KUWAIT AIRWAYS

FLIGHT SAFETY

AN IN-HOUSE NEWSLETTER OF OPERATIONS DEPT.
KUWAIT AIRWAYS CORPORATION

FLIGHT SAFETY & QUALITY ASSURANCE

Issue 3, Jan. 2006

Introduction

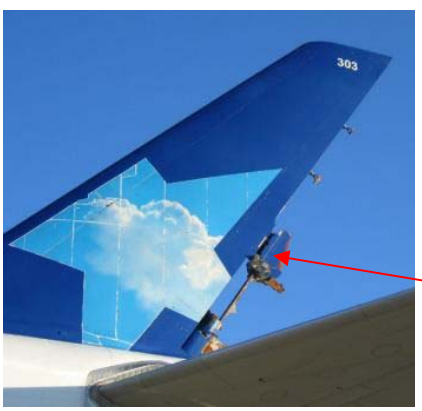
The newsletter team wishes you a very Happy and a successful 2006. We hope the previous two issues were informative, useful and you enjoyed reading them. We look forward to your feedback, suggestions and of course contribution to this newsletter in the form of articles, anecdotes, pictures, etc. which can be sent to the address given below.

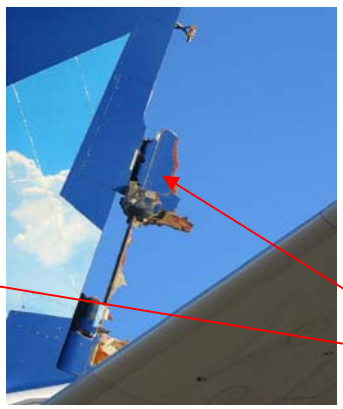
A310 Rudder failure

On 06 March 2005, an Airbus 310-308, Canadian registration C-GPAT, serial number 597 operated by Air Transat, was on a charter flight from Varadero, Cuba, to Québec City, Canada, with a crew of 9 and 261 passengers on board. While at an altitude of 35 000 feet, the flight crew heard a loud bang with simultaneous vibrations that lasted a few seconds. The aircraft entered a *Dutch roll* (a periodic rolling and yawing snaking motion) which decreased as the aircraft descended to a lower altitude. Once the aircraft reached about 19 000 feet, the flight crew had no indication of any abnormalities from systems monitoring. The flight crew considered landing at Fort Lauderdale, Florida, but elected to return to Varadero where an uneventful landing was carried out. It is only once on the ground that the flight crew noted during a visual inspection that a major part of the rudder was missing. There were no fatalities. One flight attendant sustained minor injuries. This prompted manufacturer Airbus to issue a directive calling for field inspections of rudders on both A310 and A300-600 models. As a result, nearly 400 Airbus aircraft worldwide were affected. Air Transit suspended its airbus flights in Toronto & Vancouver.

The Transportation Safety Board of Canada (TSB) is investigating this serious incident along with the Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA) of France, the German Federal Bureau of Aircraft Accidents Investigation (BFU), and the National Transportation Safety Board (NTSB) of the United States assigned accredited representatives to participate in the investigation. Technical advisors from Airbus, Transport Canada, the Direction Générale de l'Aviation Civile (DGAC), the Federal Aviation Administration (FAA), the German Aerospace Center (DLR), and Air Transat are also participating and assisting in the investigation.

The investigation team observed that only the lower rudder spar and the base rib of the rudder were remaining. Less than five per cent of the total rudder surface actually remained attached to the spar. The rudder is attached to the vertical fin through seven A-frame hinges, numbered one to seven, starting from the bottom. The remaining parts of the rudder were attached to the vertical fin's rear spar by the actuators and the four lower rudder hinges. Hinges five and six were still in place on the fin spar, but only the attachment fittings of the rudder were attached to them. The rudder position sensor was still attached to the remaining piece of rudder. Rudder hinge number seven was torn off from the fin spar.





Two views of the rudder remaining

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Flight safety/aircraft accident links

www.kac-opssafety.com
www.ntsb.gov
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www.bst.gc.ca/en/index.asp
www.bfu-web.de
www.aaib.gov.uk/home/index.cfm
www.atsb.gov.au/

This serious incident has generated lot of debate on the safety of advanced composite structures and reference is made to an earlier airbus A300 accident in November 2001, in which 265 people died as the American Airlines flight 587 crashed shortly after take-off from JFK airport in New York. In this accident, the fin and rudder were separated from the aircraft. A300 and A310 have similar fin and rudder structure. The NTSB which investigated that accident, blamed pilot error for the fact that the rudder fell off.

