الخطوط الجوية الكويتية
KUWAIT AIRWAYS

FLIGHT SAFETY

AN IN-HOUSE NEWSLETTER OF OPERATIONS DEPT.

Vol.5, No.2 Flight Safety & Quality Assurance Division February 2010

IN THIS ISSUE

NEWSLETTER TEAM
Capt. Shawki Al-Ablani
Dr.M.S.Rajamurthy

Contact:
Flight Safety & Quality Assurance Division, Operations Dept.
P.O.Box.394,
Safat 13004 Kuwait
Phone:+965–24725475
+965-24348888/ext.2550
Fax: +965–24749823
E mail:
kwioeku@kuwaitairways.com

FLIGHT SAFETY/AIRCRAFT ACCIDENT LINKS

www.flightsafety.org
www.ntsb.gov
www.bea-fr.org
www.bst.gc.ca
www.bfu-web.de
www.aaib.gov.uk
www.atsb.gov.au

EDITORIAL

Pilot fatigue is a threat to commercial aviation and is a major concern for operational flight safety. While regulatory agencies have seen it to be a causal factor in many accidents, formulation of new rules on pilot working based on various research findings is yet to come. The pilot associations across the globe are concerned about this. We look into this topic in some detail.

Much like driving, alcohol and flying do not go together. Aviation has strict rules regarding this. We look at the effect of alcohol on human system, its effect on flying and the means to mitigate it.

We have the answer and explanation to last month's quiz on wake turbulence.

As always, we look forward to your feedback, suggestions and contributions which can be sent to our office address given in this page. Happy reading and many more safe landings.

FLIGHT CREW FATIGUE

Dr.M.S.Rajamurthy

On October 5, 2009, pilots and cabin crew across the whole of Europe took an unique action. On that day, they thronged the European airports and other locations to inform the travelling public and media that the EU rules on aircrew fatigue were potentially unsafe and as a result, the air traveler's life was at risk and their safety was compromised. This, in spite of the scientific evidence which supported the crew.

The subject of fatigue suffered by flight crew and the threat it poses to air safety has been in focus for the past few years. International Federation of Airline Pilot Associations (IFALPA) has been arguing with Regulatory agencies to define flight and duty limitations based on scientific studies.

Fight deck crew's duties in cockpit require care, vigilance, physical and mental well-being. It requires crew to remain alert and contribute to flight safety by their actions, observations and communications. Cockpit noise, vibration, long flights, irregular work schedules or too little sleep can result in fatigue, which can compromise deck crew's performance. Compared with an individual who is well rested, fatigued people think and move more slowly, have memory problems and make more mistakes.

Fatigue is thought to be a factor in as many as 20% of air accidents. There have been a number of aircraft accidents where fatigue was found to be a contributing factor (see table in the next page). "Aviation, Space & Environmental Medicine" in its January 2009 edition described fatigue as a "significant problem" in modern aviation due to "unpredictable Work hours, circadian disruptions and long duty periods". Fatigue in flight deck crew is a stealthy killer, one which we ignore at our peril.

According to the Annex 6 of ICAO, fatigue is "A physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness and/or physical activity that impair a crew member's ability to safely operate an aircraft."

In simple terms, fatigue is the subjective

Incidents & Accidents where fatigue was identified as a key factor

Year	Aircraft	Location
1993	DC8-61F	Guantanamo Bay
1994	737-200F	Coventry
1997	747-300	Guam
1999	MD82	Little Rock
2001	BAe146	Zurich
2002	CL65	Birmingham
2004	747-200F BAe J31 Learjet35A	Halifax Kirksville San Bernadino
2005	BN Islander	Machrihanish
2006	CRJ200	Lexington
2007	747-400F 737-800	Stockholm Keflavik
2009 *	DHC8-400	Buffalo

** investigation ongoing but fatigue cited in reports released*

feeling of tiredness that makes concentration on a task difficult. Fatigue is used to describe a sleepy, tired or exhausted state.

When the flight deck crew are flying under fatigued conditions several warning signals could alert the dangerous situation.

