Retrospective Study

Conservation of hearing programme in IAF

Wg Cdr (Mrs) K Jauhar*

In military and aviation, the machines of war have become more devastating and deafning. Aviation activity is plagued with the problem of such high noise levels that the nuisance value of unwanted sound has now been recognised as a 'public health problem' and an occupational hazard in the IAF. The harmful effects of noise cause both auditory and non auditory effects, which creep in slowly and painlessly and go unnoticed for a long duration of time. On the basis of studies carried out in IAF, a conservation of hearing programme has been recommended, on similar lines to those of USAF and Vietnam Air Force.

Keywords : Aircraft noise; conservation of hearing; noise.

The sound levels in our urban community are rising exponentially. It has been brought out that "Civilisation is Noise". the nuisance value of unwanted sounds has now been recognised as a "Public Health Problem". Noise today is the most common cause of hearing loss the world over. In the air force also, noise is recognised as an occupational hazard.

In military aviation, the machines of war have become more devastating and deafening, contributing considerably to the noise pollution. The result of this progress has resulted in an epidemic of deafness, which is "Incurable, but surely preventable".

Hearing damage risk criteria

Aviation activity is one of the areas plagued with the problems of high noise levels. The damaging effects of noise on hearing has been recognised for a long time. Now, it is also common knowledge that the non-auditory effects of noise may be more damaging in the long run.

The risk potentials of noise have not been adequately appreciated because the damage of hearing :-

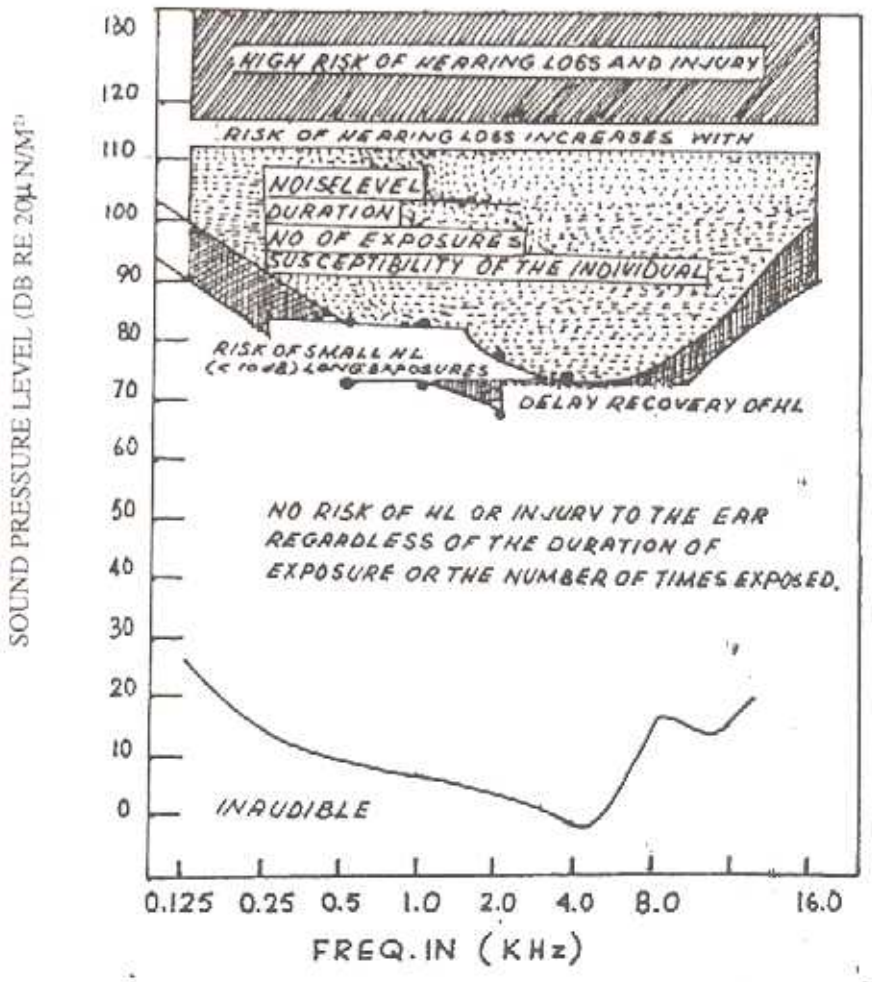
(a) Creeps slowly over a number of years.

(b) Is painless.

(c) Goes unnoticed as no major disability is caused.

(d) Has situational and individual variations.

* *Classified Specialist (ENT), AFCME, Subroto Park, New Delhi 110010*



A) SAFE NOISE LEVEL - UPTO 85 DB

B) EXPOSURE OF 90 DB A - 8 HRS/DAV

C) ABOVE 90 DB INCREMENTS OF 3DB REDUCED SAFE EXPOSURES BY 50%

93 DB - 4 HRS

120 DB - 28 SECS.

D) HIGH PERFORMANCE JET ENGINES 110-140 DB

E) 130 - 140 DB - PAIN - PHYSICAL DAMAGE TO EAR

The damage risk criteria because of noise in aviation (Figure 1) shows sound frequencies and the bandwidths of noise in decibels. It can be seen that :

(a) There is a band below 20 db which is inaudible.

