Dear Customer,

An in-flight interruption is not a regular event. None the less, as airlines strive to further optimize aircraft utilisation and minimize costs, it is inevitable that the effect of such event will become more significant for any given operation.

Herein you will find briefings on the most significant opportunities currently available to minimize in-flight interruptions. The aim is to share A320 Family fleet experience between all operators.

This FAST Special provides an analysis of in-flight interruptions recorded for the A320 Family fleet over the last 4 years. The main contributors have been identified and consequently proposals defined that may allow your airline to further reduce its in-flight interruption rate.

The proposals range from relatively simple enhancements that are easy to implement to those that are more complex, consequently requiring more time and effort to introduce. However, all are effective means of reducing in-flight interruptions and in addition offer the possibility to further enhance operational efficiency.

Information is provided to allow the benefits applicable to your organisation to be easily identified. We now invite you to consider each proposal in the context of your fleet and its operation. Should you need further information to support you, please feel free to contact us.

Antoine Vieillard
Vice President A320 Family Programme
Customer Services
It is essential to minimise the delays and cancellations that accompany the operation of commercial aircraft. Airbus continues to develop and deliver efficient, proven solutions to reduce technical delays and cancellations for every aircraft in the A320 Family fleet.

An in-flight interruption such as a turn-back or diversion places the aircraft, its passengers, freight and crew in the wrong place and in need of attention. Furthermore, these events can have a major impact throughout schedules. The trend for A320 Family in-flight interruptions is steadily declining and today the in-service fleet experiences an in-flight interruption for technical reasons about once every 7000 flights.

To ensure that all operators of A320 Family aircraft are briefed on the opportunities for minimising in-flight interruptions within their operation, Airbus Customer Services has produced this FAST Special. It aims to share fleet-wide experience with all operators.

To do this it focuses on the principle root causes of in-flight interruptions and consequently identifies proposals that are widely applicable and that have demonstrated their value in terms of not only minimizing in-flight interruptions but also in reducing delays and cancellations.

Most passengers, even frequent flyers, have never experienced an in-flight interruption, such as an In-Flight Turn Back (IFTB) or a diversion (DV). They are very rare. Nevertheless, airline Fleet Managers know that there is a need to consider technical delay reduction and in-flight interruption event limitation when looking at aircraft or procedures enhancements.

Global analysis of in-flight interruptions for the A320 Family shows that there has been a steadily improving trend in the rate over the last few years.

In-flight interruptions typically follow specific warnings to the pilot indicating:

- Landing gear ‘retracted and uplocked’ not confirmed electrically
- Excessive cabin altitude warning
- Flight control surface not responding
- Engine shutdown following excessive vibration or exhaust gas temperature
- Hydraulic low level warning due to leakage
- Smoke warning

The cost of an in-flight interruption can vary significantly from one operation to another. Costs are greatly influenced by the nature of the event and the support available at the aircraft’s location.

The immediate operational impact of an in-flight interruption could be:

- Flying to a runway long enough to accept the aircraft (in cases such as flap locks)
- ‘Overweight’ landing
- ‘Single engine’ landing following an in-flight engine shutdown
- Passenger discomfort in the case of excessive cabin altitude

Further consequences could be:

- Men and materials sent to the diverted aircraft to repair it and/or ferry it back to base
- Cancellation of following flights for the aircraft
- Lack of spares leading to an AOG situation
- Passengers booked onto another flight and/or hotel, meal and compensation costs
- Aircraft, baggage, and freight checked by the emergency services (following smoke warning, for example)
- Other aircraft and crews rescheduled at short notice
- Flight Crew replacement (due to maximum flying hours regulations)
- The aircraft out of service for a lengthy period (replacement to be sourced)

By attributing the in-flight interruption events shown in the chart below to their appropriate ATA chapters the ATA drivers are identified. That is, the ATA chapters against which the majority of root causes have been attributed. For each ATA chapter a specific section in this FAST Special has been produced. Each of these sections presents a further breakdown of the events and based on this, proposals are made that will allow in-flight interruptions to be minimized. It should be noted that not all proposals are applicable to all aircraft in the fleet, but information to allow the applicability to be determined has been provided in all cases.

The issues causing in-flight interruptions can equally result in delays at the departure gate. Therefore, when considering the added value the proposals made in this FAST Special will bring to a given operation, their effects should be considered not only in the context of minimizing in-flight interruptions but in overall operational efficiency.

