada Fax: + 1 703 834 3464
China Fax: + 86 10 64 56 76 94

or send enquiry directly to “Airbus Upgrade Services” in Toulouse

e-mail: upgrade.services@airbus.com
Fax: + 33 5 61 93 41 06

AIRBUS



A340-600 Cabin maturity programme

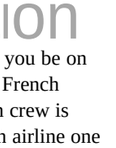
Question

Which flight would you be on when the aircraft is French registered, the cabin crew is from a major British airline one day, and from a major German airline the next day, and your fellow passengers come from all over Europe? Don't know? Here are some more clues: regular passenger announcements are made asking you to fill in your in-flight questionnaire and you travel for over 10 hours to arrive back where you started?

Answer

You would be on an A340-600 first passenger flight. These so-called Early Long Flights (ELF) put the aircraft and the cabin systems in the real commercial flight environment.

Hervé Bruere, A340-500/-600
Development M.A.P. Manager
Long Range Programme



Landry Fel, A340-500/-600
Maturity Programme Manager
Long Range Programme

Programme

Airbus organised a series of special A340-600 passenger flights called the *"First passengers' programme"* to demonstrate the aircraft operational capability in an airline environment, prior to Type Certification and delivery to the first customer, mid 2002.

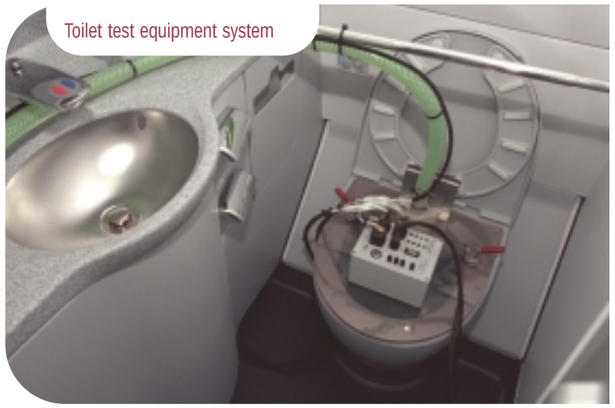
The first series of 15 flights/100 flight hours, including eight long flights, with sectors as long as 15 hours, took place in November 2001. More than 2000 passengers were transported. Based on the results of these flights, and in line with prior expectations, a number of modifications of cabin systems (hardware and software) were defined and implemented.

A second series of 25 flight hours/450 passengers in March 2002 confirmed the improvements, and was followed by the route proving flights in April 2002 (25 flights/mix of seven long range flights and 18 short-medium flights, 150 hours) when the aircraft was operated by Lufthansa and Virgin.

These flights were part of the programme of "Certification and Maturity at Entry-Into-Service", the objective of which is to ensure high reliability from the beginning of airline service. They were operated with MSN376, the third A340-600 aircraft, which made its first flight on 24 September 2001.

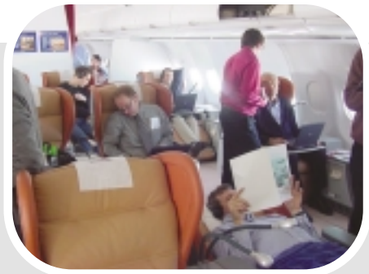
Dummy "passengers" for test purposes

Toilet test equipment system



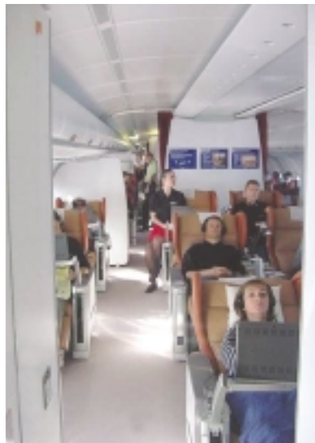
The first passengers, prior to the ELF series, were in fact dummies installed in the cabin seats, each generating a heat load equivalent to one passenger. They were used from the second flight to start the air conditioning system tests before passengers were allowed to board.

Before passenger flights, toilet reliability was tested with simulators installed on the toilet seats and generating a "waste fluid" and flushing according to a programmed automatic sequence.



Aircraft

This aircraft has a unique cabin layout with several combinations of seats, galleys and stowage areas designed to thoroughly test the cabin in very demanding in-service conditions.



A340-600 CABIN MATURITY PROGRAMME

In the all new A340-600 cabin, lights, shapes, colours and materials have been selected to enhance passenger comfort. The cabin is spacious and the large overhead bins are easily accessible. Advanced in-flight entertainment and communication systems have been integrated to all seats with Liquid Crystal Display (LCD) screens giving access to a series of digital videos and games. Telephones and portable computers could be connected to the new e-mail system.