These include

- eyes going in and out of focus,
- head bobs involuntarily,
- persistent yawning,
- Wandering or poorly organized thoughts,
- Spotty near term memory,
- short term memory loss,
- and loss of initiative.

In terms of flying, there is

- increased reaction time
- reduced visual perception
- missed or erroneous performance of routine procedures
- sloppy flying
- degradation of control accuracy
- decreased ability to concentrate on multiple tasks.

A fatigued PF (Pilot Flying) may become un-responsive to a deteriorating situation, overly focused on one thing, or ignore PNF(Pilot Not Flying) inputs. A fatigued pilot will also exhibit "uncharacteristic behavior." This could be mood change, becoming short or intolerant of otherwise useful and good inputs from PNF.

CAUSES OF FATIGUE

The two major causes of fatigue are lack of sleep and disruption of the awaken-sleep cycle called the Circadian cycle. The other factors that influence fatigue are stress, anxiety and poor health. Fatigue can also be a symptom of other problems like hypoxia and dehydration.

Study into the causes of fatigue in flight crew have revealed that

- for long haul crew, major contributors are long duty times and multiple time zone crossings.
- for short haul crew, major contributors are sleep deprivation and high workloads due to multiple sectors and shorter turnarounds.
- Early starts, night flying, time pressure and insufficient recovery and rest periods are the other major factors for both the groups.

Research has shown that a reduction in sleep as little as 40 minutes begins to degrade performance in test subjects. Further, this degradation in performance is cumulative. i.e. we cannot work 24/7 schedules that demand high level of alertness.

Data concerning accident risk factor as compared to the number of hours on duty is disturbing. Relative risk of an accident due to fatigue gets quadrupled for crews on duty for more than 12 hours as compared to a duty period of less than seven hours.

NASA research into fatigue in regional operations has revealed that 80% of deck crew responding to the survey had 'nodded off' during a flight!

<u>A. Long haul issues - Disruption of Circadian rhythm</u>

Sleep loss due to time zone dislocation is a well known phenomenon popularly referred as jet lag. Circadian cycle or rhythm is the biological clock that is built into us, which tells us that we should work when it is light (day) and sleep when it is dark (night). Circadian cycle disruption make a person try to sleep when their mind is wide-awake and force them to remain awake when the mind wants them to sleep.

Transmeridian flights in excess of three time zones can result in significant disruption of circadian rhythm. When flying westerly direction the pilot's day is lengthened. When flying east, against the sun the pilot's day is shortened. Thus the physiological time and the local time can vary by several hours.

Data shows that for transmeridian flying it can take 7- 10 days to adapt to a 10 hour eastward transition. While the effect on a westward transition is reduced 6-7 days, it is significant when the layover between sectors is only 24-48 hours. The effect on the type of sleep experienced also should be considered. In a westward transition, as the sleep period tends to be delayed, the onset of sleep at the layover hotel is rapid and first few hours sleep is deeper than normal. But, as the night progresses the sleep becomes lighter leading to an early waking. In the second day of a layover, the effect is less but will still result in inferior quality sleep for up to 12 Hours prior to departure. For eastward transitions the tendency is for an evening departure so it is not unusual for crews to have been awake for more than 16 hours before departure. On arrival, sleep onset is not as abrupt or deep as in a westward transition and tends to be more uniform in nature though of a significantly shallower nature than normal and will be disturbed for a number of days. The important factor is that for long transitions in either direction the sleep is fragmented and/or shorter duration than normal. Data from one trial shows that for a 72 hour layover following a 12 hour transition the average number of sleeps was five with an average duration of 4.6 hours which is significantly less than the nominal 8 hours.

<u>B. Short haul issues</u>

Fatigue in short haul operations seems to be dictated by the number of sectors flown during the duty day – even after accounting for length of duty and time of day. A study revealed that a six sector day was almost twice as tiring as a three sector day. Furthermore, there is an increase in the fatigue commensurate with the number of consecutive duty days. This effect is even more pronounced when the duty time impacts the nominal sleep patterns, earlies, lates or night flying.

