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THE EXTENT OF HEARING LOSS IN THE ARMY
A SURVEY REPORT

Project Director

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13. ABSTRACT

The purpose of this study was to survey the incidence of noise-induced hearing loss among United States Army troops. Accurate hearing threshold data were obtained from a heterogenous sample of 2726 men representing different branches and lengths of time of active duty. This study provides evidence suggesting that noise-induced hearing loss is the number one hazard to the health of Army personnel. The following summarizes the magnitude of the problem among career Army personnel with over 10 years on active duty:

1. Infantry - 23.0% have hearing loss severe enough to require mandatory duty limitations (H3 profiles), and an additional 4.0% did not even meet minimum standards for retention on active duty (H4 profiles).

2. Artillery - 29.8% had H3 profiles, and 3.2% had H4 profiles.

3. Armor - 40.9% had H3 profiles, and 2.3% had H4 profiles. The significance of these data is highlighted by the fact that no H3 or H4 profiles were observed among the sample of new inductees that were tested.

In light of the data contained in the report, the need is obvious for (1) an Army-wide hearing conservation program, (2) the development and utilization of effective hearing protection devices, and (3) a long-term prospective study of the incidence of hearing loss among Army personnel.

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Compensation						
Disability						
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Hearing Threshold						
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Career Personnel						
Hearing Impairment						
Hearing Loss - Incidence and Magnitude						
Duty Limitations						
Retention Standards						
Auditory Mechanism						
Army-Wide Hearing Conservation Program						
Combat Arms						

FOREWORD

1. REFERENCES.

a. VCSA Memorandum, 12 April 1971, Premature Hearing Loss by Our Troops.

b. CRD Memorandum, 3 May 1971, Premature Hearing Loss by Our Troops.

c. VCSA Memorandum, 20 May 1971, Premature Hearing Loss by Our Troops.

d. CSA Memorandum, 21 June 1971, Premature Hearing Loss by U.S. Army Troops.

e. AR 40-5.

f. TB Med 251.

2. A memorandum from the Vice Chief of Staff, Department of the Army, 12 April 1971, asked the Deputy Chief of Staff for Personnel, the Chief of Research and Development, and The Surgeon General for comments and recommendations on the subject of premature hearing loss in our troops.

3. A Chief of Staff memorandum of 21 June 1971 assigns responsibility to The Surgeon General for establishing a data base to determine the extent of premature hearing loss.

4. A pilot survey to begin the data base on premature hearing loss was approved by Medical Research and Development Command on 18 August 1971. This correspondence is the report of that survey.

5. The report is divided into these sections.

g. Appendix I, page 27.

h. Appendix II, page 48.

6. In each of the categories tested, the list below shows the total percentage of men who had changes in profile, i.e., H-2+, H-3+, H-4 profiles.

a.	New recruits prior to BCT - Fort Dix	2.4%
b.	New recruits at end of BCT - Fort Dix	6.3%
c.	Drill Instructors - Fort Dix	14.6%
d.	AIT at end of course - Fort Benning	13.0%
e.	Career Infantry Personnel - Fort Benning	53.3%
f.	Infantry Officers Career Course - Fort Benning	29.1%
g.	Advanced Tank Crew Students - Fort Knox	13.3%
h.	Career Armor Personnel - Fort Knox	45.9%
i.	AIT - Artillery Personnel - Fort Sill	7.9%
j.	Career Artillery Personnel - Fort Sill	44.8%
k.	Student Pilots - Fort Rucker	5.3%
l.	Pilot Instructors - Fort Rucker	10.0%

On page 39 under "Results according to length of time in service with each branch" - par D3, it will be seen that we were unable to test adequate numbers of the group which we wanted most, i.e., those with 10 or more years service. There are several reasons for this failure.

m.	Students from the Combat Arms attending Command and General Staff College - Fort Leavenworth	42.1%

7. The above figures highlight the fundamental, known fact that hearing loss occurs when one is exposed to loud noise, and it becomes worse as the time of exposure is lengthened. This study adds strength to our contention that hearing loss is the most common disability in the U.S. Army.

8. Finally, it must be emphasized in the strongest terms that virtually all of the hearing loss which is acquired in training exercises - and this accounts for the vast majority of it - is preventable by using information we now have, and by using protective devices which are now commercially available.

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Prinicpal Investigator

I. BACKGROUND

It has long been evident to many military and civilian otologists and audiologists that noise-induced hearing loss is a serious health hazard in all branches of the military. As evidence of this fact, it was estimated by the Veterans Administration that 52 million dollars was paid out in 1970 for hearing loss incurred as a result of service in the armed forces. This figure is for hearing loss alone and does not include compensation paid to individuals who had hearing loss plus another disability which was also ratable for compensation. In addition, $1,066,219 was spent for hearing aids, $213,747 for hearing aid batteries, and $157,911 for hearing aid repairs. These figures reflect the basic monetary outlay for individuals with hearing loss. However, they do not reflect the more important factors of decreased job performance and limited communication ability.

As recently as 25 August 1971, it was estimated by the Veterans Administration that 20% of all veterans being discharged from the Army are entering claims for hearing loss. However, it has been conservatively estimated by the authors that from 30% to 50% of all active duty Army personnel develop some degree of noise-induced hearing loss during their military careers. If these estimates are accurate, noise-induced hearing loss would rank as the number one health hazard in the Army. Sizable increases in expenditures for compensation, hearing aids, and other expenses related to this

problem can be anticipated as awareness of this problem increases among military personnel. It should be recognized that the magnitude of this problem probably bears only a slight relationship to whether or not the military is actively involved in combat. Statistics from the Army Audiology and Speech Center, Walter Reed General Hospital, indicate that relatively few soldiers suffer permanent loss of hearing as a result of noise exposure in combat; whereas, the vast majority lose their hearing as a result of slow, accumulative exposure to routine training exercises.

Evidence of the potential health hazard of noise to the soldier can be acquired from an electroacoustic analysis of common military equipment in use. The U.S. Army Environmental Hygiene Agency, Edgewood Arsenal, as well as other laboratories, have provided such data. It is well known that sustained exposure to high intensity noise is deleterious to hearing. It has been shown that most large trucks, all armored vehicles, and all helicopters exceed acceptable criteria.

It was because the incidence of hearing loss among Army personnel was suspected to be quite high, and because the noise produced by many weapons and other military equipment exceeds acceptable limits, that the present study was undertaken.

II. STATEMENT OF THE PURPOSE AND PROCEDURES

The purpose of this study was to gather accurate hearing threshold data on a heterogeneous sample of Army personnel. An effort was made to include individuals from different military occupations and with differing lengths of time in service. It was hoped that these data would give some objective indication of the magnitude of the problem of noise-induced hearing loss in the Army and stimulate further action and interest in controlling this problem among the command structure as well as among the medical specialties.

Pure tone thresholds were obtained from 2726 individuals at discrete frequencies from 250 Hz to 6000 Hz for both ears. All testing was accomplished by six experienced Military Audiologists (MOS 3360) assisted by three EENT Corpsmen (91U20). Three testing teams were formed, each consisting of two audiologists and one corpsman. Each team was assigned responsibility for obtaining audiometric data at two Army installations. Hence, a total of six installations were visited. At each installation, the test team was responsible for testing the following groups of individuals:

1. Fort Dix

    a. Newly inducted recruits prior to exposure to any basic training noise.

    b. Recruits at the end of basic training.

    c. Drill instructor students.

2. Fort Benning

a. Advanced infantry training students at the end of the course.

b. Career infantry personnel.

c. Infantry Officers' Career Course.

3. Fort Knox

a. Advanced tank crew students at the end of training.

b. Career armored personnel.

c. Miscellaneous personnel.

4. Fort Sill

a. Career artillery personnel.

b. Advanced artilliery students at the end of the course.

5. Fort Rucker

a. Student pilots.

b. Pilot instructors.

6. Fort Leavenworth

a. Students from the combat arms attending Command and General Staff College.

