KUWAIT AIRWAYS
IOSA CERTIFIED

FLIGHT SAFETY

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FLIGHT SAFETY & QUALITY ASSURANCE

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Introduction

We hope you enjoyed reading the July issue. We are delighted to inform you that we are now **IOSA certified** and are among the world's leading airlines demonstrating our operational safety and efficiency.

In this issue, we have a report on the in-flight breakup of Boeing 747-200, followed by notes on the importance of NOTAMs, flying and medication, and global aviation safety roadmap. We are sure you will enjoy reading these.

Your feedback is very important. We welcome your feedback, suggestions and contributions to this newsletter in the form of articles, anecdotes, pictures, etc. which can be sent to the address given below.

In-flight breakup of China Airlines B747

Adopted from Flight Safety Foundation Accident Prevention Vol.62 no.5 May 2005

On may 25, 2002 around 1528 local time, a Boeing 747-200 operated by China Airlines (CAL) as flight CI611 on a scheduled flight from Taipei, Taiwan, China to Hong Kong, broke up in mid air at 34,900 ft while being flown to Flight Level 350 and struck the Taiwan strait approximately 23 nautical miles northeast of Makung, Penghu islands. Of the 225 occupants, 175 were killed and the others were missing and presumed to have been killed in the accident.

The aircraft had departed at 1507 from Runway 06 at Chiang Kai Shek International Airport. At 1516, ATC told the crew to climb to FL350. The crew's acknowledgement was the last radio transmission from the aircraft.

The Aviation Safety Council (ASC) of Taiwan, China which investigated the accident in its final report gave the following findings related to probable causes:

- The in-flight breakup of C1611, as it approached the cruising altitude, was highly likely due to the *structural failure in the aft lower lobe section of the fuselage* (i.e. where the belly of the aircraft begins to curve upward towards the tail);
- On Feb 7, 1980, the accident aircraft had a tail-strike occurrence in Hong Kong resulting in structural damage in the aft lower lobe section of the fuselage. It was ferried back to Taiwan on the same day, unpressurized, and a temporary repair was conducted a day after. A permanent repair was conducted on May 23-26, 1980;
- The permanent repair of the tail strike was not accomplished in accordance with the Boeing structural Repair Manual (SRM), in that the area of damaged skin in section 46 was not removed (trimmed) and the repair doubler (a sheet placed against the skin to provide stiffness and /or additional strength) did not extend sufficiently beyond the entire damaged area to restore the structural strength;
- Evidence of fatigue damage was found under the repair doubler near its edge & outside the outer row of securing rivets. Multiple-site fatigue damage (MSD) [simultaneous presence of multiple fatigue cracks in a single structural element], including a 15.1 inch main fatigue crack and some small fatigue cracks was confirmed. This big crack and other multiple cracks initiated from scratching damage associated with the 1980 tail strike incident;
- The possibilities of mid-air collision, engine failure or separation, cabin over-pressurization, cargo-door opening, adverse weather or natural phenomena, explosive device, fuel tank explosion, and hazardous cargo or dangerous goods were ruled out.
- There was no indication of penetration of fragments, residual chemicals or burns that could be associated with a high-energy explosion or fire within the aircraft.

The accident aircraft manufactured & acquired by CAL in 1979 had accumulated 64,810 flight hours and 21,398 cycles at the time of the accident.

Due to lack of detailed maintenance records of repair in 1980, the ASC was unable

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Flight safety/ aircraft accident links

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www.aaib.gov.uk/home/index.cfm
www.atsb.gov.au/

to determine how the repairs were carried out. These were assessed from the examination of the wreckage which showed that permanent repair was not carried out as per the SRM.

The SRM specified the limits on the amount of "clean up" of fuselage skin that has to be done to remove scratches and other damages (e.g., cracks, corrosion, puncture etc.). If cleanup could not be performed within the specified limits, SRM required either replacement of damaged skin or removal (trimming) of the damaged skin and installation of a doubler over the trimmed area. The SRM said that the doubler had to extend beyond the trimmed area at least by three rows of rivets. Instead of either of these two options, a doubler was installed over the scratched skin which did not effectively cover the entire damaged area, as scratches were found at and outside the outer row of fasteners securing the doubler. As a result there was no protection against the propagation of a concealed crack in the area between the rivets and the perimeter of the doubler.

The Chief Structural Engineer (CSE) of CAL confirmed with investigators the non- compliance with the SRM procedures and attributed it to the difficulty in carrying out SRM procedures. The CSE also told that he had informed the Boeing Field Service Representative (FSR) of the same and asked the FSR to inform Boeing of the intended method of repair. Since there was no response from Boeing, CSE considered that Boeing had agreed to the repair. The Boeing FSR said that he was not told about the permanent repair.