Another fatigue factor that has been identified is the effect of workload and hassle experienced by crews. This includes the workload in the air as well as on the ground during turnarounds.

C. Night operations

For consistent night operations, research has shown that additional fatiguing effect of late finishes is not replicated. Research shows that fatigue is highest on the first night of a duty period compared with the second and subsequent nights.

D. Common factors

In addition to the specifics above, the following common factors affect fatigue.

The length of duty day has an impact on fatigue, which gets modified by other factors. The hassle experienced by crew onboard and on ground adds to the fatigue. The start time of duty day has a significant effect on fatigue. Studies have shown that prior to an early start time crews will go to bed earlier than normal but not enough to compensate fully for the earlier start. This effect is made more acute because the onset of sleep will be slower.

As a rule of thumb it is estimated that sleep is reduced by around 30 minutes for every hour the report time is earlier than 09:00 local. Likewise, in a late start pilots are unable to compensate fully by delaying their waking time prior to duty. Furthermore, data shows that after a late start for duties ending between the hours of 03:00 and 05:00 sleep is limited to an average of five hours which drops to four hours when the duty day concludes between 06:00 and 08:00.

FATIGUE MANAGEMENT

Management of fatigue in flight operations is the primary responsibility of the flight deck crew, but responsibility also lies with the operator and the government regulatory authorities.

The first and most effective solution would be for flight and duty time limits to be based on the extensive scientific research data available. The regulatory agencies are yet to come with rules based on current scientific research. The FAA is behind schedule on its proposal for new rules addressing pilot fatigue. EASA is yet to come up with rules based on Moebus Aviation report.

1. Rest options

a. Bunk rest– For all long haul operations, bunk rest will deliver the best form of in flight rest provided the rest area has been well designed in terms of minimizing noise and other disturbance factors. Sleep periods of up to six hours have been recorded. The key to the amount and time of sleep is predicated mainly by the time of day and the length of the rest period – it's less likely that deep sleep will be achieved in a shorter rest period.

b. In cabin rest

While better than nothing, studies have shown that sleep taken in a reclining cabin seat is at best only 75% as effective as rest taken in a bunk. Thanks to the cabin environment, noise Disturbance from passengers and cabin crew moving about the cabin, especially on 'day' flights, the likelihood is that more often than not rest of even this quality will not be achieved.

c. In seat napping

Where other options are not available a number of studies have shown that a short nap of approximately 25 minutes (NASA nap, also called Power napping) can significantly boost alertness and response times when compared with not taking any rest. ***KAC policy does not permit power napping.***

d. Two rest periods

On ultra long sectors in excess of 18 hours the strategy of having two rest periods is found to benefit by reducing the time spent continuously at the controls and also by making it more likely that some sleep will be achieved.

e. Cockpit lighting

The use of lighting to aid adaption to time zone changes and shift circadian rhythms is well known. Indeed there are a number studies that recommend its use to adjust pre and post flight sleep patterns. However it has also been shown that exposure to bright light also has an immediate effect in the form of increased alertness and performance. This has interesting possibilities for hanging an environment where low light, steady background noise, reduced mobility and limited social interaction is ripe for inducing a soporific state. Provided that use of brighter lighting in the flight deck does not impair night vision there may be much to recommend it use.

2. Pre & post flight strategies

i. Healthy sleep

Wherever possible getting the right amount of good quality sleep on a daily basis may be the best weapon to use against fatigue. The question is how much is the right amount? While some people can perform well on less, the rule of thumb is eight hours per night. There are strategies you can use to help determine the right amount for you. For example: if you add an hour to your normal sleep pattern for a period of seven days and then ask the question do I feel better? Has it improved my alertness, mood and mental agility? Another option is on your next vacation keep a sleep diary recording the time of sleep onset and the time you wake up (no alarm clocks!) calculate the average sleep period and then use this as a target on the return to work.

ii. Circadian adjustment strategies

These are largely based on rapidly adjusting to the new local time as soon as possible which may include exposure to light, changing eating patterns and making effort to optimize sleep during the available periods.