New features for crews include the Flight Attendant's Panel (FAP) at door one with a new touch-screen unit driven by a new Cabin Intercommunication and Data System (CIDS).

This aircraft is also equipped with a Flight Crew Rest Compartment (FCRC) of the new single occupancy design, with a fold-down bunk and a business class seat for reading or eating, and with a Lower Deck Mobile Crew Rest Container (LDMCR), accommodating eight bunks for cabin crew rest during long haul flights.

Flight Test Engineer (FTE) station

A Flight Test Engineer's (FTE) station installed in the business class cabin allows the Flight Test Engineers to monitor in real-time and record for later analysis hundreds of parameters. Connected to the FTE station are sensors to measure cabin temperature, pressure, and speed of cabin air movement.

These passenger flights were an important part of the flight test programme of this aircraft, which was mainly dedicated to cabin system tests. Other activities included airport compatibility demonstrations at Toulouse, London LHR, Frankfurt and Zurich, external noise measurements, Electro-Magnetic Interference (EMI) tests, partial cabin evacuation test, cold weather campaign, engine fire extinguishing tests, participation in air shows in Santiago, Chile and Berlin) and support to sales campaigns.

All passengers and cabin crew were expected to make use of the aircraft cabin as they would for a normal scheduled flight.

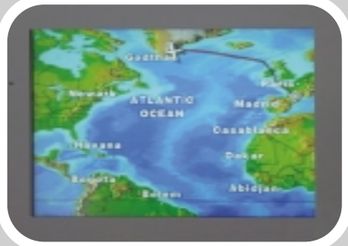
This ELF programme was open to some 45,000 Airbus employees in Europe. It consisted of several circular flights operated from Hamburg (Germany), Manchester (UK) and Madrid (Spain). For the "happy few", one flight destination was Mauritius.
The passenger loads were made up of mainly Airbus staff but several suppliers were also involved: Rolls Royce, Matsushita, KID, Air Cabin and Rockwell-Collins. Cabin crew from Virgin and Lufthansa were assisted by Airbus flight test cabin engineers.

Objectives

The main objective was to expose the aircraft, and in particular its cabin systems, to a variety of operations that are likely to occur in service and demonstrate their correct function and reliability.

The first series of Early Long Flights were performed to reveal any issues linked to the cabin operation, early enough in the development programme, to be able to define and validate modifications before first aircraft delivery. The second series of flights, with components and equipment at certification standard, demonstrated that the aircraft operates properly under standard airline operating conditions.

Airshow system displayed on passenger screen



Tail Fin camera image displayed on passenger screen

Further objectives were the collection of crew and passenger comments on cabin design and systems during long duration flights (ergonomic, perception, future cabin design input). These flights also acted as an internal communication exercise within Airbus (several sites and nationalities involved).

To determine the cabin performance, all passengers were invited to complete a questionnaire covering a variety of aspects including such parameters as cabin temperature, noise, stowage practicality, galley odours and lavatory appearance. The entertainment system was also scrutinised, with passengers being asked to assess the level of difficulty of system use as well as a series of questions to determine the in-service performance of the numerous offers: video on demand, flight information system, telephone, games and in-flight camera views. The latter includes a camera mounted near the top of the tail-fin offering views of the aircraft, an almost spiritual feel at sunrise.

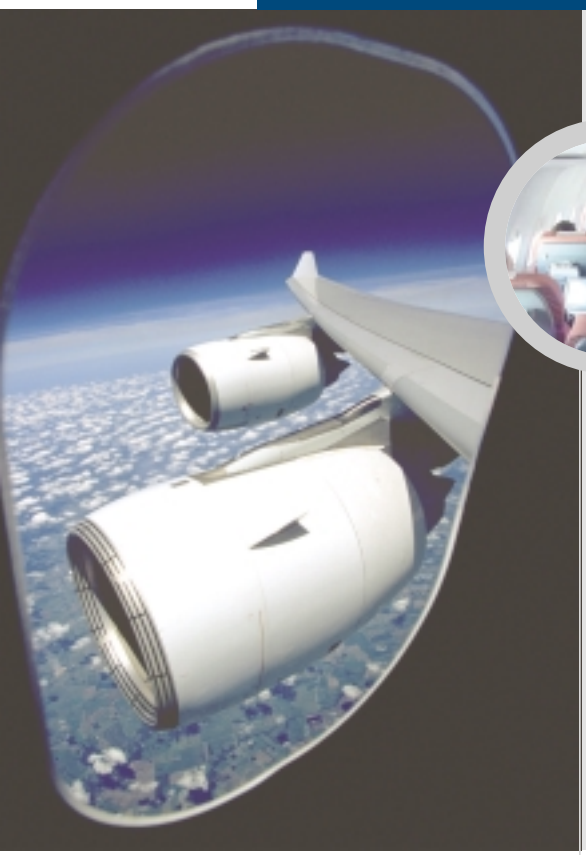
These flights were as representative of standard commercial flights as possible, including the check-in and security formalities, with the exception that several passengers had portable test equipment in their carry-on baggage! They carried out spot-checks on cabin temperature throughout the flight, measuring acoustics and were seen during the flights walking through the cabin, microphone in hand. Something they would not be allowed to do in a commercial flight.