The test teams were assigned to each installation for approximately one week. All testing was accomplished employing discrete frequency portable audiometers, all of which received a thorough calibration check and adjustment prior to use in this study. In addition, each team was equipped with an artificial ear, and a twice daily check of the intensity calibration and attenuator linearity

of the audiometers was accomplished during the testing. All threshold data with the exception of that obtained at the Command and General Staff College at Fort Leavenworth were obtained with the listeners seated in I.A.C. sound-treated test booths which were made available by the local installations. Electroacoustic measurements with the sound level meter assured acceptable levels of ambient noise in each of the test booths employed. At Fort Leavenworth, the testing was carried out in a conference room which had carpet on the floors and full-length drapes on three of the four walls. The performance of the room in attenuating external noise was determined daily by acoustical surveys conducted under normal test conditions. The measured noise levels inside the conference room were compared with the American Standards Association maximum allowable sound pressure levels for no masking of the test signals above audiometric zero. The findings indicated that the room provided sufficient attenuation of ambient noise for testing at all test frequencies with the exception of 250 and 500 Hz. At these two frequencies, masking due to extraneous noise produced an elevated rather than a true hearing level for a portion of those tested whose hearing levels were low (i.e., less than 10 dB above audiometric zero). However, this elevation of threshold at 250 and 500 Hz was not sufficient to cause any of those tested to be shifted from an H-1 profile to another profile.

III. RESULTS

In this section of the report, the data will be summarized for selected installations and test groups, and according to the length of time on active duty within selected branches. The complete data are summarized for these classifications as well as for other classifications of the men (i.e., by age and by length of time in service across all branches) in the appendix. The following statistics are reported for each of the subgroups within the two classifications of the men to be discussed: (1) the sample size, (2) the mean profile for that sample, (3) the percentage of the sample with H-1, H-2, H-3 and H-4 profiles, and (4) the mean thresholds for the sample. Mean thresholds for the various groupings of the 2726 men were reported rather than medians or modes because the mean is the most familiar of the measures of central tendency to the typical reader, and because it is the most stable measure for small samples. However, it should be noted that, at those frequencies where many members of a sample had exceptionally good hearing, the thresholds obtained were not normally distributed. This was due to the fact that the audiometers employed could not measure sensitivity better than -10 dB HL. Consequently, the mean thresholds at these frequencies suggest slightly poorer hearing for the sample than was actually the case. However, this was a factor only for the mean threshold data for a group of listeners and in no way effects the profiling of individual subjects. All profiling was accomplished

according to AR 40-501, Appendix VIII. However, since speech reception thresholds were not obtained, an average of the best two frequencies at 500, 1000 and 2000 Hz was used as a speech reception threshold in all cases where a speech reception threshold was required for profiling. All threshold data are reported according to ISO (1964) standards for audiometric zero.

A. RESULTS ACCORDING TO INSTALLATION AND GROUP.

The following summarizes the data for the 2726 men according to at which installation, and within which test group, the man was located.

1. NEWLY INDUCTED RECRUITS PRIOR TO EXPOSURE TO ANY BASIC TRAINING NOISE (Fort Dix)

Sample Size: 246 Profile: Mean - 1.02 S.D. - 0.15

Percent: H-1 - 97.6% H-2 - 2.4% H-3 - 0.0% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.0	10.1	7.3	6.5	10.5	17.6	8.5	7.3	6.9	5.6	10.3	17.0
S.D.:	7.0	6.1	6.9	6.7	11.2	12.7	7.2	6.4	6.7	6.4	11.7	14.3

2. RECRUITS AT THE END OF BASIC TRAINING (Fort Dix)

Sample Size: 255 Profile: Mean - 1.08 S.D. - 0.32

Percent: H-1 - 93.7% H-2 - 4.7% H-3 - 1.6% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	9.4	9.8	5.9	5.9	12.0	19.0	6.2	6.1	6.1	6.2	14.4	22.3
S.D.:	6.4	5.6	5.9	7.0	13.8	15.4	6.4	6.8	5.6	6.8	13.9	18.4

3. DRILL INSTRUCTOR STUDENTS (Fort Dix)

Sample Size: 32 Profile: Mean - 1.22 S.D. - 0.55

Percent: H-1 - 84.4% H-2 - 9.4% H-3 - 6.2% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	7.0	8.1	6.4	7.3	17.5	23.6	7.3	3.8	4.4	6.3	17.3	24.1
S.D.:	6.3	6.4	7.7	8.1	18.2	22.0	7.8	4.8	6.1	8.3	20.5	22.8

4. ADVANCED INFANTRY TRAINING STUDENTS AT THE END OF THE COURSE (Fort Benning)

Sample Size: 99 Profile: Mean - 1.24 S.D. - 0.70

Percent: H-1 - 86.9% H-2 - 6.1% H-3 - 3.0% H-4 - 4.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	12.7	12.8	12.2	13.0	20.3	27.4	12.3	13.8	13.1	14.5	22.1	30.7
S.D.:	7.7	6.5	6.7	7.1	15.5	19.1	7.9	9.2	8.7	11.0	15.1	19.4

5. CAREER INFANTRY PERSONNEL (Fort Benning)

Sample Size: 137 Profile: Mean - 1.96 S.D. - 1.03

Percent: H-1 - 46.7% H-2 - 19.0% H-3 - 26.3% H-4 - 8.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	16.2	17.1	17.6	22.3	39.8	48.6	14.8	16.7	16.9	21.5	41.7	52.2
S.D.:	13.2	13.9	15.5	20.2	29.3	28.4	13.4	14.3	15.0	19.1	26.5	28.1

6. INFANTRY OFFICER'S CAREER COURSE (Fort Benning)

Sample Size: 110 Profile: Mean - 1.44 S.D. - 0.76

Percent: H-1 - 70.9% H-2 - 16.4% H-3 - 10.9% H-4 - 1.8%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.0	11.4	10.9	11.8	24.6	33.8	9.9	10.9	11.6	13.5	26.9	37.4
S.D.:	7.5	7.9	8.6	9.5	21.5	24.6	6.1	6.7	7.0	10.7	20.4	23.6

7. ADVANCED TANK CREW STUDENTS AT THE END OF TRAINING (Fort Knox)

Sample Size: 240 Profile: Mean - 1.21 S.D. - 0.57

Percent: H-1 - 86.7% H-2 - 5.4% H-3 - 7.9% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.8	11.7	6.3	5.5	17.4	22.9	15.2	11.2	5.8	6.3	19.5	25.3
S.D.:	7.3	6.6	5.8	6.4	17.2	16.0	7.7	8.2	7.5	8.4	18.6	17.9

8. CAREER ARMORED PERSONNEL (Fort Knox)

Sample Size: 407 Profile: Mean - 1.78 S.D. - 0.92

Percent: H-1 - 54.1% H-2 - 15.7% H-3 - 28.7% H-4 - 1.5%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.2	14.9	12.0	15.0	38.0	46.6	16.6	14.9	12.4	17.3	40.3	48.9
S.D.:	9.2	9.5	10.8	16.0	27.2	28.7	12.5	13.4	14.4	18.6	27.8	28.5

9. **ADVANCED ARTILLERY STUDENTS AT THE END OF THE COURSE (Fort Sill)**

Sample Size: 330 **Profile: Mean - 1.12 S.D. - 0.45**

Percent: H-1 - 92.1% H-2 - 4.3% H-3 - 3.0% H-4 - 0.6%

Threshold Data

	Right Ear						Left Ear					
Freq:	**250**	**500**	**1000**	**2000**	**4000**	**6000**	**250**	**500**	**1000**	**2000**	**4000**	**6000**
Mean:	**13.9**	**12.4**	**10.7**	**8.6**	**12.2**	**17.9**	**10.8**	**7.4**	**8.7**	**5.9**	**8.0**	**12.0**
S.D.:	**8.7**	**8.5**	**8.0**	**8.2**	**15.2**	**17.8**	**11.7**	**10.4**	**10.1**	**10.5**	**17.0**	**20.0**

10. CAREER ARTILLERY PERSONNEL (Fort Sill)

Sample Size: 73 Profile: Mean - 1.78 S.D. - 0.98

Percent: H-1 - 56.2% H-2 - 13.7% H-3 - 26.0% H-4 - 4.1%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.1	16.6	17.4	17.3	37.0	42.9	14.7	11.6	13.4	14.9	33.3	38.6
S.D.:	8.9	10.2	12.9	16.4	29.7	30.2	13.2	12.5	12.0	18.1	33.8	33.6