The data collection process starts with a Pilot Report which will lead the operator to raise an Air Safety Report (or equivalent) that must be sent to its airworthiness authority. Airbus either collects a copy of this ASR, receives the details in the airline’s monthly reliability report, or more frequently, receives the contents of the reliability report plus the incident report text in electronic format and this is then loaded directly into the Airbus database in Toulouse using the following definitions:

- **Definition of In-Flight Turn-Back (IFTB):** The return of an aircraft to the airport of origin as a result of the malfunction or suspected malfunction of any item on the aircraft (Note: also called Airturnback).

- **Definition of Flight Diversion (DV):** The landing of an aircraft at an airport other than the airport of origin or destination as a result of the malfunction or suspected malfunction of any item on the aircraft.

Throughout this document the term ‘in-flight interruption’ is used when describing either an IFTB or DV.

Airbus computes:

Flight interruption rate per 100 revenue takeoffs as (IFTB+DV) 100/revenue takeoffs.
Between 2001 and 2004, 14% of in-flight interruptions have been attributed to ATA 21 chapter, environmental control system. They can be further divided as shown in the pie chart to the right.

The main reason for in-flight interruptions linked to the environmental control system is the inability to pressurise the aircraft. The avionics equipment ventilation computer can cause inability to pressurise by leaving the vent skin air valves open. This is addressed by proposal 1. Another cause of pressurisation problems is major leaks at pack level. Two pack components have been reinforced in that respect. These are proposals 2 and 3.

Miscellaneous events (21-00-00) are mainly smell or smoke reports with various origins not linked to the air conditioning. For example, an oil smell due to an APU oil leak will be logged under ATA 21 as a first step instead of ATA 49.

### Proposal 1

**ATA 21-26-00 ENHANCED AEVC**

The latest Avionics Equipment Ventilation Computer (AEVC) standard clears two major issues. It can now deal with disruption of the electrical signals from the skin air valves, which previously caused AEVC and skin air valve faults, which could result in an in-flight interruption. This new controller also prevents spurious avionics smoke warnings in flight triggered by a pin crack at the level of the Random Access Memory module. With this latest AEVC standard, shock absorption has also been improved and the smoke detector test inhibited in flight.

### Proposal 2

**ATA 21-50-00 PACK BELLOWS**

Rupture of clamps has caused pack bellows to break open, leading to cabin pressurisation difficulties. Replacing these clamps by corrosion-resistant and welded ones will minimize such occurrences.

### Proposal 3

**ATA 21-50-00 CONDENSER**

Some pressurisation difficulties have been linked to rupture of the condenser (see example of ruptured condenser below) of one air conditioning pack. The affected pack will then no longer supply air to the cabin due to the significant leak at the rupture. The solution has been to increase the thickness of the wall that exhibited this failure mode.
ATA 27
Flight controls

Joan Rendu
Engineer Flight Control Systems
Customer Services Engineering

ATA 27 - Flight Controls

In 2004, 6% of all in-flight interruptions have been attributed to ATA chapter 27. Contributors are multiple but, as the chart shows, the two most significant are flaps and vibration.

The flap category represents the biggest contributor to operational interruptions with 37% of the total for flight controls. This includes faults that range from single SFC (Slat and Flap Control Computer) faults with no effect on flap and slat availability, to faults that lead to flap/slat lock. Flap or slat lock has a direct impact on landing distance (defined in the Flight Crew Operating Manual).

Vibration is the second most significant operational interruption contributor with 12%. It should be noted that vibration has no effect on handling or performance efficiency: concerned surfaces and systems remain fully efficient during vibration events.

Proposal 1
FLAP ROTARY ACTUATOR

There are 4 rotary actuators on each wing. The function of these actuators is to translate the rotary motion of the flap drive shaft into movement of the flaps. Flap rotary actuators had recently been removed for re-greasing. Investigation revealed that during accomplishment of removal or installation of the flap rotary actuators a slight mis-rigging in the flap transmission had been induced. This was found as a contributing factor in the reported flap locks.

Proposal 2
VIBRATION

Airbus has addressed the majority of airframe vibration sources. However, vibration related events can still occur and comprehensive advice for addressing them effectively is provided in the Trouble Shooting Manual (TSM).