Airbus also used these flights to gain a better understanding of the aeromedical aspects of long range travel. A Telemedicine station was installed on-board and more than 300 medical files were created and transmitted using the SATCOM. This was a great opportunity for the medical experts to assess the operational constraints of in-flight medical care.

TO MEET THESE OBJECTIVES
special requirements were established:

- aircraft operation as on commercial flights, including services, meals, entertainment,
- no specific flight tests during the flights,
- recording of environmental parameters (noise, temperature…) with aircraft fixed instrumentation plus hand-held devices,
- operation with a high passenger load factor (95%),
- at least 1000 different passengers to establish a sound statistical basis,
- long sector flights (above 10 flight hours),
- day and night flights,
- more than 100 flight hours accumulated,
- operation from different airports to evaluate aircraft compatibility with airport services (passenger handling, refueling, catering, cleaning, servicing...).

Air conditioning measurement device

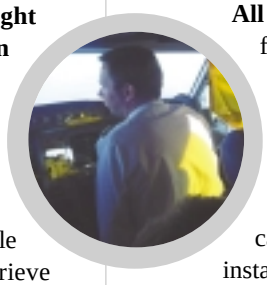


e-mails via their own laptop computers or consult websites. During one flight 25 users were connected to the service, 537 e-mails were sent and 562 e-mails received.

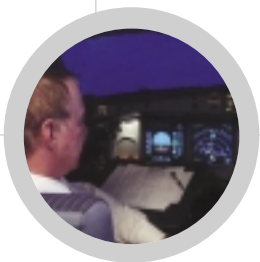
Innovative passenger services were proposed such as Cabin Information Network System (CINS):

- e-mail (same functions as on ground),
- on-board internet (cached web, a selection of favorite web sites with content updated on the ground via gatelink),
- business services (the contents of *Tenzing Now!* was updated every 15 minutes during the flight).

The Airbus In-Flight Information Services (AFIS), a new feature based on air-to-ground satellite links, was a real success. Passengers were able to send and retrieve



All functions were available from a laptop either connected to an in-seat plug (all seats equipped with RJ11 plugs) or wireless (portable terminals can be used all along the cabin thanks to antennas installed in the cabin floor).



Results

Best recollections from participants were:

- cabin design,
- In-Flight Entertainment (IFE) possibilities,
- illumination and lighting,
- low noise level,
- lavatories,
- the pleasant environment produced by the air conditioning.

As one might expect from such new systems, several issues were highlighted during the flights:

- *Temperature disagreement* between the selector and the zone controller was identified and corrected plus new Cabin Assignment Module programming. Problem solved after November flights and satisfactorily tested in March.
- *Condensation in some particular* areas was discovered, and improvements were defined, implemented and successfully tested.
- *A whistling noise* in the forward cabin due to air conditioning ducts was removed by seal redesign.

Conclusion

The availability of a fully furnished aircraft early in the flight test programme allowed an unprecedented level of testing of the full cabin in real life conditions. The lessons learnt from this experience, combined with the other flight test data and the existing in-service data from other aircraft types, gives early operators the high level of confidence that the A340-600 will be a mature product and popular at Entry-Into-Service. Passenger feedback has, in large measure, validated the work undertaken by the cabin design team and underlines the importance of working closely with customers.
The initiatives launched for the A340-600 will be read across to the yet more challenging ultra-long range A340-500, and have spawned an even greater consultative process for the A380.

CONTACT DETAILS

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ON THE A330/A340 FAMILY THE SYSTEM OF NO-BREAK POWER TRANSFER (NBPT) AVOIDS THE BREAK IN ELECTRICAL SUPPLY WHEN CONNECTING OR DISCONNECTING THE VARIOUS POWER SOURCES.