11. STUDENT PILOTS (Fort Rucker)

Sample Size: 228 Profile: Mean - 1.07 S.D. - 0.30

Percent: H-1 - 94.7% H-2 - 4.0% H-3 - 1.3% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.4	10.0	7.5	8.4	11.1	18.2	9.8	9.8	8.5	10.0	13.6	21.4
S.D.:	7.9	7.5	6.1	7.2	12.4	13.6	6.3	6.1	6.0	7.2	12.0	14.4

12. PILOT INSTRUCTORS (Fort Rucker)

Sample Size: 183 Profile: Mean - 1.16 S.D. - 0.50

Percent: H-1 - 89.0% H-2 - 5.5% H-3 - 5.5% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	10.2	8.9	7.0	7.4	15.9	23.2	8.0	7.7	7.0	8.3	18.1	26.5
S.D.:	6.7	5.7	5.6	5.7	17.5	18.5	6.4	6.6	6.8	7.6	17.9	19.9

13. STUDENTS FROM THE COMBAT ARMS ATTENDING COMMAND AND GENERAL STAFF COLLEGE (Fort Leavenworth)

Sample Size: 266 Profile: Mean - 1.63 S.D. - 0.82

Percent: H-1 - 57.9% H-2 - 21.0% H-3 - 20.7% H-4 - 0.4%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	21.0	18.3	8.7	10.0	35.0	45.4	23.3	20.2	10.9	12.6	37.1	44.8
S.D.:	6.3	6.3	6.5	10.2	23.6	27.5	9.0	9.4	10.3	14.8	24.1	26.0

B. RESULTS ACCORDING TO LENGTH OF TIME IN SERVICE WITHIN EACH BRANCH.

The following summarizes the data for each of the major branches. Within each branch, three categories of length of time on active duty are discussed (i.e., under four years, between four and ten years, over ten years).

1. INFANTRY

Sample Size: 937 Profile: Mean - 1.31 S.D. - 0.69

Percent: H-1 - 80.1% H-2 - 10.1% H-3 - 8.1% H-4 - 1.7%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	12.4	12.2	9.3	10.0	19.7	28.0	10.6	10.3	9.4	10.5	21.9	30.0
S.D.:	8.9	8.6	9.6	11.8	21.5	23.3	9.6	9.7	9.4	12.5	21.8	24.7

a. Infantry under 4 years

Sample Size: 610 Profile: Mean - 1.10 S.D. - 0.41

Percent: H-1 - 93.1% H-2 - 4.6% H-3 - 1.5% H-4 - 0.8%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.0	10.7	7.5	7.3	12.6	20.1	8.2	7.6	7.4	7.4	14.1	21.8
S.D.:	7.8	7.1	7.6	8.5	14.6	16.6	7.9	7.8	7.6	8.8	14.9	18.9

b. Infantry between 4 and 10 years

Sample Size: 149 Profile: Mean - 1.57 S.D. - 0.87

Percent: H-1 - 65.8% H-2 - 14.1% H-3 - 17.4% H-4 - 2.7%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.9	14.0	12.0	13.3	28.4	38.5	13.5	13.9	12.5	13.5	30.7	42.1
S.D.:	10.1	11.2	12.0	13.3	24.2	26.4	11.4	11.9	11.7	14.2	23.4	26.0

c. Infantry over 10 years

Sample Size: 178 Profile: Mean - 1.84 S.D. - 0.92

Percent: H-1 - 47.2% H-2 - 25.8% H-3 - 23.0% H-4 - 4.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	16.3	16.0	13.3	16.6	37.0	46.5	16.4	16.5	13.6	18.7	41.1	48.0
S.D.:	9.8	9.6	11.4	16.3	26.1	26.3	10.4	9.9	10.6	16.7	25.4	27.5

2. ARTILLERY

Sample Size: 526 Profile: Mean - 1.30 S.D. - 0.68

Percent: H-1 - 82.1% H-2 - 7.2% H-3 - 9.5% H-4 - 1.2%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.2	13.7	11.2	10.1	19.3	25.9	13.2	10.1	9.8	8.4	16.6	21.6
S.D.:	9.0	9.0	9.1	11.2	22.5	25.3	12.8	11.9	11.0	13.0	24.7	27.0

a. Artillery under 4 years

Sample Size: 374 Profile: Mean - 1.14 S.D. - 0.49

Percent: H-1 - 91.2% H-2 - 4.5% H-3 - 3.5% H-4 - 0.8%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.8	12.3	10.6	8.7	13.0	18.6	10.9	7.6	8.7	5.1	8.7	13.2
S.D.:	8.6	8.5	8.2	8.3	16.3	18.2	11.6	10.3	10.0	10.3	17.1	20.2

b. Artillery between 4 and 10 years

Sample Size: 58 Profile: Mean - 1.36 S.D. - 0.74

Percent: H-1 - 79.3% H-2 - 5.2% H-3 - 15.5% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.7	13.9	9.9	10.3	25.0	33.6	15.3	12.4	9.3	8.4	24.7	32.3
S.D.:	8.3	8.1	7.9	9.8	24.7	31.4	10.3	8.4	7.4	6.8	24.0	26.6

c. Artillery over 10 years

Sample Size: 94 Profile: Mean - 1.88 S.D. - 0.95

Percent: H-1 - 47.9% H-2 - 19.1% H-3 - 29.8% H-4 - 3.2%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	20.9	19.1	14.2	15.5	40.9	50.0	20.9	18.9	14.4	17.2	42.8	48.5
S.D.:	8.6	9.6	12.4	18.3	27.6	29.2	15.1	15.0	14.9	20.0	30.5	30.9

3. **ARMOR**

Sample Size: 741 Profile: Mean - 1.51 S.D. - 0.82

Percent: H-1 - 69.5% H-2 - 11.2% H-3 - 18.5% H-4 - 0.8%

Threshold Data

	Right Ear						Left Ear					
Freq:	**250**	**500**	**1000**	**2000**	**4000**	**6000**	**250**	**500**	**1000**	**2000**	**4000**	**6000**
Mean:	**16.1**	**13.5**	**9.6**	**11.2**	**28.6**	**36.3**	**15.7**	**13.4**	**10.0**	**12.9**	**30.6**	**38.4**
S.D.:	**8.5**	**8.1**	**8.9**	**13.1**	**24.7**	**26.7**	**10.7**	**11.4**	**12.0**	**15.7**	**25.8**	**26.7**

a. **Armor under 4 years**

Sample Size: 441 Profile: Mean - 1.22 S.D. - 0.58

Percent: H-1 - 86.0% H-2 - 6.1% H-3 - 7.7% H-4 - 0.2%

Threshold Data

	Right Ear						Left Ear					
Freq:	**250**	**500**	**1000**	**2000**	**4000**	**6000**	**250**	**500**	**1000**	**2000**	**4000**	**6000**
Mean:	**15.1**	**12.0**	**7.7**	**7.2**	**19.3**	**25.5**	**14.6**	**11.6**	**7.5**	**8.2**	**21.0**	**28.3**
S.D.:	**7.6**	**6.6**	**6.2**	**7.0**	**18.1**	**18.0**	**8.1**	**8.3**	**8.0**	**9.2**	**18.4**	**19.4**

b. **Armor between 4 and 10 years**

Sample Size: 85 Profile: Mean - 1.51 S.D. - 0.78

Percent: H-1 - 67.1% H-2 - 15.3% H-3 - 17.6% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	**250**	**500**	**1000**	**2000**	**4000**	**6000**	**250**	**500**	**1000**	**2000**	**4000**	**6000**
Mean:	**15.3**	**13.2**	**9.8**	**10.6**	**27.7**	**39.3**	**14.9**	**13.5**	**11.6**	**12.8**	**31.6**	**44.6**
S.D.:	**7.9**	**7.1**	**7.1**	**9.4**	**21.7**	**24.7**	**12.3**	**12.9**	**12.8**	**15.7**	**23.6**	**28.1**

c. **Armor over 10 years**

Sample Size: 215 **Profile: Mean - 2.09** **S.D. - 0.93**

Percent: H-1 - 36.7% **H-2 - 20.0%** **H-3 - 40.9%** **H-4 - 2.3%**

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	18.6	16.7	13.6	19.6	47.9	57.4	18.3	17.1	14.4	22.5	49.8	55.5
S.D.:	9.9	10.2	12.3	18.8	27.2	29.6	13.9	14.8	16.3	21.1	28.7	29.0

