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# Measurements of Terrifying Overflights Noise in Mirdif District near Dubai International Airport

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***Abstract*** **–**This paper is describing noise measurements in Mirdif district which is within 3 km from Dubai International Airport. This area is mainly residential with schools, parks, entertainment and local shopping area. It lies exactly at the air planes route in landing and takeoff. Air planes are less than 300 m high from the ground. The airport is one of the busiest airports in the world with traffic volume more than 370,000 airplanes. Noise level is measured for two weeks day and night outside and inside several housing villas. The instant outside noise is reaching 116 dBA when an aircraft is passing the measured point. The average Leq is more than 103 dBA while 88% of all measurements are more than 100 dBA and almost all readings are more than 95 dBA. The measurements inside villas and apartments are also very high, and Leq is equal to 80 dBA (background noise level recommended for a residential area is less than 40 dBA). Residence is subjected to that level more than 8 hours every day. The noise level in this area is terrifying and residents are in a dangerous situation.

***Keywords****:* L equivalent, dBA, air traffic noise, noise Dose

## 1. Introduction

Dubai is one of the United Arab Emirates cities located at the Arabian Gulf with a population increase from 40,000 in 1960 to more than 2 million in 2013. Today, Dubai has emerged as a cosmopolitan metropolis that has grown steadily to become a global city and a business and cultural hub of the Middle East and the Gulf region (Krane, 2013). It is also a major transport hub for passengers and cargo. Although Dubai's economy was historically built on the emirate's Western-style model of business drives, its economy with the main revenues now coming from tourism, aviation, real estate, and financial services. Dubai has recently attracted world attention through many innovative large construction projects and sports events. The city has become symbolic for its skyscrapers and high-rise buildings, such as the world's tallest Burj Khalifa, in addition to ambitious development projects including man-made islands, hotels, and some of the largest shopping malls in the region and the world (Krane, 2010).

Dubai airport is located in the middle of Dubai, in the south eastern part of the city, and expanded rapidly during the past 10 years to accommodate the growth of air traffic movement to and from the city and transited traffic .It is now the second busiest airport in the world with more than 370,000 (Krane, 2010) aircraft landing in it, carrying more than 60 million passengers all over the world (Web-1). The average aircraft landing in the airport is approximately 1000 aircraft per 24 hours. It has three terminals; the third one is erected recently to accommodate the Emirates aircrafts only (Web-2).

The location of Dubai airport as part of the city fabric is shown in figure 1. It is clear that the airport within the middle of residential and commercial areas. The planes are maneuvering within the city and in some cases they are within 20m above main roads (Shake Zayed and Etihad Motor ways), and few hundreds meters from the urban areas.

Fig. 1. The location of International Dubai Airport (Web-3)

## 2. Effect of Noise on Human

Noise has many negative effects on human, physically, mentally, and on his work and life. Although this study is not concerned with these effects, and that the research on this aspect is still going on, some of the research findings will be summarized (Balila, Hammad, 2012):

Physically, noise cause increase in the blood flow, blood pressure and heart attacks (Passchier-Vermeer, Passchier, 2000) (Kryter, 1994). A recent study nearby Los Angeles International airport shows that pregnant women living near by the airport deliver babies with some retarding (Castro, et al, 2010), and this research is enhanced by other research in EUC countries. A published study by the author, in Queen Alia International Airport, in Amman, Jordan, shows that most of the employers and aircraft crews have some sort of hear shifting and hear retarding (Hammad, et al., 1995).

Mentally, noise is annoying people, and they become more nervous, increasing suicide and death rates (Szalma, Hancock, 2011). It also affects human performance, work, and children performance at schools (Hammad, et al., 1995). Noise also affects sleep quality and awakes humans feeling tired for not getting enough rest during sleep (Hume et al., 2012).

Noise also interferes with speech and listening inside and outside buildings. The intelligibility is decreased and the audience has to pay more attention to understand the speech (Dubbelboer, Houtgast, 2007). It also has negative effect on children's health and performance (Evans, Lepore, 1993).