Analysis to determine the maximum damage that can exist before a structure can no longer meet maximum load requirements (Residual Strength Analysis), indicated that the main fatigue crack in combination with the MSD was of sufficient magnitude and distribution to the local linking of the fatigue cracks so as to produce a continuous crack within a two-bay region of 40 inches. Analysis further indicated that under normal operational loads, the residual strength of the fuselage would be compromised resulting in a continuous crack of 58 inches or longer length. Although ASC could not determine the length of crack prior to the accident flight, the fretting marks on the doubler and the regularly spaced marks and deformed cladding found on the fracture surface suggested that a continuous crack of at least 71 inches in length - a crack length long enough to cause structural separation of the fuselage - was present before the in-flight breakup of the aircraft. Examination of the wreckage by Boeing indicated that the main fatigue crack was about 93 inches long before the breakup occurred.

CAL used visual and high frequency eddy current for non-destructive Inspection (NDI). As the fatigue cracks were beneath the doubler visual detection was ruled out. Maintenance records showed that eddy current inspection was not done on tail-strike-repair area and even if they had done it would not have detected the cracks through the doubler.

Investigators found corrosion on the damaged skin near shear ties, which are located between stringers and connect the fuselage skin to fuselage frames. Some corrosion had perforated the skin. In 1991, the Civil Aviation Authority of Taiwan, China (CAA) had issued an Airworthiness Directive (AD) requiring operators of Boeing aircraft to incorporate into their maintenance programs Corrosion-Prevention-and-control-Programs (CPCPs) developed by Boeing. The B747 CPCP required that the aft lower fuselage be inspected every four years. CAL conducted the inspection of this aircraft in 1993; second inspection was done in 1998.

In May 2000, CAL established a Repair Assessment Program (RAP) for their B-747 fleet whose objective is to ensure continued integrity of repaired structure with the adjacent structure. In Nov. 2001, all the 31 doublers on the accident aircraft's fuselage were photographed in preparation for the first RAP scheduled in Nov.2002. The report said that one photograph showed traces of stains on the aft lower fuselage that were an indication of possible hidden structural damage beneath the doubler.

On the accident day, as the cabin pressure increased during the climb, the crack beneath the doubler increased and residual strength went below the limit resulting in an unstable separation, along with rapid loss of cabin pressure. Debris from the fuselage hit the vertical stabilizer before the empennage separated from the aircraft. During the breakup process, the abrupt change in aerodynamic characteristics would have resulted in significant inertial forces resulting in the separation of engines. All four engines separated almost simultaneously. The remaining portion of the aircraft was intact and hit the water in a relatively flat attitude.

As both CVR and DFDR were installed at the rear of the pressurized area of aircraft, they stopped recording at the same time, likely to the stoppage of power supply due to structural breakup. A ballistic analysis indicated that the aircraft might have remained flying for more than four seconds after the recorders stopped.

This accident which destroyed the aircraft and killed all the people on board, exemplifies the criticality of structural repair following a damage and the subsequent follow-up inspection of the repaired component for structural integrity.

KAC is now IOSA certified

Kuwait Airways has successfully completed the IATA Operational Safety Audit (IOSA) and is on the IOSA registry (www.iata.org). IOSA is an internationally recognized and accepted evaluation system; and assesses the operational safety management and control systems of an airline. Out of 180 IATA airline members, 110 have passed the audits and are entitled to become IOSA operators. KAC has been preparing for this audit since January 2005. It successfully met all the audit requirements and became the first IOSA operator in Kuwait. According to IOSA program, all IATA member airlines are required to pass the audit program by no later than 31st December 2007. To achieve this, KAC had to comply with nearly 750 standards (ISARP's) divided between eight major operational sections (*Jan.2006 issue of Flight Safety for the details*). The Flight Operations & Operational control (flight dispatch) under the Operations department constituted a major part of these. With KAC achieving IOSA registration, it positively positions itself amongst the world leading airlines, demonstrating that it provides an operation that can deliver operational safety and efficiency.

Importance of NOTAMs

NOTAM is the quasi-acronym for a "**No**tice **T**o **A**ir**M**en" and are created & transmitted by government agencies. NOTAMs are important source of information on aerodrome and related air traffic management facilities.