4. AVIATION

Sample Size: 275 Profile: Mean - 1.13 S.D. - 0.45

Percent: H-1 - 91.6% H-2 - 4.0% H-3 - 4.4% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.8	10.4	7.9	8.3	15.4	22.1	9.8	9.9	8.0	9.1	16.5	24.8
S.D :	8.0	7.3	6.5	7.3	17.4	18.1	6.7	6.9	6.9	7.9	16.3	18.8

a. Aviation under 4 years

Sample Size: 166 Profile: Mean - 1.02 S.D. - 0.17

Percent: H-1 - 98.8% H-2 - 0.6% H-3 - 0.6% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.1	9.9	7.3	7.0	10.6	17.4	9.6	9.7	7.9	8.5	12.2	19.3
S.D.:	6.7	6.5	5.6	5.7	10.9	14.3	6.0	6.5	6.6	7.3	10.4	13.4

b. Aviation between 4 and 10 years

Sample Size: 66 Profile: Mean - 1.15 S.D. - 0.50

Percent: H-1 - 90.9% H-2 - 3.0% H-3 - 6.1% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	12.4	10.5	8.0	9.8	17.7	27.0	9.2	9.0	7.1	9.2	18.0	28.6
S.D.:	10.2	9.2	7.4	9.1	19.5	20.1	7.1	6.7	5.8	8.7	18.0	21.9

c. Aviation over 10 years

Sample Size: 43 Profile: Mean - 1.51 S.D. - 0.77

Percent: H-1 - 65.1% H-2 - 18.6% H-3 - 16.3% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.4	12.0	9.8	11.0	30.7	32.6	11.5	12.1	9.8	11.2	31.0	27.7
S.D.:	8.4	7.5	8.0	8.6	23.9	21.5	8.5	8.3	8.9	8.6	22.5	24.2

IV. DISCUSSION

Perhaps the most obvious fact illustrated by the data is that the longer an individual has been on active duty the greater the probability that he will have sustained a hearing impairment. It is obvious from the data for the 246 new inductees at Fort Dix that the vast majority of individuals entering the Army have hearing within normal limits bilaterally. Recall that, of the 246 men, 97.6% had H-1 profiles. Only 2.4%, or six men, had H-2 profiles, and no H-3 or H-4 profiles were observed. However, of the 255 men who were tested at the completion of basic training, the percentage of H-1 profiles was down to 93.7%. Further reduction in the percentage of H-1 profiles is observed for the three groups of men who had completed their advanced training. For the AIT infantry personnel, the percentage of H-1 profiles was 86.9%. For the AIT artillery personnel, it was 92.1%, and for the AIT armor personnel, it was 86.7%. Hence, in just the first four-to-six months that an individual is on active duty, his chances of sustaining a hearing impairment increase substantially as his time on active duty continues. The estimated cost to the Army for training an individual through basic and advanced individual training is $4,300. Yet, even at the end of this relatively short period of time, approximately 5% of these individuals have hearing losses of sufficient magnitude that they should be removed from the job for which they have just been trained.

The relationship between the incidence and magnitude of hearing loss and length of time on active duty is even more clear from the data summarizing length of time in service within each branch. For example, of the 937 men tested in the infantry, the percentage of H-1 profiles fell dramatically with increasing lengths of time in service. Of the infantry men with less than four years on active duty, 93.1% had H-1 profiles. For the men with between four and ten years on active duty, 65.8% had H-1 profiles. For the infantry men with over 10 years on active duty, only 47.2% had H-1 profiles. In addition, 23.0% had hearing which would require mandatory duty limitations because of poor hearing, and an additional 4.0% did not meet the minimum standards for retention on active duty.

The same tendency for hearing to drop dramatically with increasing length of time on active duty can be seen for the 526 artillery men tested. Of the men with less than four years on active duty, 91.2% had H-1 profiles. However, this percentage dropped to 79.3% for the artillery men with between four and ten years on active duty. Of the men with over ten years on active duty, only 47.9% had H-1 profiles, 29.8% required mandatory duty limitations, and an additional 3.2% did not meet minimum standards for retention on active duty.

The relationship between hearing loss and length of time on active duty is most evident for the 741 men in the armored branch. The percentage of H-1 profiles for the men with less than four years on active duty was 86.0%. However, this fell to only 67.1% for the men with

between four and ten years active duty. The most dramatic data are for the men with over ten years on active duty. For these individuals, only 36.7% had H-1 profiles, 40.9% required mandatory duty limitations which presumes an inability to perform efficiently on the job, and an additional 2.3% did not meet minimum standards for retention on active duty.

Although the magnitude and severity of the problem of noise-induced hearing loss among Army personnel should be appreciated from the preceeding statistics, the seriousness of this situation in terms of the potential and real combat effectiveness of soldiers with noise-induced hearing losses cannot be fully realized without some knowledge of the nature of this type of hearing loss. Due to the anatomy and physiology of the auditory mechanism, the effect of prolonged exposure to noise is typically a reduction in sensitivity initially at the higher end of the frequency range of the human ear. (However, after several years of such exposure, the loss may progress and erode into the middle of the frequency range and even into the lower frequencies.) It is well known that, although vowels carry most of the acoustic energy of speech, the consonants are most responsible for speech intelligibility. Since most of the energy of consonants is in the higher frequencies, a high-frequency hearing loss has an unusually devastating effect upon the intelligibility of speech. In short, although consonants are rather weak signals for persons with normal hearing, they are inordinately weak or nonexistent for persons with high-frequency

noise-induced hearing loss. This problem is greatly confounded by the presence of background noise. It is a common experience of normal hearing listeners that competing noise impairs their ability to understand speech. This is due primarily to the fact that the weak consonants are susceptible to the effects of the noise and are being partially blocked out or masked by the noise. It is easy to appreciate that the effect of background noise on speech intelligibility is even more serious for the person with a high-frequency noise-induced hearing loss. Although the ability of this person to understand speech may be only slightly impaired in a quiet environment, this ability may be extremely poor in the noise of combat or over noisy communication systems. The validity of this line of reasoning is supported by the fact that, in a clinical environment, the speech discrimination ability of the patient with noise-induced hearing loss is typically much more severely impaired by a given amount of background noise than is that of normal hearing persons or patients with most other types of hearing impairments. A senior noncommissioned officer with apparent nervousness and fear resulting from his inability to communicate effectively in a combat situation is not an unusual clinical entity for military otologists and audiologists to see in recent years.

V. RECOMMENDATIONS

Based upon the data of this investigation, the following recommendations are made:

1. Immediate implementation of a well-coordinated, Army-wide, effective Hearing Conservation Program which will correct the deficiencies noted in this survey. Such a program must have the following essential components and actions:

a. Officer Audiologists - MOS 3360.

The total estimated number of these specialists needed is 58. Without them there can be no effective program. It is they who will do the instructing, advising, monitoring, correcting and supervising locally at every training post.

b. Revise the training program and placement of the 91U20 EENT technician so that these individuals can be efficiently used by the officer audiologist in mounting the Hearing Conservation Program.

c. Provide The Surgeon General of the Army the authority and the means to select the best hearing protective devices which are currently available commercially with which to meet the various requirements of the combat arms of the Army. The present system of procurement of Armored Vehicle Crewmen's Headgear is a splendid example of how the present system fails to work. At present there is no satisfactory such headgear. The "Gentex" helmet has been recommended as a suitable one, and it is commercially available. According to AMC/CDC (CDCMS-O) letter of 24 November 1971, Subject: "Materiel Need

(abbreviated) (MN(A)) for Armored Vehicle Crewmen's Protective Headgear" dated 24 November 1971, this helmet will not be available until sometime in FY 74. Thus, there is a lag time of 3 years between time of agreement that an item should be purchased and actual issue. This is too long. A whole new generation of tankers will be deafened in the meantime.

d. Expand the mission of the US Army Aeromedical Research Laboratory at Fort Rucker, Alabama so that it has the responsibility and the means to evaluate hearing protective devices for all branches of the Army and to consolidate research efforts on hearing and noise. At present this research is so fragmented and uncoordinated as to be much less effective than it should be.

e. The need for a long-term carefully designed longitudinal study of hearing loss in the Army is unequivocal. Our efforts to conserve hearing must surely be based on accurate statistics which tell us when and where and in what circumstances hearing acuity is lost. Such a study should also measure the effect of hearing loss on one's ability to perform a job effectively. We know that hearing loss diminishes one's effective performance, but the full effect of hearing loss on job performance in the Army is unknown. It must be emphasized here that this study depends altogether upon having officer audiologists at training posts where it will be carried out.

f. Finally, every effort must be made by the Medical Corps to gain enthusiastic Command support for Hearing Conservation, for in the end, it will not work unless the line - both officers and men - understand the desirability of protecting their own hearing.