(b) It also shows the safe average noise levels, are upto 85 db.

(c) Exposures to noise of 90 db, can be tolerated for upto 8 hours per day.

(d) Above 90db, increments of 3 db, reduce safe exposures by 50% e.g. at 93 db safe exposure is only 4 hours and at 120 db safe exposure reduces to a low of 28 secs, only.

(e) To correlate the above with IAF environment, it is to be noted that a high performance jet engine produces noise in the range of 110 to 140 db.

(f) Noise above 130 to 140 db can cause pain as well as physical damage to the ear.

Conservation of hearing programme

This programme has been formulated on the basis of results obtained from a number of research works carried out in the IAF. The aim of this programme is to have prevention of hearing loss in the IAF environment.

Murthy & Veghese [1] in 1975 brought out that 44.6% of the aircrew had NIHL (Noise induced Hearing Loss), 25.7% amongst the fighter group and 71.0% from the transport & helicopter group. Out of the 71% from tpt and heptrs, 59.7% had moderate hearing loss of 30 to 60 db and the balance 14.1% had severe hearing loss of 60 - 90 dB.

Deshmukh et al [2, 3] in 1982 brought out that only 28.3% of aircrew remain unaffected, 15.3% have moderate hearing loss and 56.4% had mild impairment in hearing.They also found that the frequencies involved severe hearing loss were 4, 6 & 8 KHz mainly. This study showed that 34.6% of fighter pilots, 17.3% of transport and 15.9% of helicopter pilots were affected. There was only 6% incidence of NIHL at the end of 10 yrs which increased at the end of 30 yrs when 50% of aircrew had high frequency hearing loss and 24% had low frequency HL.

Rao & Soodan [3] in 1984 carried out a study of 'Noise Environment' and an audiometric survey of technical airmen at various fighter bases. This detailed study was carried out in three parts:

(a) In the first part noise levels were studied at various locations within AF stations. Their findings were :

  (i) Flying hours vary from 100-2200 hrs/ month.

  (ii) Peak noise was between 0900 hrs to 1200 hrs.

  (iii) Noise levels in the crew-rooms, DSS, Tarmac, ATC and even class rooms were far above the Damage Risk Criteria.

  (iv) On the Tarmac & DSS area, noise levels of more than 130dB were recorded which not only interferes in communication but causes annoyance and discomfort.

(b) The second part of this study did an autdiometric survey of 3,391 technical airmen of different trades.

(c) The third part carried out studies on ear defenders, helmets and attenuation devices within the cockpit.

Conservation of hearing

Based on the studies carried out by our predecessors and understanding the effects of noise, it is recommended to formulate a 'Conservation of Hearing Program' for the IAF.

This is along the lines of the pattern prevalent in the US Air Force who had in turn based it on WHO recommendations.

The key word is 'Prevention' as there is No medical or surgical cure.

Methodology

This involves a four pronged approach under the following :

(a) Identification of 'At Risk'.
  (i) Individuals
  (ii) Areas.

(b) Control of Exposure / Noise Reduction Procedures which need to be achieved
  (i) At Source.
  (ii) Hush House effect.
  (iii) By use of PPM (Personal Protective Measures).

(c) Surveillence of 'At Risk'. This is necessary to establish the damage which can occur.

(d) Education and Awareness of 'At Risk' groups. This requires emphasis on :
  (i) Importance of hearing
  (ii) Harmful effects of noise.
  (iii) Additive effect of others.
  (iv) Motivation of users.
  (v) Administrative help for strict compliance.
  (vi) Education on protective devices.
  (vii) Implementation of the programme.

Identification of 'At Risk'

Individuals at risk of developing noise related problems are :

(a) Aircrew

(b) Technical personnel.

(c) ATC or Crash-Bay staff.

It is necessary to calculate the character of noise i.e. 'noise level' in decibels and the 'duration of exposure'. It would be ideal to wear a 'Noise Dosimeter' to calculate the daily dose and the cumulative dose of exposure.

Areas

Identification of 'high risk', 'potential risk' and 'non risk' areas with large sign boards in appropriate colour codes of Red/Amber/ Green is recommended. The noise levels and the colour coding for areas is given below :

Areas	Colours	Noise Levels
(a) High Risk	Red	105 dB and above.
(b) Moderate/ Potential Risk	Amber	85-105 dB
(c) No Risk	Green	85 dB and below.

The following measures then can be adapted for these different areas :

(a) The wearing of 'Muff' type of car defender be mandatory for all individuals present in high risk areas.