When the aircraft is on ground it is difficult for maintenance to identify the vibration source. Effective troubleshooting of in-flight vibration avoids vibration reoccurrence and associated potential operational interruptions.

Rapid and efficient troubleshooting requires accurate pilot reporting using the vibration reporting sheet (entry point for TSM task 05-50-00-810-801).

It is important to note that for optimum troubleshooting efficiency, the flight crew should attempt to isolate the vibration source during flight by modifying the flight parameters (e.g. pitch, yaw, speed, etc.).

Note that the vibration reporting sheet also allows isolation of vibration/noise from any source (e.g. flight controls, belly fairing seals, engines, doors etc.).

ATA 27 - Flight Controls

Joan Rendu
Engineer Flight Control Systems
Customer Services Engineering

ATA 27 - Flight Controls

Contact
Joan Rendu
Engineer Flight Control Systems
Customer Services Engineering
Tel: +33 (0)5 62 11 01 42
Fax: +33 (0)5 61 93 44 25
joan.rendu@airbus.com

ATA 27 - Flight Controls

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ATA 27 - Flight Controls
ATA 29
Hydraulic system

A hydraulic system is usually considered lost when one of the following cockpit messages is triggered: fluid quantity loss, fluid/pump overhear or air/hydraulic low pressure (or overpressure in a few cases). These can either be the result of a spurious/false fault message, or generated by a confirmed system failure.

Hydraulic system loss alone does not necessarily lead to in-flight interruption, as some operators (crews), in this situation, can choose to continue the flight or not.

In 2004, 9% of in-flight interruptions were attributable to ATA 29. For our review, we have divided the causes into two main categories:

- Interruptions due to hydraulic system malfunctions (i.e. false fault messages, overhear, low pressure, etc.). These represent approximately 40% of the total in-flight interruptions for ATA 29.
- Interruptions due to hydraulic leakages, which account for the remaining 60%.

Proposal 1
FLEXIBLE HOSE INSPECTION

Flexible hoses are installed in the hydraulic distribution system where movement is required to ease removal/installation of components. Pressure fluctuations, pulsations of the system and bending cycles impose a high level of stress in the hose. In addition, some flexible hoses are subject to difficult environmental conditions, such as temperature variation, foreign object damage, or chemical attacks (carbon burst, de-icing fluid etc.). If not replaced, damage to a hose or its wire braid, can lead to hydraulic leakage, and possibly system loss. Although flexible hoses are ‘on condition’ parts, Airbus recommends to carry out visual inspections of these flexible hoses, and more particularly those in specific and sensitive areas, such as the landing gear, landing gear doors, flight controls and the hydraulic bay.

During such an inspection, the installation of the line must be checked (routing, clearances, clamp position/integrity), as well as the integrity of the flexible hoses themselves (see rejection criteria in the following paragraph).

Wire-braided hoses/conduits have to be replaced when:

- Two or more wires in one plait or several wires are broken in a concentrated area
- 10% or more of a given braided area exhibits wear from chafing
- Braid is protected by a neoprene overlay and wear or chafing into the braid has occurred.

To ease the operator’s integration of such visual inspection in their scheduled maintenance programs, Airbus has developed a CD-Rom, called ‘Hydraulic Systems – Visual Inspection Guide’. It covers all the areas and equipment that could be checked and has been developed in conjunction with operators of the A320 Family.

Proposal 2
HYDRAULIC PRESSURE SWITCHES

Two types of pressure switch are installed on A320 Family aircraft:

- Engine pressure switches, located at the outlet port of both Green and Yellow Engine Driven Pumps (EDPs)
- And manifold pressure switches, located on the High Pressure (HP) Manifolds (Green, Yellow and Blue systems), as well as at the outlet port of the Blue Electric Motor Pump (EMP).

Both types of switches have the same general design, the main difference being the warning threshold value, which is higher for the engine switch.

As shown in the main leak drivers pie chart, the pressure switches currently installed can give some spurious low-pressure messages. In addition, hydraulic leakage from the switch itself was reported in past years. It is estimated that overall pressure switch failures have led to 8.4% (for ATA 29) of the in-flight interruptions since 2001.

