

## **Terms of Reference of Aircraft Noise at IGI Airport, New Delhi**

In order to determine the noise impact from aircraft flights and identify potential measures to reduce the noise impact, an Aircraft Noise Study for IGI Airport, New Delhi will be carried out in three phases:

- Phase 1: Noise Mapping
- Phase 2: Validation of noise mapping results
- Phase 3: Development of an Action Plan

### **Phase 1: Noise Mapping (through modelling):**

Noise Maps will be created with the use of specialized software for the calculation of aircraft noise taking into account the following:

1. The assessment method for the calculation of the noise indicators shall be based on an internationally accepted methodology.
2. Actual air traffic data for the year 2010 will be used (types of aircraft, number of movements, distribution of runway use, actual flight paths). The Consultant will submit all model input data for the calculation of the noise indicators for approval, prior to running the model.
3. Incorporation of terrain model and type of buildings of the affected area, if deemed necessary.
4. Incorporation of meteorological data (e.g., seasonal changes, wind data, temperature, etc).
5. The results will be presented for the following noise indices:  $L_{den}$ ,  $L_{day}$ ,  $L_{evening}$ ,  $L_{night}$ ,  $L_{eq-24h}$ ,  $L_{Amax}$  and others metrics based on the Consultant's proposal. Where appropriate presentation of results will be based on 5dBA intervals.

The Noise Maps will be accompanied by a detailed report that will include at least the following:

- a) Description of the airport, location, size, etc.
- b) Description of the greater area, characteristics and land uses with special emphasis to residential areas, population data, noise sources, existence of sensitive receptors ( e.g., schools, hospitals, etc).
- c) Air traffic data (e.g., types of aircraft, number of movements, distribution of runway use, actual flight paths).
- d) Description of the current Noise Abatement Procedures (NAPs) enforced at the airport.

- e) Description of the airport's existing Noise Monitoring System including assessment of noise monitoring results.
- f) Description of the noise model and the methodology to be used, including model input data and assumptions made.
- g) Presentation and assessment of the results based on the limits defined in Section 2.1 of the Aviation Environment Circular 1 of 2011 of DGCA as well as based on criteria used in other countries with similar airports.
- h) Calculation of the area and population living in residences subjected to the various noise levels. The noise levels at various sensitive receptors (e.g., hospitals, schools, etc.) should be calculated.
- i) Annex with the model input data and the model output (model printout).
- j) Executive Summary including the most important information from the above analysis including relevant maps, etc.

Note: Presentation of results will incorporate colour maps, tables, graphs, etc.

### **Phase 2: Validation:**

The results of the Noise Mapping (through the computer simulation) will be validated by actual measurements of noise, based on the airport's NMS for 2010 and additional measurements where required. A report should be provided including at least the following:

1. Description of the project
2. Methodology
3. Presentation of results
4. Analysis of results, including confidence levels, explanations of differences, etc.

Note: The variation between the results obtained from mapping and actual field measuring shall be acceptable to DGCA.

### **Phase 3: Action Plan:**

The Action Plan shall be created following the approval of the Noise Maps. The Action Plan shall include at least the following:

1. Description of the airport.
2. Legal context, including limits and assessment criteria.

3. Summary of the results of the Noise Mapping.
4. Evaluation of the estimated number of people exposed to noise, identification of problems and situations.
5. Presentation of noise-reduction measures tried elsewhere as well as assessment of their effectiveness, with the use (where appropriate) of noise curves.
6. Proposed measures to reduce noise impact, including environmental, operational and financial assessment of the proposed measures. The measures may include: NAPs, aircraft noise charges, operating restrictions, development of the NPRs, land use planning, local communities relation strategy, etc. For the proposed measures (where appropriate) new calculation of the  $L_{den}$  and  $L_{night}$  will be required.

### **General Requirements:**

Special emphasis will be given to a detailed proposal for the development of a comprehensive Noise Monitoring system (NMS) for the continuous monitoring of aircraft noise around IGI Airport, Delhi and under the flight paths during the landings/take-offs of aircraft. For the proposal the following should be taken into account:

- a) The Consultant will assess the location of existing monitoring locations around IGI airport and propose the installation of additional remote Noise Monitoring Terminals (NMTs), mainly in the residential colonies in the vicinity of airport. The assessment will be based on the Noise Mapping results, existing aircraft paths, availability of appropriate locations, etc. In addition, the inclusion of a mobile NMT shall be recommended. The architecture should be modular to accommodate additional stations as per need.
- b) The NMS shall comprise of a Central Receiving station to receive, process, archive and visualize data collected and transmitted by several NMTs.
- c) All the NMTs should be operational in a real time mode and central station should be able to access any/all NMTs in network mode.
- d) The NMTs should be field operational and tolerant to extreme environmental conditions in India, in high or low temperatures, high rainfall, high humidity coastal conditions and high temperature desert conditions.
- e) The NMTs should be rugged and should not require manual intervention except routine calibration and battery replacements.
- f) The communication between NMTs and central receiving station must be two-way.
- g) The NMTs should have built in GPS receiver for automatic positioning.