VI. SUMMARY

Army otologists and audiologists have long believed that noise-induced hearing loss is a serious health hazard in the Army but have lacked objective data to substantiate this point. This study provides evidence suggesting that noise-induced hearing loss is the number one hazard to the health of Army personnel.

Accurate hearing threshold data were obtained from a heterogeneous sample of 2726 men representing different branches and lengths of time on active duty in the Army. The following data summarize the magnitude of the problem of noise-induced hearing loss among career Army personnel:

1. Infantry.

Of the men in the infantry with over ten years on active duty, 52.8% had substantial hearing losses. Of these men, 23.0% had hearing losses severe enough to require mandatory duty limitations (H-3 profiles), and an additional 4.0% did not even meet minimum standards for retention on active duty (H-4 profiles).

2. Artillery.

Of the men in the artillery with over ten years on active duty, 52.1% had substantial hearing losses. Of these, 29.8% had hearing which required mandatory duty limitations, and an additional 3.2% did not meet minimum standards for retention on active duty.

3. Armor.

For the men with over ten years in the armor branch, 63.3% had substantial hearing losses. Of these men, 40.9% had hearing which

required mandatory duty limitations, and an additional 2.3% did not meet minimum standards for retention on active duty. In short, only one-third of these men had essentially normal hearing. Approximately two-thirds had hearing losses substantial enough to affect their ability to communicate.

4. Commissioned Officers.

Among career officer personnel, of the individuals in the Command and General Staff College, 42.1% had substantial hearing losses. Twenty-one percent (21.0%) had hearing consistent with an H-2 profile, and 20.7% had hearing consistent with an H-3 profile. Hence, the hearing ability of almost half of these officers was poor enough to conceivably affect their ability to communicate effectively.

In light of these data, as well as the additional data contained in this report, the need is obvious for (1) an Army-wide hearing conservation program (2) the development and utilization of effective ear protection devices, and (3) a long-term prospective study of the incidence of hearing loss among Army personnel.

APPENDIX I

The appendix contains a complete listing of the results for each of the classifications of the 2726 men that were analyzed.

I. RESULTS ACCORDING TO INSTALLATION AND GROUP

A. NEWLY INDUCTED RECRUITS PRIOR TO EXPOSURE TO ANY BASIC TRAINING NOISE (Fort Dix)

Sample Size: 246 Profile: Mean - 1.02 S.D. - 0.15

Percent: H-1 - 97.6% H-2 - 2.4% H-3 - 0.0% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	**250**	**500**	**1000**	**2000**	**4000**	**6000**	**250**	**500**	**1000**	**2000**	**4000**	**6000**
Mean:	**11.0**	**10.1**	**7.3**	**6.5**	**10.5**	**17.6**	**8.5**	**7.3**	**6.9**	**5.6**	**10.3**	**17.0**
S.D.:	**7.0**	**6.1**	**6.9**	**6.7**	**11.2**	**12.7**	**7.2**	**6.4**	**6.7**	**6.4**	**11.7**	**14.3**

B. RECRUITS AT THE END OF BASIC TRAINING (Fort Dix)

Sample Size: 255 Profile: Mean - 1.08 S.D. - 0.32

Percent: H-1 - 93.7% H-2 - 4.7% H-3 - 1.6% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	9.4	9.8	5.9	5.9	12.0	19.0	6.2	6.1	6.1	6.2	14.4	22.3
S.D.:	6.4	5.6	5.9	7.0	13.8	15.4	6.4	6.8	5.6	6.8	13.9	18.4

C. DRILL INSTRUCTOR STUDENTS (Fort Dix)

Sample Size: 32 Profile: Mean - 1.22 S.D. - 0.55

Percent: H-1 - 84.4% H-2 - 9.4% H-3 - 6.2% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	7.0	8.1	6.4	7.3	17.5	23.6	7.3	3.8	4.4	6.3	17.?	24.1
S.D.:	6.3	6.4	7.7	8.1	18.2	22.0	7.8	4.8	6.1	8.3	20.5	22.8

D. **ADVANCED INFANTRY TRAINING STUDENTS AT THE END OF THE COURSE (Fort Benning)**

Sample Size: 99 Profile: Mean - 1.24 S.D. - 0.70

Percent: H-1 - 86.9% H-2 - 6.1% H-3 - 3.0% H-4 - 4.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	12.7	12.8	12.2	13.0	20.3	27.4	12.3	13.8	13.1	14.5	22.1	30.7
S.D.:	7.7	6.5	5.7	7.1	15.5	19.1	7.9	9.2	8.7	11.0	15.1	19.4

E. CAREER INFANTRY PERSONNEL (Fort Benning)

Sample Size: 137 Profile: Mean - 1.96 S.D.: - 1.03

Percent: H-1 - 46.7% H-2 - 19.0% H-3 - 26.3% H-4 - 8.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	16.2	17.1	17.6	22.3	39.8	48.6	14.8	16.7	16.9	21.5	41.7	52.2
S.D.:	13.2	13.9	15.5	20.2	29.3	28.4	13.4	14.3	15.0	19.1	26.5	28.1

F. INFANTRY OFFICER'S CAREER COURSE (Fort Benning)

Sample Size: 110 Profile: Mean - 1.44 S.D. - 0.76

Percent: H-1 - 70.9% H-2 - 16.4% H-3 - 10.9% H-4 - 1.8%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.0	11.4	10.9	11.8	24.6	33.8	9.4	10.9	11.6	13.5	26.9	37.4
S.D.:	7.5	7.9	8.6	9.5	21.5	24.6	6.1	6.7	7.0	10.7	20.4	23.6

G. **ADVANCED TANK CREW STUDENTS AT THE END OF TRAINING (Fort Knox)**

Sample Size: 240 Profile: Mean - 1.21 S.D. - 0.57

Percent: H-1 - 86.7% H-2 - 5.4% H-3 - 7.9% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	**250**	**500**	**1000**	**2000**	**4000**	**6000**	**250**	**500**	**1000**	**2000**	**4000**	**6000**
Mean:	**15.8**	**11.7**	**6.3**	**5.5**	**17.4**	**22.9**	**15.2**	**11.2**	**5.8**	**6.3**	**19.5**	**25.3**
S.D.:	**7.3**	**6.6**	**5.8**	**6.4**	**17.2**	**16.0**	**7.7**	**8.2**	**7.5**	**8.4**	**18.6**	**17.9**

H. CAREER ARMORED PERSONNEL (Fort Knox)

Sample Size: 407 Profile: Mean - 1.78 S.D. - 0.92

Percent: H-1 - 54.1% H-2 - 15.7% H-3 - 28.7% H-4 - 1.5%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.2	14.9	12.0	15.0	38.0	46.6	16.6	14.9	12.4	17.3	40.3	48.9
S.D.:	9.2	9.5	10.8	16.0	27.2	28.7	12.5	13.4	14.4	18.6	27.8	28.5

I. MISCELLANEOUS PERSONNEL (ort Knox)

Sample Size: 120 Profile: Mean - 1.25 S.D. - 0.59

Percent: H-1 - 81.7% H-2 - 10.8% H-3 - 7.5% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.9	13.5	8.7	9.6	19.3	30.0	14.3	11.3	7.7	10.0	22.5	32.9
S.D.:	8.0	7.9	7.8	10.6	16.0	19.3	7.6	6.6	8.4	10.4	22.1	24.9