THIS ARTICLE PROVIDES A DESCRIPTION OF THE PRINCIPLES OF THE NBPT FUNCTION .

A330/A340 Electrical generation

No Break Power Transfer

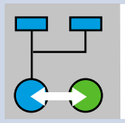
Electrical power can be supplied to an aircraft's AC bus bar from a variety of sources: from the Integrated Drive Generators (IDG) on the engines, the generator on the Auxiliary Power Unit (APU), or externally, from the Ground Power Unit (GPU). On previous aircraft, when transferring from one power source to the other there is a momentary break in supply. Momentarily blank screens in the cockpit during engine start and cabin lights switching off then on are the most visible signs of break power transfers.

Pascal Chabriel
Electrical Power Generation System
Airbus Customer Services
Engineering & Technical Support and Services

System description & function

The electrical generation system has several generating channels ensuring segregation in the electrical distribution system and redundancy in case of generator failure. Generators are capable of taking over the loads from other electrical channels following a chain of priorities that are managed by the Electrical Contactor Management System (ECMS).
The ECMS manages the electrical transfer when generators are successively connected to the electrical network.

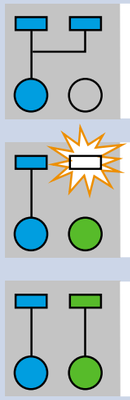
NBPT



1. *One source supplies both channels. On request for connection of the second power source a synchronisation is initiated*
2. *Upon synchronisation, power sources are paralleled during a few milliseconds*
3. *Paralleling is then stopped. Power sources supply their own channels*

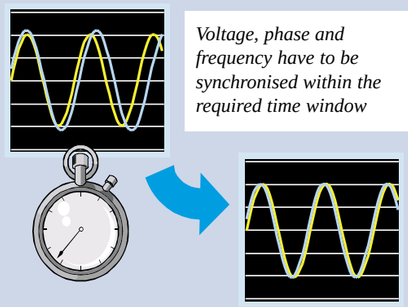
An electrical transfer without a break requires that the two power sources are momentarily connected in parallel, i.e they are connected simultaneously to the same bus bar.

CONVENTIONAL TRANSFER



1. *One generator supplies both channels*
2. *On request for connection of the 2nd generator, the power supply of the associated bus is removed for a few milliseconds*
3. *The generator is then connected to its bus*

If the NBPT function is not available, a conventional Break Power Transfer (BPT) is achieved like on the aircraft of the previous generation.



Voltage, phase and frequency have to be synchronised within the required time window

With AC power sources, the frequency, phase and voltage have to be synchronised before the paralleling, and it is the purpose of the NBPT function to perform this synchronisation.

CONTROLS

THE NBPT FUNCTION INVOLVES THE FOLLOWING COMPUTERS:

GCU
GENERATOR CONTROL UNIT
This computer monitors and controls the parameters of the Integrated Drive Generators and Auxiliary Power generator.

GPCU
GROUND POWER CONTROL UNIT
The main purpose of this computer is to monitor the parameters of the ground power units and allow their connection to the aircraft network when parameters are within the limits. It also acts as a controller of the synchronisation between power sources during NBPT.

ECMU
ELECTRICAL CONTACTOR MANAGEMENT UNIT
This computer controls the various AC and DC power contactors of the electrical distribution system which is split in two.
Two ECMUs are installed on the aircraft. ECMU 1 manages the contactors of side 1 of the electrical generation system and ECMU 2 manages side 2.
The electrical power transfers to the AC bus bars are coordinated by the ECMUs based on the inputs from the GCU/GPCU and sets of auxiliary contacts of the various contactors of the electrical system.