While planning the flight, every pilot checks for aviation weather report. An equally important part of flight planning is to check all relevant NOTAMs. Which NOTAMs should be checked? It is not sufficient to check the NOTAMs of the airport from which you are departing and one at which you are arriving. Consider for example, a VVIP visiting the state to which you are flying, there could be restricted airspace surrounding that area for security reasons. The aviation regulation require that the "pilot in command of an aircraft shall, before commencing the flight, be familiar with the available information that's appropriate to the intended flight." There are three categories of NOTAM files; National NOTAMs, FIR NOTAMS and Aerodrome NOTAMs. Before commencing a flight, pilots must ensure that NOTAMs of each category have been reviewed in order to be familiar with all NOTAM information appropriate to the intended flight.

What if all NOTAMs are not checked? You may end up with a diversion, where a facility you need is not available! This was in the relevant NOTAM which you missed. In case of restricted airspace, which may be patrolled by armed interceptor aircraft, an unwary pilot entering could lead to a close encounter of the worst kind?!

Flying and medication

Contributed by Capt.Shawki Al-Ablani, Deputy Operations Director, Flight Safety and Quality Assurance Division

An understanding of the effects of medication during flying is useful not only for the passengers but also to the flight crew as this will help them in helping/handling passengers who are on medication and get into a bad situation during a long-haul flight.

In the confines of the pressurized aircraft cabin, the effects and side-effects of drugs can be heightened due to the interaction between the physiological stresses of flight, particularly, the oxygen deficiency and medicines. Lack of oxygen alters the brain function and hence any drug affecting the brain will be altered too. Medicines and drugs that fall under this category include anti-histamines, acetazolamide, fat-soluble beta-blockers, alcohol and psycho tropes. Let us look at the effect of each one of these.

- Anti-histamines are prescribed for "cold cures", motion sickness, hay-fever and Urticaria (nettle rash). Almost all anti-histamines produce side-effects such as drowsiness, vomiting, diarrhea, fatigue, dry mouth and tinnitus. Gastro-intestinal symptoms are perhaps mistaken by the passengers for food poisoning?!
- Acetazolamide is used to treat glaucoma and to regularize breathing at altitude. Hypnotics and sedatives, tranquilizers and anti-depressants, marijuana, LSD and Opium belong to the Psycho trope group. The interaction between these drugs and lack of oxygen can have other effects on brain. For example, there have been cases of memory loss when the hypnotic Traizolam (0.5 gm) was taken on board to encourage sleep and minimize jetlag. This benzodiazepine, with a short half-life of 2.6 hours caused transient global amnesia that lasted for several hours after landing! In each case, a moderate amount of alcohol, such as a glass of wine was consumed. Consequently, the National Westminster Bank have excluded sleeping pills from their travel kit. "The other reason is that under the influence of a hypnotic one won't be alert enough in an emergency." A common experience with tranquillizers taken for aerophobia on board is severe depression, which cannot be shaken no matter how idyllic the passenger's destination.
- Diabetic passengers on long-haul should increase their dosage of insulin when they are westbound and decrease it when they are east-bound, to bring their insulin levels inline with the time-zone they are flying into. They should also taken into account the fact that consumption of excessive alcohol can precipitate hypoglycemia.
- Epileptic passengers have to increase their dosage as lack of oxygen, over-breathing, fatigue and stress can provoke seizure. Those whose condition is poorly controlled should be advised to increase their medication twenty four hours before take-off and maintain high dosage until they arrive at their final destination. This should be followed by a gradual decrease of the dosage.
- Certain drug groups such as salicylates, female sex hormones, catecholamines and alaeptics have been found to cause hyperventilation.

While the above is a brief on the effect of medication during flights particularly of long duration, as the individual requirements vary due to the medical history, it is imperative that the passenger consults the family doctor and strictly adhere to the doctor's prescription.

Global Aviation Safety Roadmap

Summarized from the article " The road to safety" by Andrew Mahon in April/May 2006 issue of Airlines International IATA Magazine, issue no.1

Safety is the number one priority for the aviation industry. So the key stake holders of the aviation industry - Airbus, Boeing, Airports council International (ACI), Civil Air Navigational Services Organization (CANSO), International Federation of Airline Pilots Association (IFALPA), Flight Safety foundation (FSF) and International Air Transport Association (IATA) have rallied together to produce a **Global Aviation safety Roadmap**.

This forms the starting point for an innovative approach to safety. The goal of the roadmap is to reduce the global accident risk in commercial aviation. The challenge is to drive an already low accident rate even lower. The 13 page document articulates a global approach to achieve this objective. The features of the strategy are greater coordination

among stakeholders ; elimination of waste and duplication; proactive ventures; transparent and accessible metrics; and a data driven process for analyzing risks so that the new initiatives can be prioritized.