iii. Exercise:

Those who exercise regularly show improved sleep quantity and quality. It is important to consider the type of exercise as well as its duration. Some research has suggested that only heavy exercise (like a brisk jog, fast cycling, rowing or swimming) will deliver changes in performance. However more recent data indicates that benefit is also seen when more moderate exercise is taken. Care should be taken not to do exercise too close to a planned sleep period with most studies recommending a two hour buffer between exercise and sleep.

iv. Nutrition

Eating a meal just before a sleep period is not recommended although it is important to maintain good nutrition so if you have to eat before sleep (hunger does not aid sleep) favor foods like grains, pastas, breads and fruits and avoid high fat or acid meals.

It is worthwhile noting that many accidents attributed to pilot error have their origin in fatigue and failure to manage it. Fatigue is manageable and it is in the hands of the flight deck crew, operators and regulatory agencies.

REFERENCES:

1. "Fatigue issues revisited"., Interpilot, Sept-Oct.2009.
2. "Fatigue manifestations"., Skybrary briefing note OGHFA BN, Eurocontrol.

Alcohol and Flight Safety

Dr.M.S.Rajamurthy

In November 2009, British police pulled out an United Airlines pilot from a Boeing 767 aircraft at London's Heathrow airport. He was charged for being on duty while his Blood Alcohol Content (BAC) was over the limit. The main reason behind this is the detrimental effect of alcohol on human faculties resulting in degraded ability to fly properly and hence the risk of an accident.

The importance of not drinking alcohol in proximity to duty is well known amongst the pilot community through the phrase - "Bottle to throttle time". However, there is a much wider issue relating to the use of alcohol in terms of overall risk to health. Long term health risks have impact on flight safety.

Facts about alcohol

Alcohol is a sedative, hypnotic, and addicting drug. It is rapidly absorbed from the stomach & small intestine, and transported by the blood throughout the body. Toxic effects of alcohol vary considerably from person to person, and are influenced by variables such as gender, body weight, rate of consumption(time), and total amount consumed.

An average healthy person eliminates pure alcohol at a fairly constant rate of about 1/3 to 1/2 oz. of pure alcohol per hour, which is equivalent to the amount of pure alcohol contained in any of the popular drinks shown in the table below. This rate of elimination of alcohol is relatively constant, regardless of the total amount of alcohol consumed. i.e. irrespective of the intake, the rate of alcohol elimination from the body remains the same. Therefore, the more alcohol an individual consumes, higher will be the alcohol concentration in his blood and the longer it takes his/her body to get rid of it.

Beverage Type	Typical Serving (oz.)	Pure Alcohol Content (oz.)
Light Beer	12	.48
Table Wine	4	.48
Champagne	4	.48
Aperitif Liquor	1.5	.38
Whiskey	1.25	.50
Vodka	1	.50

Flying Skills

Flying an aircraft is a complex task which requires:-

- Interpretation of sensory information in the form of visual, motion, proprioceptive and aural cues.
- Cognitive evaluation of the sensory information presented.
- Performance of motor tasks in response to the perceived situation.
- Sound functioning of the higher cortical faculties responsible for planning, judgment, cognition, calculation, attention, vigilance, sequencing, and memory.

Basic faculties required for successfully flying an aircraft are:

- Adequate and unimpaired senses of vision and hearing.
- Sufficient intelligence & judgment.
- Suitable personality.
- Motor skills
  – adequate power, dexterity, & coordination to manipulate aircraft controls,
  – sufficient power & coordination of speech for radio based communication,
  –strength & agility to allow entrance-to and egress-from the aircraft.

Unlike in driving land vehicles, a Pilot is exposed to additional factors specific to flying, namely,

– hypoxia of increasing altitude,
– high noise levels,
– requirement for radio communication with the outside world,
– higher accelerations during aircraft maneuvering, and
– visual-vestibular illusions with the potential for loss of three dimensional orientation.

Pilots are imparted comprehensive training to hone their skills & faculties to the task of flying aircraft.