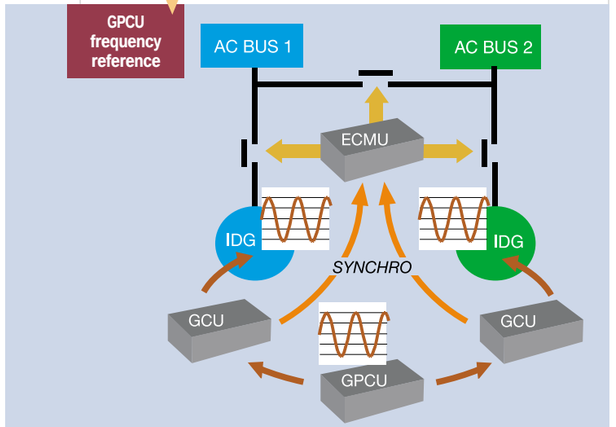
NBPT operating principles

SYNCHRONISATION AND PARALLELING

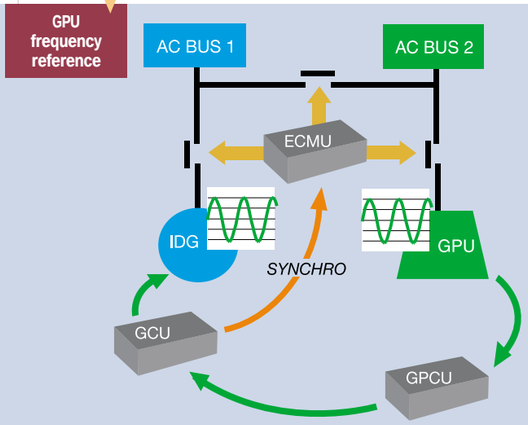
An NBPT is achieved by synchronising the voltage, phase and frequency of the power source already supplying an AC bus bar, with the power source to be connected to this bus bar. Upon synchronisation the generators are momentarily connected in parallel on the electrical network for a few milliseconds, then the original supplier is switched off.
An NBPT cannot be achieved between external power A and B since the GPCU has no control of the GPU parameters. Also during NBPT involving a GPU, other generators have to be synchronised to the GPU parameters.

NBPT WITH IDGs

Before NBPT between two IDGs their associated GCU tunes the frequency of the generators to a Frequency Reference Unit (FRU) provided by the GPCU. When the synchronisation is achieved a signal is sent to the ECMU by the GCUs to allow the two generators to operate in parallel for some milliseconds.

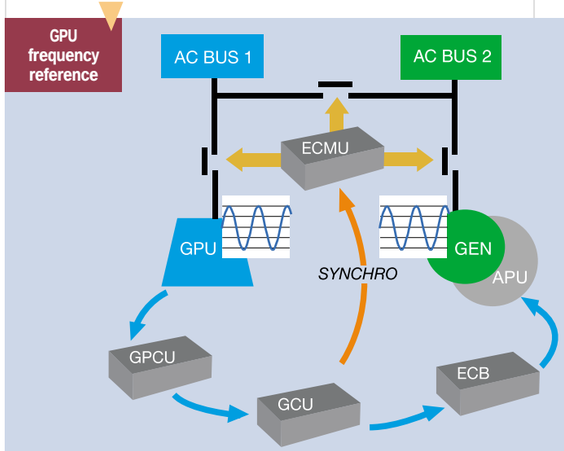


Before NBPT between an IDG and a GPU, the parameters of the IDG are synchronised to the external power unit parameters.

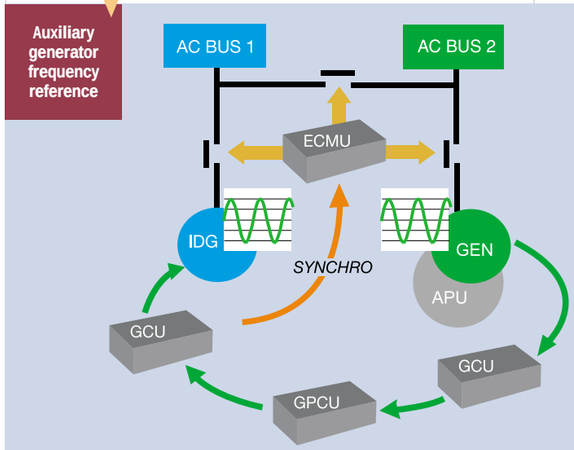


NBPT WITH THE AUXILIARY GENERATOR

Contrary to the IDG, the auxiliary generator has no frequency regulation device. The frequency of this generator depends directly on the rotation speed of the Auxiliary Power Unit (APU).
Thus before NBPT between a GPU and the APU generator, the Electronic Control Box (ECB) tunes the rotation speed of the APU to synchronise the auxiliary generator to the GPU frequency.



Before NBPT with an IDG, the parameters of the IDG are synchronised to the auxiliary generator parameters.



Conventional transfers

If for any reason the NBPT function is not available a conventional electrical transfer (with break) lasting less than 200 multiseconds is performed. Aircraft systems have been designed to sustain break power transfers of 200 multiseconds and so, no system failure should result from a power transfer with break. The reasons for having conventional break power transfers are provided hereafter.

NON STANDARD PROCEDURES

The NBPT function has been designed in order to be operative on the ground during the Standard Operating Procedures (SOP) described in the Flight Crew Operating Manual (FCOM). Outside these procedures or in flight the system performs conventional electrical transfers with a momentary break.