It has therefore been decided to develop an enhanced design for both pressure switch types to cure these issues. For this purpose:

- PN 450-1-3100-00 will replace PN 50-1-3100-00 on the EDP outlet ports
- PN 450-2-3100-00 will replace PN 50-2-3100-00 on the manifolds and EMP outlet ports.

These units are still under the validation process and will be available for procurement mid-2005.
For further information on their availability and to follow up Airbus actions, please refer to TFU 29.30.00.008.

Please also refer to closed TFU 29.11.17.001 (EDP Pressure Switch failure on IAE Engines), which introduces a new pressure switch installation on IAE Engines through Airbus SB 29-1096 and IAE SB V2500-NAC-0263.

GROUND SERVICE MANIFOLD PRE-MOD 25159

Airbus recommends that pre-mod 25159 Green and Blue Ground Service Manifolds, PN S4-3500272, are replaced by post-mod 25159 Manifolds, PN S4-350711, S4-350712 or PN S4-350071L before reaching 19,000 flight cycles (refer to SIL 29-077).

The investigations carried out on several returned units of the above PNs have led Airbus to publish some recommendations, detailed in SIL 29-080, that describe the preventive replacement of these manifolds.

PTU and Ground Service Manifolds leakages represent 19% of in-flight interruptions due to hydraulic leakage for aircraft prior to MSN 972.

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PTU and Ground Service Manifolds leakages represent 19% of in-flight interruptions due to hydraulic leakage for aircraft prior to MSN 972.
Landing gear non-retraction during take-off phase is a key factor in in-flight interruptions. It represents roughly 14% of fleet reports. Although significant decrease in rate has been demonstrated on ATA 32, the large number of equipments involved in the landing gear extension/retraction sequence still gives a remote, but wide, spread of failure modes.

The proposals given provide simple and proven advice to significantly reduce ATA 32 related flight interruptions.

The first one, related to ground lock pins and ground lock sleeves, commonly called ‘safety devices’, or ‘safety pins’, may appear obvious. However, the increase of flight interruptions reported due to safety devices forgotten on the landing gear prior to take off, combined with an increase of queries on the subject led us to make known Airbus operator experiences.

The other one relates to the nose landing gear (NLG) ‘flight/ground’ indication system. This item aims to address improvements and thus to correct one of the main contributing factors to landing gear retraction failure.

Proposal 1
GROUND LOCK SAFETY DEVICES

Installation of the landing gear safety devices (ground lock pins and collars), when the aircraft is towed or pushed-back during flight operation is optional. Airbus do not intend to make recommendations to favour one way or the other as some airlines require installation of ground lock pins and collars, whereas some do not want to do this.

The rationale behind this optional statement is that during the A320 Family operation, green hydraulic power supply is generally ON, giving two different means to physically achieve the landing gear down and locked position:

• Gear architecture (nose landing gear over-centred position and downlock springs),
• Green power supply at the downlock actuators.

However, under towing operation for maintenance, when the hydraulic power supply is not available, one downlock means is removed. Under such circumstances, Airbus recommends usage of the ground lock pins and collars which are 100% reliable to ensure physical downlocking of the landing gear.

With regard to the above, Airbus would like to highlight the following:

• Installation of the devices is optional. It is not a requirement for operational pushback (i.e. during turnaround)
• The devices are made visible (with a red flag for the pins) to the ground crew. It remains the operator’s responsibility to check they do not hang underneath the aircraft prior to departure
• It remains the airline’s maintenance staff responsibility to ensure the red paint/flags are in good condition

Some airlines who fit ground lock pins and collars during turnaround have particular check-lists requesting their flight crew to ask ground crew to show, in their hands, removed pins and collars prior to final dispatch. This may be an effective way to avoid interruptions, if you wish to install those pins during short turn around.

Ease of implementation
Low cost
None
Proposal 2
NOSE LANDING GEAR ‘FLIGHT/GROUND’ INDICATING SYSTEM

The NLG ‘flight/ground’ indicating system consists of a mechanical mechanism driving two sensors (FIN 24GA and 25GA) see figure above. It indicates whether the aircraft is ‘in flight’ and ‘straight’ (shock absorber extended and centred) or ‘on ground’ (shock absorber compressed or not ‘straight’).

Three failure modes have been identified that induce bending or fatigue break of the sensors 24/25GA rod links, which can lead to flight interruptions:

- Looseness of the NLG cover
- Seizure/jamming of the rod links
- Corrosion/seizure of the target lever eye end bearings.