## 3. Location of the Measurements

Measurements were carried out in Mirdif area, located within 3 km from the landing point of aircrafts. This area is mainly residential and local commercial buildings. Most of the residential are villas with two storey buildings. One main gated residential project is UP Town, which are 4 floor buildings and the ground floor is commercial, coffee shops, restaurant and entertainment area, while the three upper floors are residential. This gated project contains hundreds of flats. The subfloor is a parking lot. Mirdif contains also two schools, two local parks, mosques and other facilities.

The measurements continued for 2 weeks day and night between the housing and within the ground floor of the gated UP Town area and in the parks.

The location of Mirdif area, where the measurements is conducted is shown in figure 2. It is within 3 km from the aircrafts landing point or takeoff.

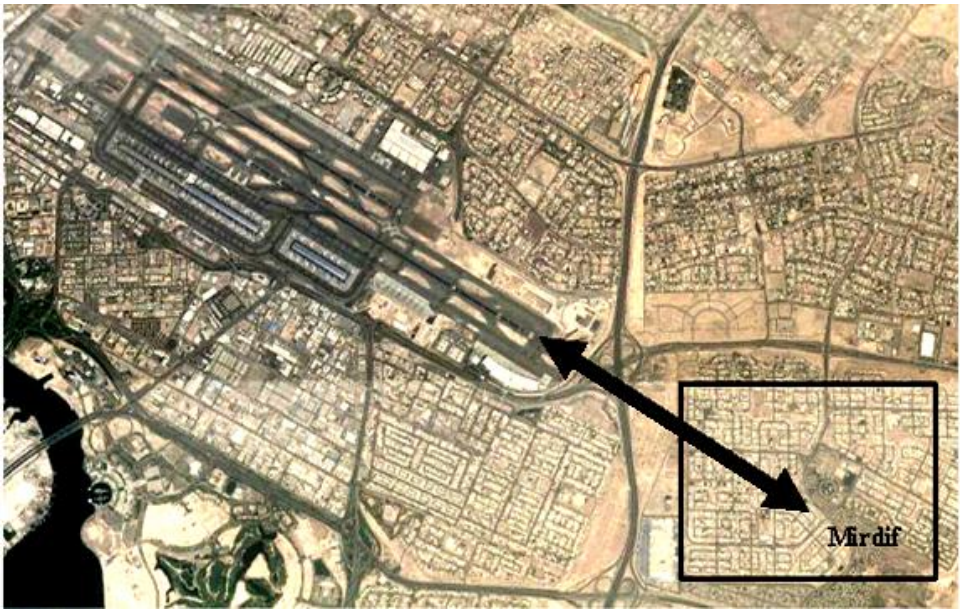


Fig. 2. Mirdif Area which is within 3km from the runway

## 4. Measurement Procedure

The noise generating by aircraft in Mirdif district is very high and can be recognized by everyone in the area. It is not only annoying and disturbing but also reaching dangerous levels affecting all those living or using facilities in the area. Initial recording of aircraft noise level shows that 116 dBA at ground level is the value reached as maximum noise in the area when airplanes were close to the measuring points.

The recordings are carried out within Mirdif district are only using special program STI (speech Transmission Index).This program is designed to be used by iPhones, initially to evaluate the intelligibility in rooms and closed spaces (Steeneken, Ecophon Seminar 2006). It also measures Leq for 30 seconds and plots the results as dBA and also dBA vs. frequency and stores them as graphics and digital numbers (Young, et al., 1997). Measurements are conducted during the airplane appearing until leaving the measuring points and that takes 30 seconds. Due to the air traffic density this is repeated every 2 minutes, and that means that 30% of the total time (day and night) is subjected to those levels.

Measurements are also conducted inside the houses while the windows are closed, day and night. Figure 3 shows three places where the outside measurement is carried. Figure 4 shows picture of the iPhone measuring Leq in octave band frequency. More than 200 different measurements were recorded outside and some 50 different measurements inside sitting rooms (ground floors) and bed rooms (1$^{st}$ floors). An example of the recorded measurements is shown in table 1.