The road map aims to assist International Civil Aviation Organization (ICAO) with the implementation of harmonized, consistent and coherent safety oversight regulations and processes. It has the potential to support the establishment of state regulatory authorities which are competent, properly funded and independent. It has the ability of industry to work together across the board on all aspects of airline business. While the road map provides a common frame of reference and is essentially at higher level, the details are to be evolved later and requires the involvement of ICAO.

The origin of the road map goes back to May 2005 when industry representatives were invited to meet the ICAO Air Navigation Commission for an informal consultation. At that meeting, Guenther Matschnigg, IATA senior vice president for Flight safety, Operations and infrastructure made a presentation about global aviation safety from an airline perspective. In his presentation Guenther Matschnigg, stressed the overlap and ineffective utilization of resources, which could be avoided and much more could be achieved in a coordinated manner if there was a sort of safety roadmap.

The safety roadmap finds its genesis in Global Air Traffic Management Implementation roadmap which was developed by Industry Safety Strategy Group (ISSG) under the chairmanship of David Mawdsley of IATA, with the participation of industry bodies who eventually became the signatories of the document.

The safety roadmap is the latest step in the evolution of aviation safety. There has never been a shortage of Aviation safety measures and programmes, with initiatives from regulatory authorities, regions, organizations and operators on all aspects of safety, from flight ops and training to communication and navigation systems. But with 189 ICAO contracting states, 200 countries and languages, airlines in excess of 800, 1350 major airports, 150,000 flight crew and around 16,000 commercial aircraft it is easy to envisage the jigsaw puzzle that safety strategy produces. The entire aviation community appreciates and agrees that piecemeal approach without co-ordination results in wastage of vital resources.

Africa is a good example of the need for consistency and co-ordination. The region has attracted attention because of safety deficiencies. African accident rate is ten times the world average. As a result a wide spectrum of initiatives have been deployed. However, there is little synchronization. As a result those involved in improving safety are not clear of the issues and their priority. As it is not coordinated there is waste of money and time and the goals are not achieved.

The safety roadmap document identifies the urgent need of a safety roadmap for Africa in the short and long term. Apart from cohesion and efficiency, the key feature of safety roadmap is its proactive stance towards measuring safety levels and determining risk.

While traditional and most high-profile safety statistics are accidents and hull losses per million sectors of flight hours– the most reactive of all measures, the safety roadmap advocates a methodical, data driven approach to ongoing safety improvements. For this, open reporting and access to data is essential. Once data illustrates the need for action, a plan is developed, implemented and progress measured. A continuous cycle of improvement ensues.

In this context, initiatives like IATA Operational Safety Audit (IOSA) are front and centre, providing invaluable safety intelligence that can be shared among stake holders. As on the end of first quarter of 2006, more than 150 air carriers have gone through the safety audit—which for the first time sets the global standards - and to date 110 airlines are on the registry. IATA has made IOSA registration a condition of membership by the end of 2007, raising the bar of safety standard worldwide.

The roadmap also builds on past successes and data driven regional initiatives such as the U.S.Commercial Aviation Safety Team (CAST), Europe's Joint Safety Strategy Initiative (JSSI) and the Pan American Aviation Safety Team Initiative (PAAST). CAST is a good example of major players including regulators, working together. CAST was formed in 1997 with the objective of reducing the fatal accident rate by 80% by 2007, if adopted worldwide. The regional plan projects to be a 73% fatality risk reduction by 2007 achieved through a program of prioritized safety enhancements.

It is this idea of common framework for stakeholders that drove the roadmap initiative forward. "That means if we talk about global safety, we talk the same language" says Matschnigg. Working across the board is definitely a facet of the roadmap that appeals to stakeholders like ACI who want to be more involved in safety from the ground up. The roadmap document will come with more definite recommendations to make it directly applicable. These may cover the introduction of new technologies, standard operating procedures and training methods that have proven benefits. Then the members can be encouraged to adopt these improvements.

Industry expects positive results from the safety roadmap although all participants in the project agree that lot of work remains to be done to build the consensus achieved so far. By now clear view of the roadmap to implementation could be ready. *The safety roadmap may signify a long drive but the destination makes the effort worthwhile.*

Web watch

www.pilotfriend.com - a general aviation portal with links to extensive pilot resources - aviation weather, airport data base, flight planning, aviation medicine, flight training, flight safety etc. - a very informative and educative site.

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.