The following modifications have been defined to address these failure modes:

- Cover fastening reinforcement (Messier-Dowty - Vendor Service Bulletin 580-32-3133)
- Rod links reinforcement (Messier-Dowty - Vendor Service Bulletin 580-32-3157)
- Target lever modification to add a greasing path and then allow its lubrication (Messier-Dowty - Vendor Service Bulletin 580-32-3155).


Pending embodiment of these modifications, some maintenance may be applied to prevent the failure mode of the rod eye end and target lever axle (refer to TFU 32-21-112): ‘Cleaning of the interface rod link axle as well as the target lever axle. If the target lever or the axles are removed, ensure the axle lever torque value is between 4 and 5Nm (2.949 to 3.687lbf)”.

During 2004, 8% of all in-flight interruptions have been attributed to ATA chapter 36. Analysis of these interruptions clearly shows that the main causes are either bleed air duct leak detection or bleed air over-temperature regulation (leading to single or double bleed loss). These two main reasons are driving more than 60% of ATA chapter 36 interruptions.

The main contributors to these failure modes are well identified and have fixes already available:

- Temperature Control Thermostat (TCT) failure is one major contributor to the over-temperature regulation (either TCT failure or TCT filter clogging)
- Bleed air duct seal leakage for bleed air leaks.

The new technology developed for the bleed air duct seals is also available for the air conditioning packs through SB A320-21-1153 (available second quarter of 2005). It should be noted that bleed air leaks in the pack bay will trigger a wing leak warning and as such contribute to ATA36 reliability performance.
Proposal 2
BLEED OVER-TEMPERATURE DUE TO TCT FAILURE

Part of 51% of in flight interruptions (combined bleed fault and over-temperature). For information: bleed fault warnings can be due to either an over-temperature or an over-pressure. From experience, it is considered that a large part of bleed faults are due over-temperature and consequently linked to TCT behaviour.

The type of failure is known to be due to a particular TCT Part Number (PN). An improved PN is available to address this issue and application of a one-time TCT inspection, as per SB A320-36-1049, will allow the TCT PN to be identified and replaced if required.

Proposal 3
BLEED OVER-TEMPERATURE DUE TO TCT FILTER CONTAMINATION

Part of 51% of in flight interruptions (combined bleed fault and over-temperature).

Another well known possibility for bleed air over-temperature is the TCT filter clogging. To address this issue regular filter cleaning is recommended and is available through application of the corresponding MPD task. Today’s recommended interval is 20 months. Nevertheless, depending on operating environment and operator’s experience, a loss or a more frequent initial interval may be used. For example, it has been well established that Middle East operators were more affected than others. This recommendation is also described in SIL 36-055.
Overall, for the year 2004, 6% of in-flight interruptions were attributed to ATA chapter 52.

As far as doors are concerned, cargo door false open warnings were identified as the main contributor to reported in-flight interruptions or rejected take off. In addition, analysis shows that, in most cases identified preventive actions could have avoided these events.

In all cases, doors were confirmed closed and locked afterwards.

Since the introduction of a new standard of cargo door handle mechanism, the number of events has been drastically reduced.

The major causes identified are:

- Cargo door handle deformed or cracked (old standard)
- Partial embodiment of SB A320-52-1039 (old standard)
- Proximity switch 28WV/34WV or 30WV/32WV
- Handle hook mechanism jammed (old standard)

More detailed information on these issues is provided in SIL 52.055. Trouble shooting information is given in Trouble Shooting Manual 52-31.00.

Two types of cargo door handle can be found on A319/A320/A321 aircraft. Mod 26213 introduced a new cargo door improved design, starting with MSN 759. From this MSN, a completely new design of handle was introduced.

Although two thirds of aircraft in service at the end of 2004 are fitted with the new cargo door standard, reports on ‘old standard’ handles represent more than 75% of the cases as you can see on the pie chart on the following page.
Proposal 2
PROXIMITY SWITCH 28WV /34WV or 30WV/32WV

The proximity switches 28WV /34WV and/or 30WV/32WV can become incorrectly adjusted or faulty. AMM procedure 52-71-00 describes the cargo door proximity switch adjustment procedures.

As a preventive action, some operators have introduced a proximity switch adjustment check, as per AMM 52-71-00, every C-check.