- h) The NMTs should have provisions for camera attachment.
- i) The NMS should have provisions for collection of meteorological data such as wind direction and speed, humidity, temperature, etc.
- j) The data must have portability to central receiving station via cellular GSM/GPRS/CDMA networks, Ethernet, PSTN, etc.
- k) Options for other modes of data retrieval should be available such as USB, RS232 port, specific protocol for smart sensors, fiber optics (internal or external), radio-modem (internal or external).
- l) The software installed on central receiving station must have provision for data acquisition, data archival, data analysis, data display, and report generation.
- m) The operator from central receiving station must be able to configure parameters of NMTs via software.
- n) The operator from central receiving station must be able to switch ON/OFF the NMT through command via software.
- o) The remote station for continuous aircraft noise monitoring system should have a standalone operating terminal, appropriate for outdoor installation for continuous measurement of aircraft noise. Microphone connected to an advanced acoustic signal processing unit, complete with an electronic measurement and processed-data storage, provided with an integrated GSM/GPRS radio-modem. The NMT should have optional audio data storage facility for listening and storing. The NMT should conform to IEC 61672-1 (2002-05) Class 1 standards, self calibrating option type. The outdoor microphone shall conform to IEC 61672-1 (2002-05) Class 1, self calibrated type.
- p) The NMS should be able to segregate the noise from other sources such as from moving vehicles inside and outside the airport, ground operations, etc. and the noise generated due to aircraft operations.
- q) The data collected should be real time and authentic. The accuracy and acceptability of the data will be analyzed/checked/decided by the Noise Desk/Working Group.
- r) The NMS should have the capability to generate daily, weekly, monthly and annual reports for each and all of the stations at least for the following indicators:
  - $L_{eq}$  ( $L_d$  – Day time) : 06 AM to 06 PM - daily
  - $L_{eq}$  ( $L_e$  – Evening time) : 06 PM to 10 PM - daily
  - $L_{eq}$  ( $L_n$  – Night time) : 10 PM to 06 AM - daily
  - $L_{n10}$ ,  $L_{n90}$ ,  $L_{n50}$ ,  $L_{max}$ ,  $L_{min}$ , etc.

- s) The security and maintenance of the NMTs shall be the sole responsibility of the vendor.
- t) Any accident or injury to the vendor's staff during the period of the study shall be the sole responsibility of the vendor.
- u) The vendor shall arrange hands-on training to at least 5 persons of the Noise Desk/Working Group engaged in this study.
- v) Communication between NMTs and central receiving station must be two-way.

**Reporting:**

The deliverables of each phase shall be submitted in 20 copies including maps, annexes, etc. in addition, a full electronic copy of each will be submitted including all contents of the deliverables while the maps will also be submitted in digital form

**DIAL/DGCA Obligations:**

DIAL/DGCA will provide the Consultant with the following:

1. General information related to airport.
2. Satellite photo of the airport area and orthophotomaps.
3. Digital terrain model with ground terrain contours.
4. Air traffic data for the two representative months of the previous year.
5. Available flight tracks/paths.

**Technical Proposal:**

The technical proposal shall include detailed information relevant to the compliance with the technical specifications for each phase and paragraph, providing clarifications where needed and also information on the following:

1. Detailed description of the noise model to be used.
2. Methodology to be used.
3. Organizational chart of the study team.
4. CVs of the member of the study team. The proposal shall include detailed information on the role of each member of the study team in previous studies especially related to aircraft noise.

5. Detailed time schedule for the execution of the study taking into account the following deadlines:

Phase 1 : November, 2011  
Phase 2 : January, 2012  
Phase 3 : April, 2012

6. Consultants with experience in similar noise studies (e.g., similar size airports, etc) and having valid recognition under NABL/EP Act, 1986 or equivalent with necessary infrastructure and manpower are only eligible to submit the bid.

### **Financial Proposal:**

The financial proposal shall include the submission of the completed Bill of quantities (as per the format attached). The exact scope of Phase 3 will be determined based on the results of Phase 1 and Phase 2. Therefore it is possible that not all types of proposed measures will finally be included. The following should also be taken into consideration during the preparation of the financial proposal:

- The Consultant may participate in meetings with other competent authorities.
- The Consultant shall bear the cost for the preparation of the presentation material in electronic form (Power Point), maps, drawings, graphs, etc within the framework of participation in meetings, presentations, consultations with public etc.

The financial proposal will also include the following “options”:

- Cost for each scenario of NAPs (if needed).
- Hourly/daily charge for each category of study team specialist.

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## BILL OF QUANTITIES

**PROJECT: Aircraft Noise Study at IGI Airport, New Delhi.**

**Consultant:**

<b>Phase</b>	<b>Description</b>	<b>Cost (Rs)</b>
<b>1</b>	<b>Creation of strategic Noise Maps</b>	
<b>2</b>	<b>Validation of Noise Mapping Results</b>	
<b>3</b>	<b>Action plan including potential analysis of the following measures:</b>	
<b>3i</b>	Aircraft noise charging	
<b>3ii</b>	Operational restrictions	
<b>3iii</b>	Development of NPRs	
<b>3iv</b>	Land uses	
<b>3v</b>	Strategy for community relations	
	Other expense(please specify)	
	<b>TOTAL</b>	

**OPTIONS:**

<b>No.</b>	<b>Description</b>	<b>Cost (Rs)</b>
<b>1</b>	NAP for each scenario	
<b>2</b>	Hourly charge for each category of study team specialist (hourly fee per person)	