However, in the present case, the aircraft was at a cruising altitude where there is no need for aggressive rudder control. In fact, no crew inputs to the rudder were given throughout the flight. Yet the rearmost lugs holding the tailfin to the fuselage were damaged. The rear lugs, of the six that attach the fin to the fuselage, generally endure the greatest loads.

According to Mark Fernandez, the investigator in charge for the Transportation Safety Board (TSB) of Canada, "We believe the rudder pulled the fin back, so the loads were from front to back." In other words, they were not side-to-side, as occurred in previous cases resulting from rudder reversals. There is no evidence of lateral loading beyond certain limits, which are considered within the normal range.

The vertical tail plane (VTP) and the rudder were transported from Cuba to Bremen, Germany, for further examination. The VTP, to which the rudder is attached, is bolted to the top of the fuselage by six attachment lugs. Ultrasonic inspection, of the VTP revealed delamination damage to the two rear attachment lugs.

Composites are made of hundreds of layers of carbon fibre sheeting stuck together with epoxy resin. Each layer is only strong along the grain of the fibre. Aircraft engineers need to work out from which directions loads will come, then lay the sheets in a complex, criss-cross pattern. If they get this wrong, a big or unexpected load might cause a plane part to fail. It is vital there are no kinks or folds as the layers are laid, and no gaps in their resin coating. Holes between the layers can rapidly cause extensive 'delamination' and a loss of stiffness and strength.

Prof. Williams, an authority on composites from MIT, USA and other scientists have stated that composite parts in any aircraft should be tested frequently by methods such as ultrasound, allowing engineers to 'see' beneath their surface. Prof. Williams' research suggests that repeated journeys to and from the sub-zero temperatures found at cruising altitude causes a build-up of condensation inside composites, and separation of the carbon fibre layers as this moisture freezes and thaws. Among various scenarios, three are under investigation - rudder layers damaged by oil or glycol leaking onto the composite material; damage caused by lightning during a previous flight and damage occurred to the inside of the composite layers, which cannot be seen from the outside. The accident has brought in many issues - composite primary structure/ controls, adequacy of inspections, pilot training etc. The investigation is still on.

IOSA Audit of KAC

The IATA Operational Safety Audit (IOSA) which took place between Dec.3 and 7, 2005 was carried out by an approved Audit Organization (AO) S H & E International Air Transport Consultancy.

The IOSA programme is an internationally recognized and accepted evaluation system, designed to assess the operational management and control systems of an Airline. IOSA uses internationally recognized quality audit principles, and is designed so that the audits are conducted in a standardized and consistent manner.

This audit is a formal and structured process for assessing the operations of an organization, to determine the level of compliance or conformity with the specific recognized requirements, known as IOSA Standards and recommended Practices (ISARP's), usually referred to as IOSA Standards (www.iata.org/ps/services/iosa1.htm).

To achieve IOSA Registration, KAC had to comply with nearly 750 Standards (ISARP's), divided between eight major operational sections:

1. ORG : Corporate Organization and Management System
2. FLT : Flight operations
3. DSP : Operational control - Flight Dispatch
4. MNT : Aircraft Engineering and Maintenance
5. CAB : Cabin Operations
6. GRH : Aircraft Ground Handling
7. CGO : Cargo Operations
8. SEC : Operational Security

It is worth noting that FLT and DSP which came under Operations Department constituted the bulk of the IOSA Standards:

- FLT section had 277 ISARP's which is 36.9% of the total IOSA programme.
- DSP Section had 87 ISARP's, which is 11.6% of the total IOSA programme. Together the Operations Department had to deal with 48.5 % of the total IOSA programme.

Considering that at least five references were given in most cases for each Standard of FLT, DSP and part of ORG (related to Operations Department: 71 out of 81): i.e. 2250 ((292+87+71)x5) references of various Operations related manuals were dealt with; thus exhibiting the voluminous IOSA task performed.