FAILED SYNCHRONISATION

If for any reason the system is not able to perform the synchronisation within the required time window a BPT is performed and no failure message is recorded in that case. There are several system behaviours that could affect the stability of parameters and so the ability of the system to keep the generators synchronised:

- Ground power unit providing fluctuating parameters.
- IDG with worn piston and block bores.
- Electrical load variations at the time of the transfer (e.g flight controls or cargo door operation).
- High oil viscosity in cold weather conditions.
- Simultaneous start or shut down of engines.
- Fluctuating Engine & APU rotation speed...

As a consequence the NBPT function cannot be available in 100% of the electrical transfers. If the rate of BPTs remains within acceptable limits and no failure message is recorded there is no peculiar investigation required.

INADVERTENT PARALLELING

The NBPT function is inhibited if the system detects that a paralleling with non-synchronised generators is likely to occur, which would induce damage to aircraft equipment. Basically this protection is activated if the electrical system sees that a contactor has an incorrect status. In this event there are dedicated fault messages and the Trouble Shooting Manual (TSM) provides the necessary instructions in order to identify the cause of the inhibition and recover proper operation of the NBPT function.

CDROM 'NBPT SIMULATION TOOL'

PROCUREMENT DETAILS:
SIL 00-032
Ref: SCM1 AM211 11/01

Conclusion

The NBPT function has been designed in order to be available on the ground during the aircraft standard operating procedures. Outside these procedures Break Power Transfers are observed.

However due to some system behaviour affecting the synchronisation of the generators, BPTs may also be observed randomly at a very limited rate even though the standard operating procedures have been followed. If there is no failure message recorded and the rate of BPT remains within acceptable limits there is no maintenance action required.

Airbus has issued Service Information Letter SIL 24-070 and developed a simulation tool of the NBPT Function. This simulation tool illustrates in a user-friendly manner the information provided by the SIL and allows a better understanding of the NBPT principles.

Prize winning Knowledge Based Engineering team

Every engineering organisation bases itself on its knowledge. So why are there Knowledge Based Engineering (KBE) teams active throughout the Airbus partnership?

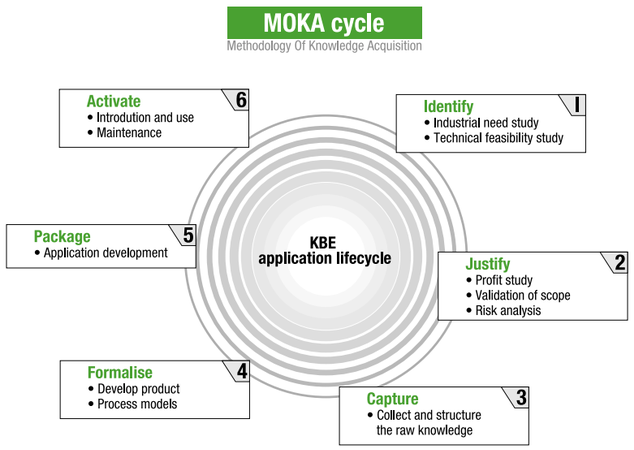
This article investigates the KBE arena and tries, through examples, to show why Airbus is a worldleader in this technology.

Andrew Godbehere, Engineering Programme Manager
Airbus UK

What is Knowledge Based Engineering?

KBE METHODOLOGY

Although there are many definitions, a simplification is to say that engineering processes and rules are captured, coded in to the computer, and run so that results can be generated more accurately and faster. They are generally unique applications, tailored to the engineer's needs, which focus around the process, and not the data generation. This is illustrated in the MOKA (Methodology Of Knowledge Acquisition) cycle as shown.



Two main streams

KNOWLEDGE ACQUISITION & STRUCTURING

We have all been doing this for years, both in terms of handbook development, design guides, stressing manuals and technical reports. However as the technical age advances so the electronic archiving and retrieval of information becomes more advanced. Also, we all know how difficult it can be to find information on the internet. When we find it, how do we know it is knowledge applicable to our context?

For example: I do an on-line search for 'bonded lap joint'. I get 3297 hits. I put this into context by searching for 'bonded lap joints analysis on single shear high temperature'. I get 6 hits. How do I know, on my leading edge panel, which 'pocket of knowledge' to use? Frankly I am more confused now than before. The knowledge presented to me needs to be approved and verified for my particular application.

Simply 'information mining' or 'cognitive search engines' don't help, without the approval of knowledge and the appropriate structuring of it. MOKA gives a framework for this. So we have at least one methodology for our structuring. However, what about the acquisition???