Impairment of faculties due to alcohol

The impairment of various faculties due to alcohol have been studied through aero medical investigations. In the following these are detailed along with the associated impact on safety.

1.<u>Higher cortical functions</u>

Complex task performance and reaction times are impaired by BAC in excess of 0.04% and 0.08% respectively. Visual tracking performance during whole body motion & in non-moving individuals are impaired at BAC level as low as 0.027%. The monitoring and decision components of reaction time tasks are impaired by BAC level of 0.09%.

All these functions are crucial for safe flying and impairment to these is detrimental to flight safety.

2. <u>Visual and vestibular functions</u>

Vision is the most important sensory modality for flying and is required for monitoring and adjustment of aircraft performance. It is required for spatial orientation and navigation during both VMC and IMC conditions.

- In the absence of adequate visual stimulus, control of an aircraft is typically lost within 60 seconds.
- The speed of the eyes, in pursuing a target, is reduced by alcohol.
- The speed of the eye's saccadic motion, their latency times, and reaction times are impaired by BAC greater than 0.04%.
- BAC of 0.05% and above slows down the ability of the eyes to accommodate or adjust their focus.
- Alcohol intoxication results in double vision and dilatation of the pupils leading to blurred vision.

Any impairment to vision and increase in visual perception delays will affect adversely the flying skills and is detrimental to flight safety.

During the angular accelerations of flight there occur reflex rapid, oscillatory eye movements called nystagmus. This tends to impair the view of objects within the aircraft and produces blurring of vision of instruments. Usually a pilot is able to suppress this nystagmus by deliberately fixating on an instrument. The ability to suppress this nystagmus is impaired at BAC as low as 0.02%.

Positional Alcohol Nystagmus (PAN) results in rapid, oscillatory eye movements when the head is placed in specific positions in the absence of angular acceleration. *This results in impairment of vision as well as spatial disorientation. PAN has been measured 34 hours after alcohol ingestion, long after there is no measurable alcohol in the blood.*

The maintenance of correct <u>Spatial</u>

Orientation is important for the flight. This depends primarily on vision but the vestibular apparatus and the somatic sensory organs also contribute.

- BAC greater than 0.04% impairs the function of the vestibular apparatus, and its interaction with the eyes in maintaining correct posture & balance.
- High doses of alcohol retard the suppression of post-rotatory nystagmus, an important consideration in turning aircraft.
- PAN may play a role in spatial disorientation.

Impairment of the visual system and the intimately related vestibular system by alcohol causes some degree of pilot incapacitation, which could lead to spatial disorientation and an aircraft accident.

3. Impairment of motor skills

Flying requires coordinated, motor actions and fine dexterous movements for operation of aircraft instruments, navigation and radio communication equipment. Slight to moderate physical forces have to be applied during normal operations but significant forces may be required during emergency procedures.

While alcohol has little effect on muscular strength it impairs the coordination of motor functions.

Basic motor coordination tasks such as standing still, hand steadiness, walking, especially with the eyes closed, and a variety of sensorimotor tracking/pointing tasks are all impaired by alcohol.

Impaired coordination during sensorimotor actions could lead to degraded performance and hence compromise flight safety.

4. Effects in conjunction with altitude hypoxia

The hypoxia produced by aviation altitude exposure will subtly or potently impair pilot performance. The degree of hypoxic impairment varies with the altitude exposure. *While alcohol and altitude hypoxia both impair pilot performance their interaction could be additive in nature.*

5. Tolerance to positive radial acceleration.

While performing a balanced turn of an aircraft, the pilot is exposed to a centrifugal force due to the radial acceleration. High levels of this acceleration can result in impairment of vision and even unconsciousness as blood is unable to reach the eyes and brain.

While a high level of acceleration is not normally encountered, it could occur during steep turns or emergency maneuvers, or uncontrolled spiral flight. Alcohol reduces the tolerance of this acceleration. A 'moderate' dose will reduce the threshold by 0.1 - 0.4g and will intensify the severity of the symptoms produced by a given level of acceleration.