MINIMUM EQUIPMENT LIST FOR A310/300 TYPE SIMULATOR

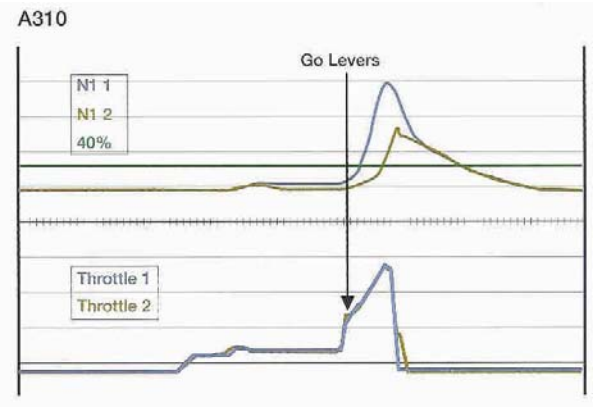
Under the IOSA programme, for the effective utilization of the simulator facilities, a Minimum Equipment List for A300/A310 training simulator is prepared and approved by Kuwait DGCA/ASD.

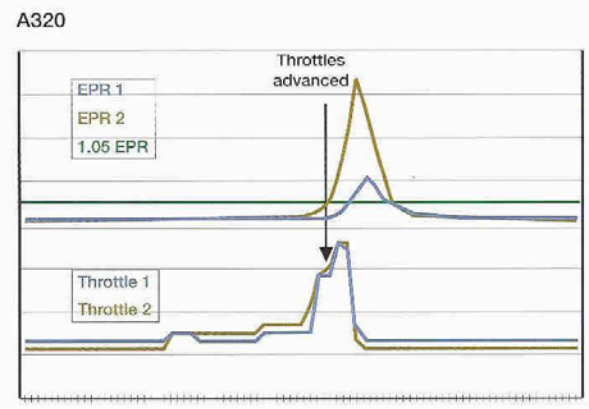
Runway Excursions at Take-off

Adapted from the article of same title by Jean Daney in the Sept.2005 issue of ***SAFETY FIRST - The airbus safety magazine***

There have been two events involving an A310 and an A320 that resulted in the aircraft exiting the runway during takeoff run. The circumstances that caused these events are very similar:

During the alignment on the runway centerline before takeoff, one throttle was advanced slightly above the other. This led to a situation where one engine was above idle. Then the go-levers were triggered(A310) or the thrust levers were advanced (A320) without prior N1 stabilization. The engine above idle accelerated faster than the other, leading to an asymmetrical thrust increase. In both cases, the takeoff was rejected but the aircraft left the side of the runway at low speed. DFDR data for the two cases are shown in the plots below.





Engine acceleration depends on acceleration schedule (FF vsN2) and throttle movement.

- There are two types of acceleration: Slow throttle movement "behind" the engine acceleration schedule: thrust is a function of the throttle position.
- Fast/normal throttle movement " ahead of" the engine acceleration schedule: Thrust is a function of the max. acceleration schedule capability.

The time to accelerate the engine up to the takeoff power depends on the initial power level: the acceleration from min. ground idle is slow, while acceleration from intermediate thrust is fast.

At low power setting, engines may have different acceleration profiles while the same acceleration profile for both engine is available from a certain amount of thrust.

To summarize, asymmetric power increases if the go-levers are triggered (A310) or the thrust levers are advanced(A320) without N1 stabilization while:

- One engine is at idle and the other is slightly above idle
- One engine is slower to accelerate than the other.

FCOM RECOMMENDATIONS:

A310: - Slightly advance throttles and monitor spool-up until both engines are above idle(approx. 40% N1) OR
- Slightly advance throttles and monitor spool-up until both engines are aligned and stabilized between 1.05 and 1.10EPR with no more than 0.002 EPR difference between both engines.

A320: - If the crosswind is at or below 20Kts and there is no tailwind: PF progressively adjust engine thrust in two steps:
- From idle to about 50% N1(1.05 EPR)
- From both engines at similar N1 to takeoff thrust.

- In case of tailwind or if crosswind is greater than 20 Kts: PF sets 50% N1 (1.05 EPR) on both engines then rapidly increases thrust to about 70% N1(1.15 EPR) then progressively to reach takeoff thrust at 40Kts ground speed.

COMMUNICATION TO THE PILOTS: It is important to emphasize the understanding of engine response at takeoff thrust setting, particularly the requirement of setting a similar N1(or EPR) on both the engines, prior to setting the takeoff thrust during type rating and recurrent training.