Knowledge Acquisition
Put three bonded joint experts in a room and ask them to state how to design my bonded joint. I get three processes; rule sets and, possibly, results. How do I get consensus? Well this requires advanced interviewing, data analysis and negotiation techniques to be applied to my group of experts. However there are technologies and techniques out there that have demonstrated an ability to rapidly develop consensus and so acquire and approve knowledge in the most efficient way. This includes methodologies in which the interviewer is trained how to talk with multiple experts, harvest their knowledge and get them to agree a single knowledge base.

So, I have my knowledge, I have approved and structured it, so what? Well I now have KNOWLEDGE, not INFORMATION. I have it in a form readily utilised by either PEOPLE (written or INFORMAL) or MACHINE (electronic or FORMAL). I have the basis for building my applications.

APPLICATION BUILDING & EXPLOITATION

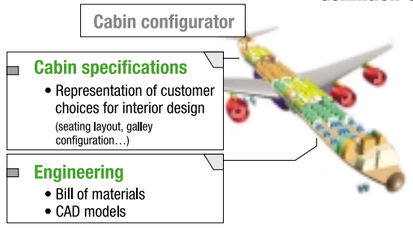
This is where the 'intellectual' and the 'practical' come together – exploiting knowledge in an efficient way for our core business of aircraft engineering. By accelerating elements of the engineering process great economic or lead time advantages can be realised over current practices. More importantly, if done well, the applications can be used from aircraft programme to programme, realising the savings over and over.

Two examples

CABIN CONFIGURATION

A customer can discuss the seating layout, galley configuration and interior details in Toulouse using one suite of applications, geared to give the customer an instant representation of their choices. This is forwarded electronically to the Final Assembly Line (FAL) where another, integrated suite of KBE applications is used to engineer the cabin.

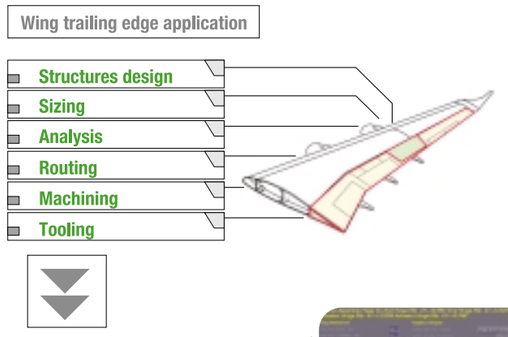
A bill of materials and CAD (Computer Aided Design) models for the customer's interior, including seats, galley and overhead services, can be delivered in a fraction of the time previously achievable. More importantly, the applications are used for every customer variant, and are being developed across the Airbus family.



All of these modules can be integrated to help in both the product definition and detailing phases. It delivers benefit due to the large number of similar components and due to the fact that a fuller suite of disciplines can be engineered together in one environment.

WING TRAILING EDGE

On the A380 programme the Trailing Edge team are utilising KBE in the engineering of the trailing edge fixed structural assembly. This application suite has the potential to integrate the structures design, sizing, analysis, routing, machining and tooling disciplines in a way never previously anticipated.



Prize winning team

This integrated application suite won the KBO (Knowledge Based Organisation) prize this year, recognising it as the most innovative use of KBE in the world during 2001.

Are we alone?

Almost every major engineering organisation has invested in this technology, including aerospace and automotive organisations.

Conclusion

The building of Knowledge Based Engineering applications has been happening across the Airbus partnership for more than 12 years in many forms, ranging from cabin applications, fuselage, wing structure and systems engineering to tooling and numerically controlled production. However, what characterises them all is their ability to automate the mundane, secure quality, securing static and dynamic processes, and integrating in a concurrent environment engineers from across engineering and manufacturing. Various levels on benefits have been claimed, from minor to major, but the most recognised is the philosophical shift from focusing on data generation (e.g. CAD), to engineering process, with data being simply the output. It all boils down to helping our prize winning engineers to focus on the engineering, together.

AIRBUS

CUSTOMER SUPPORT AROUND THE CLOCK... AROUND THE WORLD

Customer support

AROUND THE CLOCK...AROUND THE WORLD

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Fax: +86 10 64 57 09 64

RCSM LOCATION	COUNTRY
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Algiers	*Algeria*
Amman	*Jordan*
Athens	*Greece*
Bangkok	*Thailand*
Beirut	*Lebanon*
Berlin	*Germany*
Brussels	*Belgium*
Buenos Aires	*Argentina*
Cairo	*Egypt*
Caracas	*Venezuela*
Charlotte	*USA - North Carolina*
Chengdu	*China*
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*
Dusseldorf	*Germany*
Frankfurt	*Germany*
Guangzhou	*China*
Hangzhou	*China*
Hanoi	*Vietnam*
Helsinki	*Finland*
Hong Kong	*S.A.R. China*