J. CAREER ARTILLERY PERSONNEL (Fort Sill)

Sample Size: 73 Profile: Mean - 1.78 S.D. - 0.98

Percent: H-1 - 56.2% H-2 - 13.7% H-3 - 26.0% H-4 - 4.1%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.1	16.6	17.4	17.3	37.0	42.9	14.7	11.6	13.4	14.9	33.3	38.6
S.D.:	8.9	10.2	12.9	16.4	29.7	30.2	13.2	12.5	12.0	18.1	33.8	33.6

K. ADVANCED ARTILLERY STUDENTS AT THE END OF THE COURSE (Fort Sill)

Sample Size: 330 Profile: Mean - 1.12 S.D. - 0.45

Percent: H-1 - 92.1% H-2 - 4.3% H-3 - 3.0% H-4 - 0.6%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.9	12.4	10.7	8.6	12.2	17.9	10.8	7.4	8.7	5.9	8.0	12.0
S.D.:	8.7	8.5	8.0	8.2	15.2	17.8	11.7	10.4	10.1	10.5	17.0	20.0

L. STUDENT PILOTS (Fort Rucker)

Sample Size: 228 Profile: Mean - 1.07 S.D. - 0.30

Percent: H-1 - 94.7% H-2 - 4.0% H-3 - 1.3% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.4	10.0	7.5	8.4	11.1	18.2	9.8	9.8	8.5	10.0	13.6	21.4
S.D.:	7.9	7.5	6.1	7.2	12.4	13.6	6.3	6.1	6.0	7.2	12.0	14.4

M. PILOT INSTRUCTORS (Fort Rucker)

Sample Size: 183 Profile: Mean - 1.16 S.D. - 0.50

Percent: H-1 - 89.0% H-2 - 5.5% H-3 - 5.5% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	10.2	8.9	7.0	7.4	15.9	23.2	8.0	7.7	7.0	8.3	18.1	26.5
S.D.:	6.7	5.7	5.6	5.7	17.5	18.5	6.4	6.6	6.8	7.6	17.9	19.9

N. STUDENTS FROM THE COMBAT ARMS ATTENDING COMMAND AND GENERAL STAFF COLLEGE (Fort Leavenworth)

Sample Size: 266 Profile: Mean - 1.63 S.D. - 0.82

Percent: H-1 - 57.9% H-2 - 21.0% H-3 - 20.7% H-4 - 0.4%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	21.0	18.3	8.7	10.0	35.0	45.4	23.3	20.2	10.9	12.6	37.1	44.8
S.D.:	6.3	6.3	6.5	10.2	23.6	27.5	9.0	9.4	10.3	14.8	24.1	26.0

II. RESULTS ACCORDING TO BRANCH

A. INFANTRY

Sample Size: 937 Profile: Mean - 1.31 S.D. - 0.69

Percent: H-1 - 80.1% H-2 - 10.1% H-3 - 8.1% H-4 - 1.7%

Threshold Data

	Right Ear						Left Ear					
Freq:	**250**	**500**	**1000**	**2000**	**4000**	**6000**	**250**	**500**	**1000**	**2000**	**4000**	**6000**
Mean:	**12.4**	**12.2**	**9.3**	**10.0**	**19.7**	**28.0**	**10.6**	**10.3**	**9.4**	**10.5**	**21.9**	**30.0**
S.D.:	**8.9**	**8.6**	**9.6**	**11.8**	**21.5**	**23.3**	**9.6**	**9.7**	**9.4**	**12.5**	**21.8**	**24.7**

B. ARTILLERY

Sample Size: 526 Profile: Mean - 1.30 S.D. - 0.68

Percent: H-1 - 82.1% H-2 - 7.2% H-3 - 9.5% H-4 - 1.2%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.2	13.7	11.2	10.1	19.3	25.9	13.2	10.1	9.8	8.4	16.6	21.6
S.D.:	9.0	9.0	9.1	11.2	22.5	25.3	12.8	11.9	11.0	13.0	24.7	27.0

C. ARMOR

Sample Size: 741 Profile: Mean - 1.51 S.D. - 0.82

Percent: H-1 - 69.5% H-2 - 11.2 H-3 - 18.5% H-4 - 0.8%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	16.1	13.5	9.6	11.2	28.6	36.3	15.7	13.4	10.0	12.9	30.6	38.4
S.D.:	8.5	8.1	8.9	13.1	24.7	26.7	10.7	11.4	12.0	15.7	25.8	26..

D. SIGNAL

Sample Size: 49 Profile: Mean - 1.47 S.D. - 0.77

Percent: H-1 - 69.4% H-2 - 14.3% H-3 - 16.3% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.6	14.9	8.2	9.2	30.5	38.6	17.1	14.6	9.5	11.4	32.1	39.4
S.D.:	7.8	6.7	5.7	8.4	24.5	28.2	8.6	10.0	9.5	13.3	23.9	24.9

E. AVIATION

Sample Size: 275 Profile: Mean - 1.13 S.D. - 0.45

Percent: H-1 - 91.6% H-2 - 4.0% H-3 - 4.4% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.8	10.4	7.9	8.3	15.4	22.1	9.8	9.9	8.0	9.1	16.5	24.8
S.D.:	8.0	7.3	6.5	7.3	17.4	18.1	6.7	6.9	6.9	7.9	16.3	18.8

F. AIRBORNE

Sample Size: 11 Profile: Mean - 1.18 S.D. - 0.60

Percent: H-1 - 90.9% H-2 - 0.0% H-3 - 9.1% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	5.0	7.3	4.1	6.8	13.2	21.4	7.3	2.7	2.7	5.5	16.4	28.6
S.D.:	5.5	4.7	4.4	8.7	19.0	23.7	5.6	2.6	3.4	6.5	26.7	31.2

G. ENGINEER

Sample Size: 50 Profile: Mean - 1.44 S.D. - 0.70

Percent: H-1 - 68.0% H-2 - 20.0 H-3 - 12.0% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	14.9	14.0	6.9	9.1	27.7	34.6	15.7	14.2	9.5	12.8	30.9	37.8
S.D.:	9.8	8.0	5.4	9.8	24.7	25.1	9.9	8.8	9.5	13.6	23.9	25.1

H. OTHER

Sample Size: 137 Profile: Mean - 1.3 S.D. - 0.61

Percent: H-1 - 81.0% H-2 - 11.7% H-3 - 6.6% H-4 - 0.7%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.0	12.3	8.6	9.3	19.5	27.8	13.9	11.5	8.0	10.2	22.1	31.9
S.D.:	7.8	7.9	8.2	9.2	16.2	18.2	8.1	7.6	7.3	9.6	19.5	21.8

III. RESULTS ACCORDING TO LENGTH IN SERVICE

A. 0 - 2 YEARS

Sample Size: 1438 Profile: Mean - 1.12 S.D. - 0.45

Percent: H-1 - 91.8% H-2 - 4.5% H-3 - 3.1% H-4 - 0.6%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	12.8	11.3	8.2	7.6	13.7	20.3	10.7	8.3	7.7	7.3	13.9	20.5
S.D.:	7.9	7.0	7.1	7.5	15.0	16.5	9.0	8.4	7.9	8.9	16.1	18.8

B. 2 - 4 YEARS

Sample Size: 273 Profile: Mean - 1.19 S.D. - 0.54

Percent: H-1 - 87.5% H-2 - 6.2% H-3 - 5.9% H-4 - 0.4%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.2	11.6	8.7	7.9	18.5	26.1	12.1	10.2	7.9	8.6	19.8	29.3
S.D.:	8.8	8.3	8.3	9.0	19.4	20.6	9.3	8.7	8.9	10.0	18.5	21.7

C. 4 - 6 YEARS

Sample Size: 200 Profile: Mean - 1.34 S.D. - 0.71

Percent: H-1 - 79.0% H-2 - 9.0% H-3 - 11.0% H-4 - 1.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.5	10.5	9.3	9.8	20.7	29.6	10.2	10.2	10.0	11.4	23.9	33.0
S.D.:	7.5	6.9	7.8	9.4	20.7	22.3	9.8	10.2	10.2	13.0	22.1	24.7