## 5. Results

### 5. 1. Outside Aircraft Noise

The average Leq, in dBA for all day and night readings, is plotted in figure 5 for different frequencies between 125 Hz to 8 kHz. The average varies between 85 dBA and 99 dBA, and that is considered to be very high noise exposure for one third of the day and night. The maximum average generating noise by aircraft is between 250 Hz and 1250 Hz. High noise at low frequencies is a challenge to build skin insulation in these frequencies.

Figure 6 represents the Leq, in dBA for all measurements. 88% of the readings are higher than 100 dBA and almost all the readings are higher than 95 dBA. The maximum Dose at 100 dBA according to the NOISH is 15 minutes during 5 days working (NIOSH, 41912003), while the whole Mirdif district is subjected to more than 100 dBA for the one third of every day and night, 8 hours daily. While the

maximum noise Dose at 105 dBA is 4 minutes and 43 seconds. Most aircraft noise is reaching 112, 114, & 116 dBA to one or two seconds at ground. The maximum Dose at 112 dBA is less than one minute for 5 working days, while in Mirdif this occurs every two minutes.


Fig. 3. (a): Example of the measurements location in Mirdif
(b): UP Town gated housing where Measurements are carried
(c): The two storey building in Mirdif where measurements are carried


Fig. 4. Example of the STI measurement by the iPhone

Table. 1. Example of one night readings of noise level.

| date | read.no. | | frequency | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 30/1 | | dBA | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| night | 1 | 102.8 | 87.8 | 98.6 | 100 | 98.9 | 93.9 | 92 | 85.3 |
| | 2 | 102.6 | 86.7 | 97.9 | 99.8 | 99.2 | 93.3 | 90.3 | 82.8 |
| | 3 | 105.5 | 88.7 | 99.5 | 101.7 | 100.8 | 97.9 | 97 | 90 |
| | 4 | 105.6 | 89 | 99.8 | 101.2 | 100.4 | 98.8 | 97.3 | 90.6 |
| | 5 | 102.2 | 86.9 | 97.2 | 98.3 | 97.4 | 94.4 | 94.2 | 87.4 |
| | 6 | 105.2 | 88.8 | 99 | 101.2 | 100.3 | 97.6 | 97.1 | 91.2 |
| | 7 | 104.8 | 88.5 | 99.1 | 101.2 | 99.5 | 97 | 96.7 | 91.4 |
| | 8 | 104.9 | 89.1 | 99.5 | 101.3 | 100 | 96.8 | 96.7 | 91.9 |
| | 9 | 100.4 | 84.9 | 95.1 | 96.4 | 95.7 | 93.1 | 91.6 | 85.1 |
| | 10 | 105.9 | 91.7 | 99.9 | 102 | 98.5 | 99.1 | 99.5 | 90 |