Introduction of an all metal sensor PN 8-933-01 improved the reliability of the sensors. The new all metal sensor is fully interchangeable with the previous standard and is now the preferred spare part.

Inductance check of the proximity sensors is covered by AMM task 32-31-73 and allows their condition to be assessed.

Proposal 3
HANDLE HOOK MECHANISM

Cases of the handle hook mechanism (IPC 52-31-21) being stiff or jammed have been found. In these cases, the hook does not engage correctly on the handle. Should such a situation occur, the handle flap will not be flush with the door outer skin contour and generate a warning.

It is recommended to clean/lubricate the handle locking linkage every C-check as per MPD 52-30-00-03-1 and AMM task 12-22-52-640-009.

Over the last four years the number of events attributed to the Propulsion System has regularly decreased. In 2004, 14% of in-flight interruptions were attributed to the ATA chapters concerned (ATA 70 to 80). During these four years, well over 900 aircraft have been delivered (a fleet growth of almost 70%).

These events were reviewed for each of the propulsion systems employed in the A320 Family (breakdown shown in the pie-chart) to identify the main contributors and proposals are provided accordingly.

The review of each propulsion system reveals two common contributors to in-flight interruptions, which are Exhaust Gas Temperature (EGT) and vibration.

Several causes were identified, amongst them bird strike and EGT overlimit are the most numerous. Whereas bird strikes are hard to prevent, some EGT driven events may be avoided through close trend monitoring.

Generic proposals

The first generic proposal is to implement an engine trend monitoring system. Low EGT margin conditions, as well as possible drift in engine behaviour can be monitored and actions initiated before possible events occur.

Secondly, in order to monitor fleet reliability and follow related engine reliability initiatives, we suggest contacting Airbus Customer Services Powerplant or your engine representative.

More engine information is also available on:
- www.cfm56.com
- www.iae4u.com
Advances in propulsion systems have led to improved engine performance and efficiency, but with increased complexity come challenges such as vibration, oil quantity loss, and oil leaks. These issues can lead to component wear and degrade the overall performance of the engine.

### CFM56-5A & 5B Engines

For CFM56-5A engines during the last four years, faults in Full Authority Digital Electronic Control (FADEC) are the biggest contributor to in-flight interruptions (14.6%). Normally, this includes faults in the Electronic Control Unit system (ECU).

Vibration is the second biggest contributor with 10.8%. In the majority of cases, this is attributed to Low Pressure Turbine (LPT) and High Pressure Compressor (HPC) blade vibration.

For CFM56-5B during the last four years, vibration (13%), N1 (Low Pressure System Speed) fluctuations (8%) and compressor vane (8%) faults are the biggest contributors to in-flight interruptions. The event causes are the T12 temperature sensor and the air system Variable Bleed Valve (VBV).

### Proposal 1: Compressor Vane
Proposed actions include:

- **N1 Fluctuations:**
  - Production assembly manual revised (Apr 04)
  - Component Maintenance Manual 73-31-22 TR 75-05 (Oct 04) issued
- **Affected Population Identification:** 1867 parts are affected
- **CFM Service Bulletin SB75-0062 (5A), & SB75-0030 (5B)** to improve VBV System reliability.
- **Mobil 28 grease** is introduced in the VBV ballscrew actuators, replacing the Tribolube 2 grease.

Several cases of transitory ENG COMPRESSOR VANE warnings have been reported at Take Off (TO) to Climb (CLB) thrust transition, on hot days, on recently overhauled engines.

### V2500-A1 & A5 Engine

For V2500-A1, EGT and vibration are the biggest contributors to in-flight interruptions with 27% and 13.4% respectively. With the exception of foreign object damage, the evolution in these parameters can be monitored with a trend monitoring system (see Generic Proposals on page 21).

For V2500-A5, EGT and engine stalls are the biggest contributors with 20% and 16% respectively. Regarding stall events, two main drivers were identified:

- **HP Compressor 6:** Fleet Management Plan completed successfully (IAE NMSB 72-0045 - Airbus SB 72-1023)
- **Variable Stator Vane system (VSV).**

Several cases of stall events were reported to be due to seized VBV stop mechanism. Investigation revealed that a defined population of units were assembled with insufficient quantity of lubricant. The following corrective actions have been implemented:

- Production assembly manual revised (Apr 04)
- Component Maintenance Manual 73-31-22 TR 75-05 (Oct 04) issued
- Affected population identification: 1867 parts are affected
- CFM Service Bulletin SB75-0062 (5A), & SB75-0030 (5B) to improve VBV System reliability.
- Mobil 28 grease is introduced in the VBV ballscrew actuators, replacing the Tribolube 2 grease.