Incident summaries

FLIGHT KU677(A320) departed Abu Dhabi airport (OMAA) on sector AUH-MCT as scheduled passenger flight. While the F/O (acting as PF) started executing a rolling take-off on R/W 13 and at a speed approximately 60 Kts, both crew heard a loud bang, which appeared to be the left engine (Engine NO.1) has surged, the take-off was rejected. Aircraft stayed at the R/W till the checklist was completed and was taxied out by the Capt. using the aircraft power to the final position. Engineer check confirmed that the engine was damaged and the engine was replaced. No fatalities or personal injuries.
The incident is under investigation.

FLIGHT KU281, Sector KWI-DAC (A300) was dispatched (released) to service on time after the acceptance of flight Commander, inputs of flight dispatch and agreement of OCC. Destination's weather forecast was below landing minimum at ETA ±1. Upon arriving overhead of destination and waiting for a considerable time in hold, then commencing approach to 4000 ft, ATC advised PIC to divert due to persisting fog, meanwhile the RVR readout were below KAC-minima. The flight landed safely at Chang Mai(CNX) airport. Flight stayed briefly on ground CNX and departed to DAC airport as the weather improved . Total delay was 6 hours.

The incident is under investigation.

Aviation Safety– 2005- the year that was

- Aviation safety Network release—Jan.2006 (aviation-safety.net/index.php)

Last year's multi-engine airliner accident statistics released by the Aviation Safety Network shows 35 fatal accidents resulting in 1059 fatalities. Africa is still the most unsafe region with 13 accidents. Although this is significantly lower than the ten-year average of 40, the number of fatalities was almost equal to the 1995-2004 ten-year average. This was due to high number of serious accidents. 2005 accidents again highlighted the four aviation safety priorities, identified by the Flight Safety Foundation (FSF):

* **Controlled flight into terrain (CFIT)** accidents in 2005 were probably responsible for almost one quarter of all fatal accidents, killing over 160.

*** Approach and landing** accidents were twelve, killing 228 passengers and crew members.

*** Loss of control** of some kind can be attributed to several accidents last year. In August an MD-80 crashed when the flight crew were not able to recover from an engine flameout, airplane stall and high speed descent at night over unlit mountainous terrain. All 160 on board were killed.

*** Human factors**

As most accident investigations are not completed yet, it's too early to tell in what cases human actions were a causal factor in accidents in 2005. However the investigation into the August 14 crash of a Cypriot Boeing 737 plane in Greece will surely focus on questions like why the Pressurization Mode Selector (PMS) was left in the "Manual" position after maintenance, why the crew did not detect this, how the crew interpreted the various warnings and indications and that the aircraft did not pressurize after takeoff. Another issue will be the intra-cockpit communications. It must be stressed that human factors does not mean "pilot error"; in human factors it is important to determine which mistakes were made, why, under what circumstances etc.

Aviation Quotes!

- The only time you have too much fuel is when you're on fire.
- You know that your landing gear is up and locked when it takes full power to taxi to the terminal
- Flying the airplane is more important than radioing your plight to a person on the ground incapable of understanding or doing anything about it
- Basic flying rules:
  Try to stay in the middle of air.
  Do not go near the edges of it.
  The edges of the air can be recognized by the appearance of ground, buildings, sea, trees and inter stellar space. It is much more difficult to fly there.

Web watch

Aviation-safety.net - provides with up-to-date, complete & reliable authoritative information on airliner accident and safety issues
www.pprune.com - Professional Pilots Rumour network - plenty of discussions on incidents, airspace safety etc.
www.jaa.nl - Joint Aviation Authorities
www.easa.eu.int/home/index.html - European aviation safety Agency
enggonline/home.htm - Intranet site of Engineering department, Industrial engineering and automation support an excellent site providing on-line engineering data base of the complete fleet, including aircraft maintenance manuals, engine manuals, Qc documents etc.
www.kuwait-airways.net - Kuwait airways intranet service site—information on admin, departmental services, etc.

The Confidential Aviation Hazard Reporting System (CAHRS) provides a means of reporting hazards and risks in the aviation system before there is loss of life, injury or damage. It is open to anyone who wishes to submit a hazard report or safety deficiencies confidentially and non-punitively. Reports help to identify deficiencies and provide safety enhancement in areas of aviation. CAHRS forms can be collected at different location of KAC (i.e. Flight Dispatch) Premises. Completed forms can be dropped in FS&QA allocated box at Flight Dispatch or e-mailed to kwioe@kuwaitairways.com or faxed to 00965-4749823 or mail to Flight Safety and Quality Assurance office, Operations Department, P.O. Box 394, Safat 13004, Kuwait Airways –Kuwait.