RCSM LOCATION	COUNTRY
Indianapolis	*USA - Indiana*
Istambul	*Turkey*
Jakarta	*Indonesia*
Jinan	*China*
Karachi	*Pakistan*
Kingston	*Jamaica*
Kuala Lumpur	*Malaysia*
Kuwait city	*Kuwait*
Lanzhou	*China*
Larnaca	*Cyprus*
Lisbon	*Portugal*
London	*United Kingdom*
Louisville	*USA - Kentucky*
Luton	*United Kingdom*
Macau	*S.A.R. China*
Madrid	*Spain*
Manchester	*United Kingdom*
Manila	*Philippines*
Mauritius	*Mauritius*
Medelin	*Columbia*
Memphis	*USA - Tenessee*
Mexico city	*Mexico*
Milan	*Italy*
Minneapolis	*USA - Minnesota*
Monastir	*Tunisia*
Moscow	*Russia*
Montreal	*Canada*
Mumbai	*India*
Nanchang	*China*
Nanjing	*China*
New York	*USA - New York*
Ningbo	*China*
Noumea	*New Caledonia*
Oslo	*Norway*

RCSM LOCATION	COUNTRY
Palma de Mallorca	*Spain*
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Philadelphia	*USA - Pennsylvania*
Phoenix	*USA - Arizona*
Pittsburgh	*USA - Pennsylvania*
Port of Spain	*Trinidad and Tobago*
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Roma	*Italy*
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San Salvador	*El Salvador*
Santiago	*Chile*
Sao Paulo	*Brazil*
Seoul	*Korea*
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Shenzhen	*China*
Shenyang	*China*
Singapore	*Singapore*
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Vienna	*Austria*
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Xi'an	*China*
Zurich	*Switzerland*

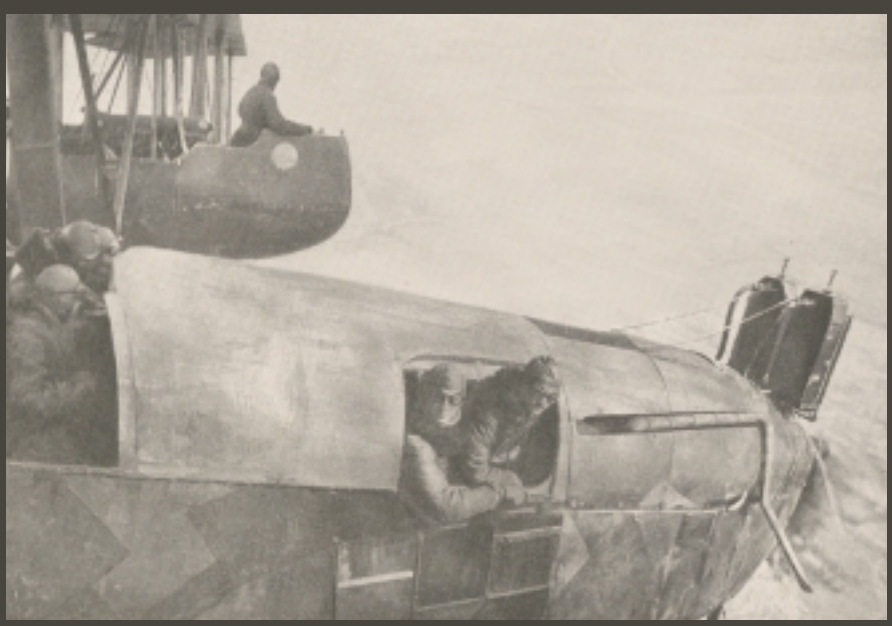
Customer Services

AIRBUS

Flight Operations Monitoring

part 2

FOM has been around for a very long time. There is nothing as accurate as MK1 eyeballs, especially six pairs of them, to measure deviation from normal operations and provide multiple analyses of the situation.
Each crew member was ideally placed to identify possible risks and launch corrective action to improve safety!
Undoubtedly, a large crew can provide greater insight working in the fresh air of the total flight operation environment.



Gotha G.V. 1918

The Airbus A340. 4 engines 4 long haul.

The Airbus A340 is the only modern 4-engined, long-haul aircraft in service today. So unlike its twin-engined competitors it can fly the most direct routes. No matter how far from civilisation. Flying up to 18 hours non-stop, the A340 takes you a lot farther, yet makes long haul seem a great deal shorter. **Airbus. Setting the standards.**

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