

AIRCRAFT NOISE LEVEL STUDY AT THE SULTAN ISMAIL
INTERNATIONAL AIRPORT

AIZA NORWANI BINTI ABDUL WAHAB

A project report submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Engineering (Civil-Environmental Management)

Faculty of Civil Engineering
Universiti Teknologi Malaysia

NOVEMBER 2008

ABSTRACT

This study emphasizes on noise level study of aircraft at the Sultan Ismail International Airport (SIIA), Senai, Johor. Aircraft noise is more significant than any other noise sources in airport and it affects people living in the vicinity and its surrounding areas. Aircraft noise which is produced during engine run-up, taxiing, take-off, approach, landing and flyover is determined by using three methods of calculation which are widely used globally. Noise and Number Index (NNI) and Equivalent Continuous Sound Level (L_{eq}) are determined by conducting data sampling. The equipment used is *Pulsar Model 64 Data Logging Sound Level Meter*. Samplings are taken once at 3 various locations, within airport compound and its surrounding areas, up to 1 km radius from the center of runway for a duration of 12 hours on each station. Unit for NNI is PNdB while unit for L_{eq} is in dB(A). The study also determines current and future Noise Exposure Forecast (NEF) values for 3 aircraft operation which are take-off, approach and flyover. Data on Effective Perceived Noise Level (EPNL) for Airbus A320-214 and Boeing 737-400 are provided by International Civil Aviation Organization (ICAO). NEF contours are also plotted for current and future conditions. All values obtained are compared to standard classification and community's acceptability. Results show that current and future condition at the Sultan Ismail International Airport is acceptable with no prominent problem except for annoyance in airport compound. NEF contours show that the development at the SIIA and its surrounding areas are within allowable limit and boundary.

ABSTRAK

Kajian ini bertujuan untuk mengkaji aras bunyi kapal terbang di Lapangan Terbang Antarabangsa Sultan Ismail, Senai, Johor. Bunyi bising yang berpunca dari kapal terbang adalah lebih ketara berbanding punca-punca bunyi yang lain di lapangan terbang dan ini pastinya memberi kesan kepada komuniti yang tinggal di dalamnya mahupun di sekitarnya. Bunyi bising dari kapal terbang dihasilkan semasa proses pemanasan enjin, pergerakan, perlepasan, pendaratan dan penerbangan. Aras bunyi kapal terbang semasa proses ini berlaku ditentukan dengan menggunakan tiga kaedah pengiraan yang digunapakai secara meluas di serata dunia. Indeks bunyi bising dan nombor (NNI) serta aras bunyi berterusan setara (L_{eq}) ditentukan dengan menjalankan persampelan data. Alat yang digunakan ialah meter aras bunyi jenis *Pulsar Model 64 Data Logging*. Data direkodkan di 3 stesen berasingan (dalam kawasan lapangan terbang dan sekitarnya, dalam lingkungan radius 1 km dari landasan kapal terbang) untuk tempoh 12 jam bagi setiap stesen. Unit bagi NNI ialah PNdB manakala L_{eq} dikira dalam unit dB(A). Kajian ini juga menentukan ramalan pendedahan bunyi bising (NEF) bagi keadaan semasa dan akan datang yang terbahagi kepada 3 operasi kapal terbang iaitu perlepasan, pendaratan dan penerbangan. Data bagi aras bunyi berkesan (EPNL) untuk Airbus A320-214 dan Boeing 737-400 disediakan oleh Pertubuhan Penerbangan Awam Antarabangsa (ICAO). Kontur NEF bagi keadaan semasa dan akan datang juga diplotkan. Semua nilai yang didapati daripada persampelan data dan juga pengiraan dibandingkan dengan klasifikasi piawai dan penerimaan komuniti. Keputusan kajian menunjukkan bahawa tiada masalah ketara di Lapangan Terbang Sultan Ismail pada masa sekarang dan akan datang kecuali gangguan bunyi bising dalam kawasan lapangan terbang sahaja. Kontur NEF juga menunjukkan pembangunan dibina dalam kawasan dan had yang dibenarkan oleh klasifikasi piawai.

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CHAPTER 1

INTRODUCTION

1.1 Overview

Over the last decade, the aviation industry has undergone rapid growth and this is predicted to continue for the foreseeable future at 5 to 7 percent per annum (Hume *et al.*, 2003). This is due to the demand of the transport industry in developed and developing countries. Pressures on the environment are increased and in the recent years, concern over airport environmental impacts on surrounding communities has been spurred by a continual growth in air traffic together with urban development in close proximity to many airports around the world.

Pollution can be defined as any change or disturbance in terms of physical, chemical and biological that cause imbalance to environment (EQA, 1974). In other words, pollution is the introduction of contaminants into an environment that causes instability, disorder, harm or discomfort to the physical systems or living organisms. Pollution can take the form of chemical substances, or energy, such as noise, heat, or light energy. Pollutants, the elements of pollution can be foreign substances or energies or naturally occurring.

Generally, there are four major types of pollution, which are air, water, soil and noise. The disturbance of noise is the most important environmental issue and problem to affect the growth of airports in the world. Noise, which can be defined as unwanted sound, is a necessary by-product of the operation of transportation vehicles. However, it is important to bear in mind that airports generate little noise. It is noise generated by aircraft in and around airports that causes problems.

Malaysia is no exception. Sultan Ismail International Airport, located in Senai, Johor is set to become a major hub in the future. Study of aircraft noise level at the airport especially in the vicinity and its nearby surrounding is needed in order to ensure a good environmental condition. Communities near airport are becoming more sensitive to noise disturbance issues and have increasing expectations in regard to the quality of life.

1.2 Problem Statement

The problem of aircraft noise disturbance involves a complex interaction of a number of physical, biological, physiological and sociological processes. The relevant physical factors can be divided into those associated with the noise generation such as aircraft type, operation and noise level. Study of current condition of the Sultan Ismail International Airport is needed in terms of aircraft noise level and its acceptance according to standards. Study of surrounding land uses is also important to ensure there is no incompatibility development within the prohibited area.

1.3 Objectives of Study

The objectives of this study are identified as follows:

1. To determine Equivalent Continuous Sound Level (L_{eq}) and Noise and Number Index (NNI) value in the vicinity of the Sultan Ismail International Airport;
2. To determine Noise Exposure Forecast (NEF) value for the airport;
3. To determine land uses compatibility around airport using Noise Exposure Forecast (NEF) contour for current and future condition.

1.4 Scope of Study

The study covers about 15 km², including the vicinity of the Sultan Ismail International Airport, Senai and outward from the airport compound to 1 km radius. Three parameters are used which are L_{eq} , NNI and NEF. L_{eq} and NNI are measured by conducting data sampling on site at selected locations. Results are then to be classified. NEF is determined by using data provided by International Civil Aviation Organization (ICAO) and results are then to be classified. Meanwhile, NEF contours for current and future condition is plotted based on results calculated.

1.5 Limitation of Study

In preparing this study, there are some limitations that need to be considered. Equipment availability factor is seen as the major constraint and obstacle. Equipment can only be used once at a time due to a long sampling duration at each station. Thus, it cannot be at different places at the same time or used simultaneously. This problem may give inaccurate results in the study. On the other hand, schedule of Environmental Laboratory also plays a major role on equipment loan. With only one set of sound level meter provided by Environmental Laboratory, data sampling for this study needs to be conducted during semester break, to avoid clash timetable. Besides equipment, another limitation of this study is time constraint, causing limited and fewer sampling stations.

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