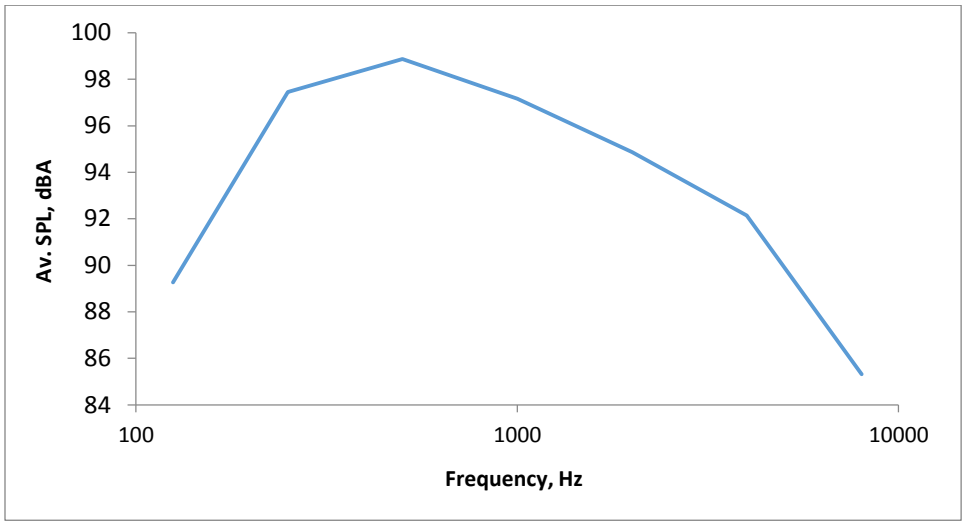


Fig. 5. The Average Leq, dBA of all measurements

### 5. 2. Measurements Inside the Houses

Measurements were conducted in few typical villas inside Mirdif area. All private villas are detached, two floors and constructed from hollow bricks plastered with two layers of cement and total thickness of 0.25m. Widows are double glazing (6+10+6mm) with aluminum framing, and small; one window in the bedroom at first floor with dimensions of 07x1.25 $m^2$ and three small windows in the living room at the ground floor. Measurements were carried in bed rooms at 1$^{st}$ floor and in the living room, at ground floor.

Figure 7 is the dBA reading for all the measurements. 30% of the measurements are more than 80dBA and some are reaching 90 dBA and 95 dBA. All the measurements are more than 79 dBA.

The relation between the measured Leq, in dBA vs. the frequency is shown in figure 8 with the maximum background noise and comfort levels recommended in residential areas (NC, ISO & RC, OSHA).The measured dBA is more than double the maximum allowable levels.

The noise inside residential spaces is double the maximum recommended level at almost all frequencies. A 45 dBA is set as the maximum level for sudden sleep awakes, and the maximum recommended for outside noise in residential areas is 55 dBA (NC, ISO & RC, OSHA).