The number of serious errors committed by pilots dramatically increases at or above BAC of 0.04%. This does not mean that problems don't occur below this value. Some studies have shown decrements in pilot performance at BAC as low as 0.025%.

The negative effects of alcohol are significantly amplified by other variables such as sleep deprivation, fatigue, medication use, or flying at night or in bad weather.

Regulations

The use of alcohol and drugs by pilots is regulated by FAR Part 91– General Operating and Flight Rules. Section FAR 91.17 among other provisions states that no person may operate or attempt to operate an aircraft:

− Within 8 hours of having consumed alcohol

−While under the influence of alcohol

− With a blood alcohol content of 0.04% or greater

− While using any drug that adversely affects safety.

*KAC is more stringent than FAR Part 91. KAC OPM Para. 2.1.16.3 stipulates that no person may operate an aircraft within **12** hours of having consumed alcohol.*

Recommendations to the crew

1. Do not fly while under the influence of alcohol. As a minimum, adhere to the company guidelines (KAC OPM)
2. Do not fly while using any drug that may adversely affect safety.
3. Take a more conservative approach and wait 24 hours from the last use of alcohol before flying. This is especially true if intoxication occurred or if you plan to fly IFR. *Cold showers, drinking black coffee, or breathing 100% oxygen cannot speed up the elimination of alcohol from the body.*
5. Consider the effects of a hangover. Eight hours from "bottle to throttle" does not mean you are in the best physical condition to fly, or that your BAC is below the legal limits.
6. Recognize the hazards of combining alcohol consumption and flying.
7. Use good judgment. Your life and the lives of your passengers are at risk if you drink and fly.

Ideally, total avoidance of alcohol should be a key element observed by every crew member in planning or accomplishing a flight.

Alcohol avoidance is as critical as developing a flight plan, a good preflight inspection, obeying ATC procedures, and avoiding severe weather.

Concluding remarks

Flying is a complex task requiring continuous and coordinated sensory, cognitive, and motor functioning by the crew. Alcohol impairs most aspects of the flying task. Some flight related skills are adversely affected by BAC levels as low as 0.025% while aircraft flight and simulator flight is clearly impaired by levels of 0.04%. Higher BAC levels result in correspondingly more profound impairment of flying skills and reduction in flight safety.

The use of alcohol is a significant self-imposed stress factor that should be eliminated from the cockpit. The ability to do so is strictly within the crew's control.

Flight deck crew must adhere to company regulations and should keep in mind that regulations alone are no guarantee that problems won't occur. *It is far more important for Flight deck crew to understand the negative effects of alcohol and its deadly impact on flight safety.*

References:

1. Guillermo J. Salazar, Melchor J. Antuñano, "Alcohol and Flying", Medical Facts for pilots, Publication AM-400-94/2, Aeromedical Education Division, Civil Aerospace Medical Institute Federal Aviation Administration.

2. Dougal Watson., " The effect of Alcohol on pilot performance and safety", AVMEDIA 1997, June 1997.

3. FAR Part 91– General Operating and Flight Rules.

Wake turbulence & Crosswind

In the last issue, we had a question on the wind condition requiring maximum caution in case of wake turbulence. Here is the answer and the explanation.

As shown in the diagrams to the right, wake vortices tend to move outward from the aircraft. When we are behind a departing aircraft, the vortex from the right wing will tend to move to the right and the vortex from the left wing will tend to move to the left in no wind conditions.