(b) All individuals to carry ear defenders while working in potential or moderate risk areas and put on defenders as and when noise appears.

(c) No ear defenders to be worn in no risk areas.

(d) Individuals not concerned with the operations of aircraft should not be permitted to enter in the high or potential risk areas.

(e) All individuals must enter high risk area only for the particular job and leave the area as soon as the job is over.

(f) All ground runs and engine testing must be done in only in special areas.

(g) All the doors and windows of hangars, offices and other rooms, close to aircraft noise, be kept closed.

(h) Construction of buildings in or near the high risk zone should be avoided.

Control of Exposure

Noise reduction can be achieved by :

(a) Reduction of noise at source.

(b) Removal of noise or 'Hush house effect'.

(c) Attenuation of energy by use of Personal Protective Measures.

At source this is achieved by reducing the radiated energy. This can be done with the help of engineers, basically at the engine designing state, or by adding the engine noise muffling devices. However, these may not be suitable in case of some fighter aircraft because both these may increase weight and volume which may compromise the size, speed and carrying capacity of aircraft which is not desirable. Within the cockpit, attenuation is done by various ways, like padding of interiors, increasing thickness & proper sealing of canopies, proper tuning of RT sets and now even the use of noise canceling boom microphones. However, it is noted that usually damage to hearing is more often outside the cockpit and not when the pilot is flying.

Removal of effects of noise or Hush house effect. This is done by various method like :

(a) Sound proofing or air conditioning of the buildings near the taxi track or tarmac.

(b) Using engine detuners.

(c) Insulation of the walls by keeping the doors and windows of all offices closed.

(d) Use of blast deflectors or sound reflectors.

(e) Making of earth walls and corrugated sloping fences.

(f) Planning and relocation of buildings at the IAF stations.

Attenuation of energy is achieved by the use of PPM (Personal Protective measure). Personal protective devices are the cheapest, most common and effective ways of preventing hearing loss from noise. The various types are :

(a) Ear Defenders

  (i) Insert Type

  (ii) Muff Type

(b) Helmets. The use of inner and outer helmets.

(c) Jerkin Suits. For use at noise levels of 140 dB and above.

The use of PPM is comparable to use of sun glasses which cuts out the harmful effects, thus making :

(a) Unsafe noise to safe noise.

(b) Increasing safe duration exposure in that area.

Many varieties of ear defenders are available and many factors like durability, hygiene, price and personal preference go into deciding which is the ideal one. A foam polyurethane plug, which is a

cylindrical object which can be pressed and inserted and takes about two minutes to get the shape of ear canals, is effective and good. The others are disposable, re-usable rubber and fibre glass variants. Some are also with fluid or silicon gel filled inside so that it reduces irritation to the canal skin. Any good device provides attenuation of 25 - 28 db in the lower and 40 db in higher frequencies. This increases the time duration for damage to ear and practically converts unsafe noise to safe noise. Theoretically, the most effective are 'Ear Muffs'. These consist of cups worn around the ears fitted with sound absorbing material, which are sealed to the side of the head by a plastic or rubber gasket. Anything that breaks the seal reduces the attenuation. The disadvantage of these are that they are cumbersome and sometimes painful if they don't fit too well.

Surveillance of 'At Risk'

Periodic audiometry once in six months to a year of all personnel who work in high and potential risk areas should be carried out. Individuals should be classified into :

(a) Surveillance ears or 'Green Ears'.

(b) Referal Ears of 'Wet Ears'. 'Referal Ears' are individuals showing mdoerate to severe hearing loss who should be medically evaluated and given sheltered employment to avoid further deterioration of their condition.

Education and Awareness

Lastly, the most important factor for this programme is the education and awareness for the people at risk. They have to be explained the following :

(a) The importance of hearing in the day-to-day living and that the hearing is a very important sense which usually one loses at 65 years. Coupled with vision which deteriorates at 40, the loss of both can mean a life of isolation.

(b) Noise has many auditory and non-auditory effects which effect the individuals without them realising.

(c) The additive effect of some toxic drugs, diabetes mellitus ageing and noise add up and cause very fast deterioration in hearing.

(d) Each user should possess a set of ear defenders and, he should be educated and motivated to use them in risk areas.

(e) Administrative compliance of preventive measures should also be insured.

References

1. Murty VSN, Rao K. Acounstic Trauma amongst jet aircraft maintenance personnel. *Aviat Med 1975*; 19-21.
2. Deshmukh SP, Rao AB, Soodan KS and Pranesh Rao BN. Study of noise induced hearing loss amongst serving aircrew in IAF. AFMRC Project Report No. 1288/81, 1983.
3. Rao AB, Soodan KS and Pranasha Rao BN. Study of Noise environment and audiometric survey of Technical Airmen at various Fighter bases in IAF. *Medical Journal Armed Forces of India*. 1990; 46(3) : 187-192.