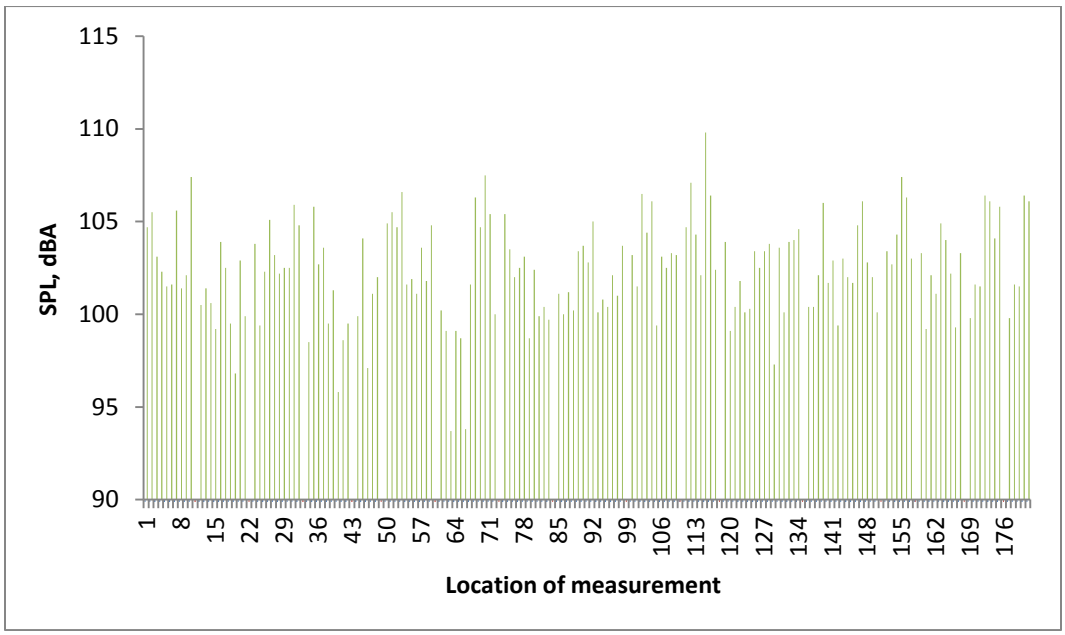


Fig. 6. The Leq, dBA reading of all measurements

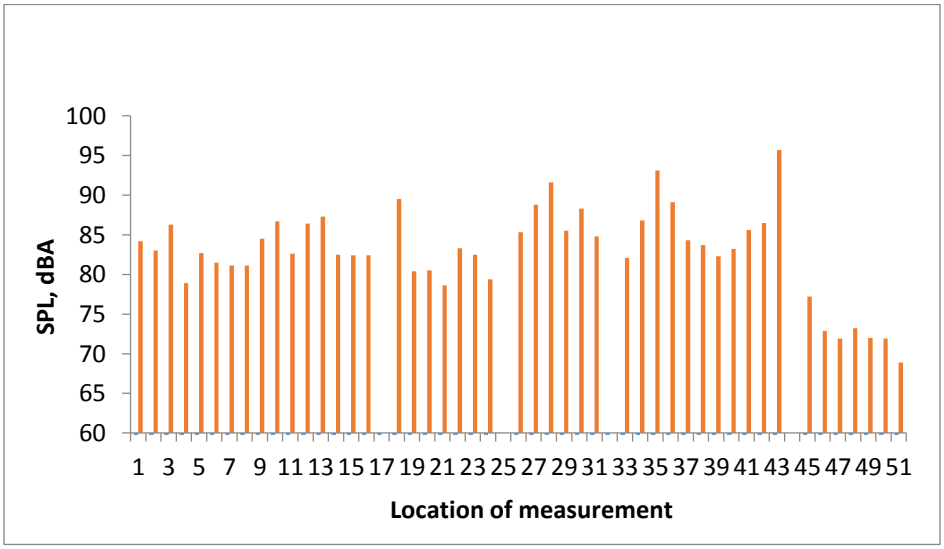


Fig. 7. dBA measured inside the houses

## 6. Conclusion

The noise level in Mirdif district is terrifying, and residents living in this area are subjected to very high noise levels, day and night. Unfortunately the quite area in Mirdif is the underground including the UP-Town parking area, while the luxury villas and apartments are dangerous places to live in. The Tragedy side of this result is that residents are less aware of the dangers of this noise, and little attention is paid to educate them concerning this fact. More buildings are under construction and more residents are coming to live in Mirdif. There are other areas around the airport, in Dubai, subjected to the same level of aircraft noise as they are close to the airport. A full and comprehensive surveying is needed to all areas around the airport and urgent solution is required to reduce that noise.

The only possible solution to those living in this area is to leave Mirdif and find more quite places. Mirdif area can only be part of the airport.

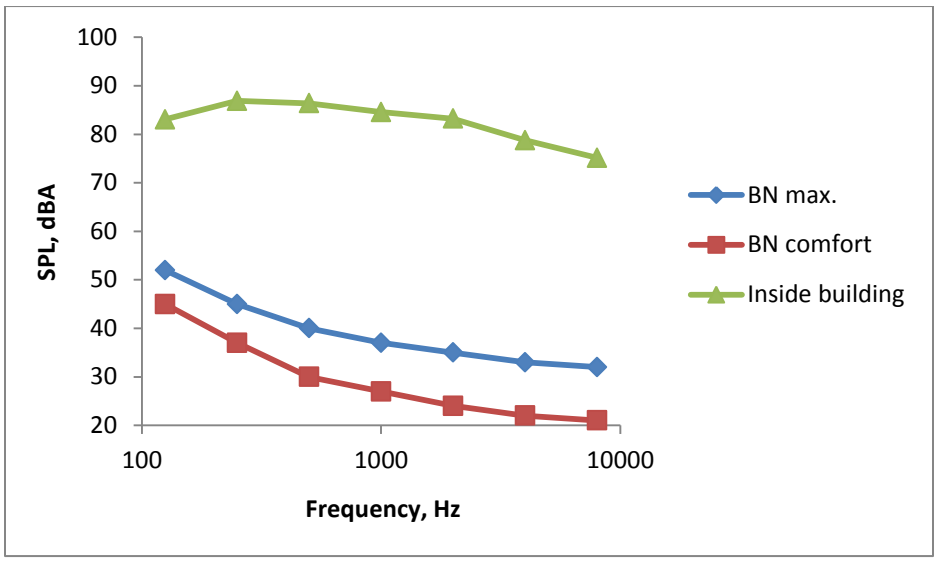

Fig. 8. The measured Leq, dBA vs. the Frequency, and the recommended background noise

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