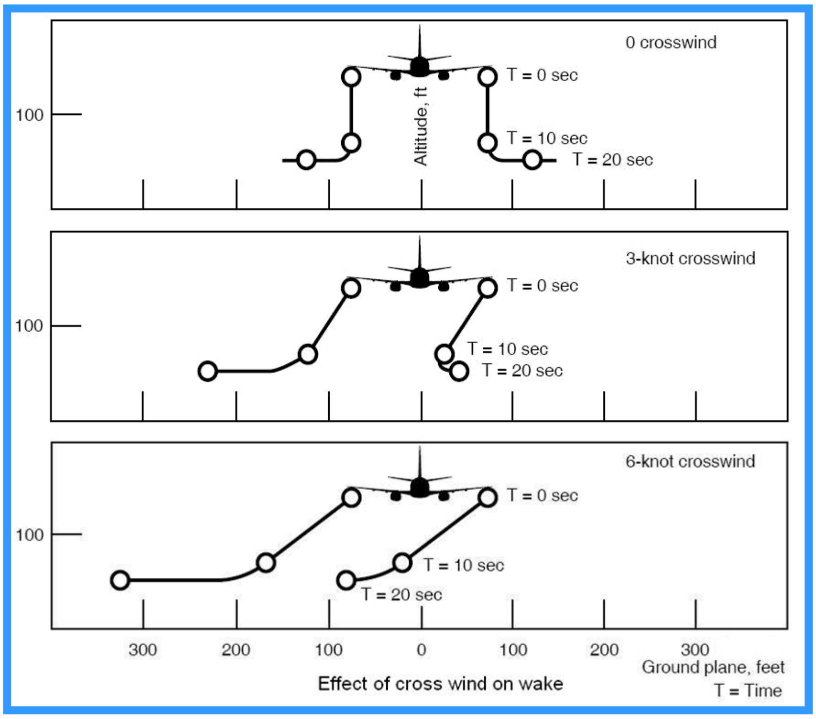
If there is a crosswind, it will influence the movement of the vortices. A 3 knots crosswind will hold the upwind vortex pretty much in place at the runway where it was created, while the downwind vortex will rapidly move away from the runway.

Crosswind greater than approximately 5 knots will tend to break up the vortices. A 6 Knots cross wind will move the vortices away from the runway faster.

Thus, lighter crosswind of about 3 Knots require maximum caution. Stronger crosswind is good for vortices as it tends to break them and move them away faster.

We need to note the point of rotation of the larger aircraft. That point of rotation is where the vortices will be developed. From that point on, there will be vortices off the wings of that departing aircraft. So it's important that our rotation point occurs prior to the rotation point of the preceding aircraft, because we do not want to be rotating in the vortices of the preceding aircraft. We need to do that prior to reaching the preceding aircraft's point of rotation.

For the same reason as discussed above, we want to climb upwind of the departing aircraft. If the crosswind moves the vortices to the left, our departure path should be to the right to avoid those vortices.



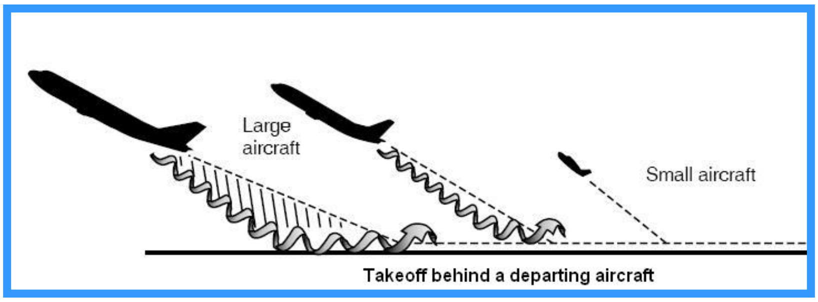


PHOTO OF THE MONTH

Rejected Take Off

On Jan.3,2009, early morning at around 7 am local time, an Air Berlin Boeing 737-800, performing flight AB-2450 from Dortmund ,Germany to Las Palmas, Spain with 165 passengers and 6 crew, rejected takeoff at high speed from Dortmund's runway 06 in snowfall and came to a stop on a down slope soft ground. The takeoff was rejected at high speed because of disagreeing airspeeds between captain and copilot.

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. CAHRS form can be downloaded from the Operations dept. section of our site **www.ourkac.com.** Completed forms can be dropped in FS&QA allocated box at Flight Dispatch or e-mailed to kwioeku@kuwaitairways.com or faxed to +965-24749823 or mail to Flight Safety and Quality Assurance office, Operations Department, P.O. Box 394, Safat 13004, Kuwait Airways, Kuwait.