D. 6 - 8 YEARS

Sample Size: 90 Profile: Mean - 1.56 S.D. - 0.88

Percent: H-1 - 67.8% H-2 - 11.1% H-3 - 18.9% H-4 - 2.2%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	16.9	15.4	11.9	13.7	29.1	40.7	15.1	13.5	11.2	11.8	29.6	41.2
S.D.:	12.4	13.5	13.6	14.5	26.4	31.8	12.5	12.5	11.3	11.8	25.4	28.9

E. 8 - 10 YEARS

Sample Size: 114 Profile: Mean - 1.47 S.D. - 0.77

Percent: H-1 - 69.3% H-2 - 14.0% H-3 - 16.7% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	16.7	15.2	9.4	11.2	28.5	39.1	17.5	16.2	11.2	12.0	31.2	43.6
S.D.:	8.3	8.0	7.4	9.5	22.0	24.8	9.3	9.4	9.9	13.6	22.6	26.0

F. 10 - 15 YEARS

Sample Size: 373 Profile: Mean - 1.65 S.D. - 0.83

Percent: H-1 - 57.0% H-2 - 22.0% H-3 - 20.1% H-4 - 0.9%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.6	15.8	10.6	12.8	33.8	42.9	17.7	16.5	11.4	15.0	36.2	43.4
S.D.:	8.6	8.0	8.7	13.4	24.5	26.5	11.6	11.2	11.0	16.4	25.2	26.5

G. 15 - 20 YEARS

Sample Size: 218 Profile: Mean - 2.11 S.D. - 0.94

Percent: H-1 - 34.8% H-2 - 23.9% H-3 - 37.2% H-4 - 4.1%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	18.0	16.7	14.1	19.2	47.6	55.1	17.2	16.0	14.5	21.2	49.3	55.7
S.D.:	10.4	10.7	13.1	18.3	27.6	29.2	12.7	13.3	15.1	19.3	28.2	29.4

H. 20 - 25 YEARS

Sample Size: 55 Profile: Mean - 2.33 S.D. - 0.94

Percent: H-1 - 27.3% H-2 - 18.2% H-3 - 49.1% H-4 - 5.4%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	18.0	18.0	18.1	24.6	53.1	62.0	17.5	18.6	17.4	27.4	55.5	62.4
S.D.:	11.4	13.5	16.0	23.4	26.7	29.1	15.3	16.6	17.9	23.0	28.2	27.1

I. 25 - 30 YEARS

Sample Size: 15 Profile: Mean - 2.33 S.D. - 1.05

Percent: H-1 - 33.3% H-2 - 6.7% H-3 - 53.3% H-4 - 6.7%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.3	18.7	16.3	21.3	49.7	56.7	20.7	22.0	19.7	22.3	58.7	64.3
S.D.:	10.7	11.0	11.3	16.4	26.3	29.1	14.5	15.3	16.0	14.5	29.1	29.0

IV. RESULTS ACCORDING TO AGE

A. 16 - 20 YEARS

Sample Size: 928 Profile: Mean - 1.14 S.D. - 0.47

Percent: H-1 - 91.3% H-2 - 4.4% H-3 - 3.8% H-4 - 0.5%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.0	11.7	8.7	7.9	14.4	21.2	10.8	8.9	8.2	7.4	14.4	21.6
S.D.:	8.4	7.4	7.7	8.0	15.9	17.3	9.4	9.0	8.5	9.4	16.8	20.0

B. 21 - 25 YEARS

Sample Size: 868 Profile: Mean - 1.16 S.D. - 0.51

Percent: H-1 - 89.6% H-2 - 5.3% H-3 - 4.5% H-4 - 0.6%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	12.8	11.1	8.8	7.8	15.1	22.5	11.2	9.4	7.7	8.3	16.3	23.6
S.D.:	7.5	7.0	7.1	7.9	16.3	18.0	8.9	8.6	8.2	9.5	17.5	20.2

C. 26 - 30 YEARS

Sample Size: 281 Profile: Mean - 1.46 S.D. - 0.78

Percent: H-1 - 71.2% H-2 - 13.5% H-3 - 13.9% H-4 - 1.4%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.1	12.0	10.3	11.8	25.2	34.3	11.2	10.9	10.5	12.6	27.0	37.5
S.D.:	10.0	10.1	10.8	12.1	23.7	27.1	10.3	10.4	11.1	14.4	23.7	26.6

D. 31 - 35 YEARS

Sample Size: 307 Profile: Mean - 1.64 S.D. - 0.84

Percent: H-1 - 59.0% H-2 - 18.2% H-3 - 22.1% H-4 - 0.7%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.5	15.8	9.8	12.2	33.4	41.9	17.7	16.2	10.2	13.3	36.0	42.9
S.D.:	8.7	8.0	7.4	12.3	24.5	27.1	10.1	9.2	8.3	14.0	25.7	27.3

E. 36 - 40 YEARS

Sample Size: 247 Profile: Mean - 1.94 S.D. - 0.93

Percent: H-1 - 42.5% H-2 - 24.3% H-3 - 29.6% H-4 - 3.6%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	19.6	17.4	13.2	17.5	45.2	54.9	19.4	18.1	14.6	20.3	46.4	54.5
S.D.:	9.8	10.4	12.4	18.3	27.1	28.1	13.0	13.6	14.8	19.5	26.8	28.4

F. 41 - 45 YEARS

Sample Size: 69 Profile: Mean - 2.28 S.D. - 0.89

Percent: H-1 - 27.5% H-2 - 18.9% H-3 - 52.2% H-4 - 1.4%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.8	16.2	16.4	22.0	50.6	57.9	17.8	17.6	17.2	24.3	55.6	60.7
S.D.:	9.3	11.1	13.8	20.3	27.5	29.9	16.7	18.3	20.4	23.8	30.0	29.1

G. 46 - 50 YEARS

Sample Size: 18 Profile: Mean - 2.72 S.D. - 1.11

Percent: H-1 - 33.3% H-2 - 27.8% H-3 - 22.2% H-4 - 16.7%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	18.6	18.3	21.4	25.0	46.7	47.5	15.3	15.8	16.7	21.1	41.9	48.6
S.D.:	12.1	12.8	16.6	22.6	24.9	24.0	11.4	11.0	13.3	14.4	21.1	25.3

H. 51 - 55 YEARS

Sample Size: 7 Profile: Mean - 2.57 S.D. - 0.79

Percent: H-1 - 14.3% H-2 - 14.3% H-3 - 71.4% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	17.2	20.0	13.6	21.4	55.7	62.9	20.0	20.0	16.4	24.3	68.6	71.4
S.D.:	9.9	10.0	7.5	6.9	21.9	27.1	8.7	6.4	8.5	10.6	24.1	19.7

V. RESULTS ACCORDING TO LENGTH OF TIME IN SERVICE WITHIN EACH BRANCH

A. INFANTRY

1. UNDER 4 YEARS

Sample Size: 610 Profile: Mean - 1.10 S.D. - 0.41

Percent: H-1 - 93.1% H-2 - 4.6% H-3 - 1.5% H-4 - 0.8%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.0	10.7	7.5	7.3	12.6	20.1	8.2	7.6	7.4	7.4	14.1	21.8
S.D.:	7.8	7.1	7.6	8.5	14.6	16.6	7.9	7.8	7.6	8.8	14.9	18.9

2. 4 - 10 YEARS

Sample Size: 149 Profile: Mean - 1.57 S.D. - 0.87

Percent: H-1 - 65.8% H-2 - 14.1% H-3 - 17.4% H-4 - 2.7%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.9	14.0	12.0	13.3	28.4	38.5	13.5	13.9	12.5	13.5	30.7	42.1
S.D.:	10.1	11.1	12.0	13.3	24.2	26.4	11.4	11.9	11.7	14.2	23.4	26.0

3. OVER 10 YEARS

Sample Size: 178 Profile: Mean - 1.84 S.D. - 0.92

Percent: H-1 - 47.2% H-2 - 25.8% H-3 - 23.0% H-4 - 4.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	16.3	16.0	13.3	16.6	37.0	46.5	16.4	16.5	13.6	18.7	41.1	48.0
S.D.:	9.8	9.6	11.4	16.3	26.1	26.3	10.4	9.9	10.6	16.7	25.4	27.5