Several cases of transitory ENG COMPRESSOR VANE warnings have been reported at Take Off (TO) to Climb (CLB) thrust transition, on hot days, on recently overhauled engines.

### Proposals

**Proposal 1:** Compressor Vane System

- **Proposed actions:**
  - Production assembly manual revised (Apr 04)
  - Component Maintenance Manual 73-31-22 TR 75-05 (Oct 04) issued
  - Affected population identification: 1867 parts are affected
  - CFM Service Bulletin SB75-0062 (5A), & SB75-0030 (5B) to improve VBV System reliability.

**Proposal 2:** Compressor Vane System

- **Proposed actions:**
  - Production assembly manual revised (Apr 04)
  - Component Maintenance Manual 73-31-22 TR 75-05 (Oct 04) issued
  - Affected population identification: 1867 parts are affected
  - CFM Service Bulletin SB75-0062 (5A), & SB75-0030 (5B) to improve VBV System reliability.

**Proposal 3:** Compressor Vane System

- **Proposed actions:**
  - Production assembly manual revised (Apr 04)
  - Component Maintenance Manual 73-31-22 TR 75-05 (Oct 04) issued
  - Affected population identification: 1867 parts are affected
  - CFM Service Bulletin SB75-0062 (5A), & SB75-0030 (5B) to improve VBV System reliability.

**Other Proposals:**

- **Proposal 4:** Compressor Vane System

Additional brackets may be added to better support the harnesses and the current bracket, made of aluminium alloy, will be replaced by a stainless steel one. The modifications may be done on wing and a Service Bulletin and kit will be available from the second quarter of 2005.

**Contact**

Raquel Sanchez-Garcia
Population System Engineer
Customer Services Engineering
Tel: +33 (0)5 61 93 25 53
Fax: +33 (0)5 93 44 38
raquel.sanchez-garcia@airbus.com
Conclusion

As this FAST Special has explained, an in-flight interruption is a rare event and, for the A320 Family, the rate continues to fall. Nonetheless, these events are unquestionably significant for any aircraft operator.

The ongoing process of identifying reliability drivers continues. Airbus and its vendors will also continue to offer new enhancements as needs and opportunities appear.

The current fleet of the A320 Family is operated by approximately 150 different organizations. Today, on average, an aircraft of the A320 Family experiences an in-flight interruption approximately once every 7000 flights. For an operator of six aircraft with average utilization, this suggests one in-flight interruption event every four or five months.

For this FAST Special, analysis of the events recorded during the last four years has been carried out. This has allowed proposals that will be applicable to the greatest number of operators to be identified. However, as might be expected for a mature aircraft family, the root causes are widely spread. Nonetheless, some proposals stand out as having a wide applicability and offer a significant contribution to further in-flight interruption reduction. In addition, most proposals offer an intrinsic improvement in overall system reliability that should not be forgotten when considering their implementation.

The recently available standard V06 of the Avionic Equipment Ventilation Computer (AEVC), described on page 4, addresses a number of issues that have been at the root of a relatively high percentage of in-flight interruptions.

Similarly, the Temperature Control Thermostat (TCT), described on page 17, has also been identified as being the cause of a relatively high number of events, particularly when operating in dusty environments.

Other proposals that are considered to be of particular interest are:

- **Nose Landing Gear Ground/Flight Indicating System** (page 14)
- **Bleed Air Duct seals** (page 15 and 16)
- **Air Conditioning Pack Bellows clamps** (page 5)
- **Air Conditioning Pack Condenser reinforcement** (page 5)
- **Hydraulic Hose inspection** (page 8 and 9)

Implementation of any one of the proposals in this FAST Special applicable to your airline and its fleet will reduce the number of in-flight interruptions.

Should there be any questions concerning the contents of this document please do not hesitate to contact the author of the relevant ATA chapter, your Regional Customer Services Manager (RCSM) or your Customer Services Director (CSD).