B. ARTILLERY

1. UNDER 4 YEARS

Sample Size: 374 Profile: Mean - 1.14 S.D. - 0.49

Percent: H-1 - 91.2% H-2 - 4.5% H-3 - 3.5% H-4 - 0.8%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.8	12.3	10.6	8.7	13.0	18.6	10.9	7.6	8.7	6.1	8.7	13.2
S.D.:	8.6	8.5	8.2	8.3	16.3	18.2	11.6	10.3	10.0	10.3	17.1	20.2

2. 4 - 10 YEARS

Sample Size: 58 Profile: Mean - 1.36 S.D. - 0.74

Percent: H-1 - 79.3% H-2 - 5.2% H-3 - 15.5% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.7	13.9	9.9	10.3	25.0	33.6	15.3	12.4	9.3	8.4	24.7	32.6
S.D.:	8.3	8.1	7.9	9.8	24.7	31.4	10.3	8.4	7.4	6.8	24.0	26.8

3. OVER 10 YEARS

Sample Size: 94 Profile: Mean - 1.88 S.D. - 0.95

Percent: H-1 - 47.9% H-2 - 19.1% H-3 - 29.8% H-4 - 3.2%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	20.9	19.1	14.2	15.5	40.9	50.0	20.9	18.9	14.4	17.2	42.8	48.5
S.D.:	8.6	9.6	12.4	18.3	27.6	29.2	15.1	15.0	14.9	20.0	30.5	30.9

C. ARMOR

1. UNDER 4 YEARS

Sample Size: 441 Profile: Mean - 1.22 S.D. - 0.58

Percent: H-1 - 86.0% H-2 - 6.1% H-3 - 7.7% H-4 - 0.2%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.1	12.0	7.7	7.2	19.3	25.5	14.6	11.6	7.5	8.2	21.0	28.3
S.D.:	7.6	6.6	6.2	7.0	18.1	18.0	8.1	8.3	8.0	9.2	18.4	19.4

2. 4 - 10 YEARS

Sample Size: 85 Profile: Mean - 1.51 S.D. - 0.78

Percent: H-1 - 67.1% H-2 - 15.3% H-3 - 17.6% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.3	13.2	9.8	10.6	27.7	39.3	14.9	13.5	11.6	12.8	31.6	44.6
S.D.:	7.9	7.1	7.1	9.4	21.7	24.7	12.3	12.9	12.8	15.7	23.6	28.1

3. OVER 10 YEARS

Sample Size: 215 Profile: Mean - 2.09 S.D. - 0.93

Percent: H-1 - 36.7% H-2 - 20.0% H-3 - 40.9% H-4 - 2.3%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	18.6	16.7	13.6	19.6	47.9	57.4	18.3	17.1	14.4	22.5	49.8	56.5
S.D.:	9.9	10.2	12.3	18.8	27.2	29.6	13.9	14.8	16.3	21.1	28.7	29.0

D. AVIATION

1. UNDER 4 YEARS

Sample Size: 166 Profile: Mean - 1.02 S.D. - 0.17

Percent: H-1 - 98.8% H-2 - 0.6% H-3 - 0.6% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	11.1	9.9	7.3	7.0	10.6	17.4	9.6	9.7	7.9	8.5	12.2	19.3
S.D.:	6.7	6.5	5.6	5.7	10.9	14.3	6.0	6.5	6.6	7.3	10.4	13.4

2. 4 - 10 YEARS

Sample Size: 66 Profile: Mean - 1.15 S.D. - 0.50

Percent: H-1 - 90.9% H-2 - 3.0% H-3 - 6.1% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	12.4	10.5	8.0	9.8	17.7	27.0	9.2	9.0	7.1	9.2	18.0	28.6
S.D.:	10.2	9.2	7.4	9.1	19.5	20.0	7.1	6.7	5.8	8.7	18.0	21.9

3. OVER 10 YEARS

Sample Size: 43 Profile: Mean - 1.51 S.D. - 0.77

Percent: H-1 - 65.1% H-2 - 18.6% H-3 - 16.3% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	13.4	12.0	9.8	11.0	30.7	32.8	11.5	12.1	9.8	11.2	31.0	27..
S.D.:	8.4	7.3	8.0	8.6	23.9	21.5	8.5	8.3	8.9	8.6	22.5	24

E. SIGNAL

1. UNDER 4 YEARS

Sample Size: 17 Profile: Mean - 1.24 S.D. - 0.56

Percent: H-1 - 82.3% H-2 - 11.8% H-3 - 5.9% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	14.7	12.4	8.2	7.9	21.8	28.8	11.1	7.6	5.9	10.0	26.5	33.5
S.D.:	7.2	5.6	5.3	6.6	17.2	15.9	6.5	4.0	5.1	7.9	19.4	18.9

2. 4 - 10 YEARS

Sample Size: 9 Profile: Mean - 1.22 S.D. - 0.67

Percent: H-1 - 82.3% H-2 - 11.8% H-3 - 5.9% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	20.0	16.1	6.7	9.4	19.4	32.2	18.9	18.9	14.4	11.1	17.8	32.2
S.D.:	9.4	8.2	3.5	7.7	21.2	31.7	7.8	9.3	11.3	12.7	19.1	31.5

3. OVER 10 YEARS

Sample Size: 23 Profile: Mean - 1.74 S.D. - 0.86

Percent: H-1 - 52.2% H-2 - 21.7% H-3 - 26.1% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	18.7	16.3	8.7	10.0	41.3	48.3	20.9	18.0	10.2	12.6	42.0	46.5
S.D.:	7.4	6.4	7.1	9.9	26.4	31.6	8.1	10.8	10.6	16.6	25.1	25.2

F. ENGINEER

1. UNDER 4 YEARS

Sample Size: 9 Profile: Mean - 1.00 S.D. - 0.00

Percent: H-1 - 100% H-2 - 0.0% H-3 - 0.0% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	8.3	11.1	6.1	8.3	16.7	26.1	16.0	9.4	9.4	11.1	24.4	24.4
S.D.:	10.0	8.6	5.5	7.5	8.3	17.3	9.4	8.8	8.1	10.2	12.1	14.6

2. 4 - 10 YEARS

Sample Size: 20 Profile: Mean - 1.45 S.D. - 0.76

Percent: H-1 - 70.0% H-2 - 15.0% H-3 - 15.0% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	15.8	12.8	6.3	8.3	21.5	29.0	16.0	13.5	8.8	14.5	31.5	35.8
S.D.:	9.2	8.0	4.8	6.7	21.9	22.3	11.4	10.1	9.0	15.2	28.8	25.3

3. OVER 10 YEARS

Sample Size: 21 Profile: Mean - 1.62 S.D. - 0.74

Percent: H-1 - 52.4% H-2 - 33.3% H-3 - 14.3% H-4 - 0.0%

Threshold Data

	Right Ear						Left Ear					
Freq:	250	500	1000	2000	4000	6000	250	500	1000	2000	4000	6000
Mean:	16.9	16.4	7.9	10.2	38.3	43.6	17.9	16.9	10.2	11.9	33.1	45.5
S.D.:	9.4	7.3	6.0	12.9	28.3	28.5	8.0	6.6	12.6	13.7	23.1	27.2

APPENDIX II

Listing of Test Team Personnel

and Sites Visited

TEAM #1	SITES
SEDGE, Roy K., CPT, MSC (Team Leader) Brooke General Hospital	Fort Benning and Fort Rucker
WALDEN, Brian E., CPT, MSC Army Audiology and Speech Center Walter Reed General Hospital	
GRIMES, William H., SFC Brooke General Hospital	

TEAM #2	SITES
WORTHINGTON, Don W., CPT, MSC (Team Leader) Army Audiology and Speech Center Walter Reed General Hospital	Fort Knox and Fort Leavenworth
SCHUCHMAN, Gerald I., CPT, MSC Army Audiology and Speech Center Walter Reed General Hospital	
ULIKOWSKI, George J., SFC Walter Reed General Hospital	

TEAM #3	SITES
BEARCE, Gerald R., CPT, MSC (Team Leader) US Environmental Hygiene Agency Edgewood Arsenal	Fort Dix and Fort Sill
GOLDSTEIN, Jeffrey I., 1LT, MSC US Environmental Hygiene Agency Edgewood Arsenal	
FRANKS, John R., SP5 Army Audiology and Speech Center Walter Reed General Hospital	