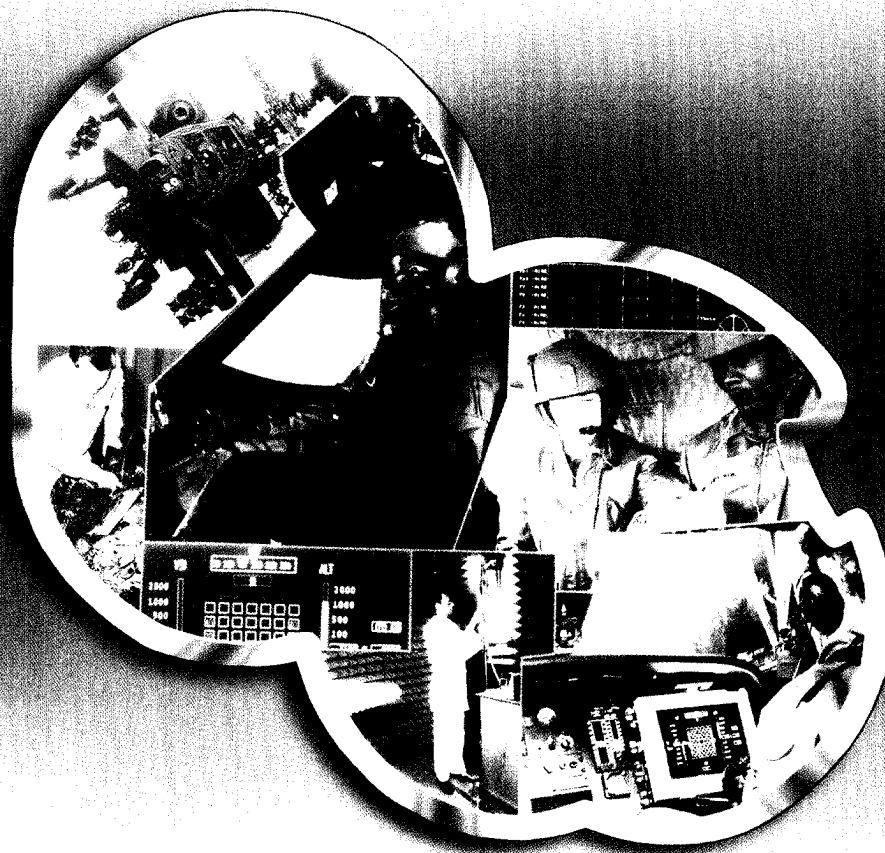


USAARL Report No. 2002-06

Noise Protection of the HGU-56/P Aircrew Integrated Helmet System Worn With Eyeglasses

by William A. Ahroon, Elmarce Gordon, and Dale A. Ostler



Aircrew Protection Division

January 2002

Approved for public release, distribution unlimited.

20020205 050

U.S. Army
Medical Research
Laboratory

Notice

Qualified requesters

Qualified requesters may obtain copies from the Defense Technical Information Center (DTIC), Cameron Station, Alexandria, Virginia 22314. Orders will be expedited if placed through the librarian or other person designated to request documents from DTIC.

Change of address

Organizations receiving reports from the U.S. Army Aeromedical Research Laboratory on automatic mailing lists should confirm correct address when corresponding about Laboratory reports.

Disposition

Destroy this document when it is no longer needed. Do not return it to the originator.

Disclaimer

The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation. Citation of trade names in this report does not constitute an official Department of the Army endorsement or approval of the use of such commercial items.

Human use

Human subjects participated in these studies after giving their free and informed voluntary consent. Investigators adhered to AR 70-25 and USAMRMC Regulation 70-25 on Use of Volunteers in Research.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release, distribution unlimited		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) USAARL Report No. 2002-06			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Aeromedical Research Laboratory		6b. OFFICE SYMBOL (If applicable) MCMR-UAD		7a. NAME OF MONITORING ORGANIZATION U.S. Army Medical Research and Materiel Command	
6c. ADDRESS (City, State, and ZIP Code) P.O. Box 620577 Fort Rucker, AL 36362-0577			7b. ADDRESS (City, State, and ZIP Code) 504 Scott Street Fort Detrick, MD 21702-5012		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO. FT
11. TITLE (Include Security Classification) Noise Protection of the HGU-56/P Aircrew Integrated Helmet System Worn With Eyeglasses (U)					
12. PERSONAL AUTHOR(S) William A. Ahroon, Elmaree Gordon, Dale A. Ostler					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM TO		14. DATE OF REPORT (Year, Month, Day) 2002 January	
				15. PAGE COUNT 41	
16. SUPPLEMENTAL NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) noise, noise protection, hearing, eyeglasses		
FIELD	GROUP	SUB-GROUP			
19. ABSTRACT (Continue on reverse if necessary and identify by block number) The use of ancillary devices such as eyeglasses with a sound attenuating helmet can reduce the effectiveness of the helmet to protect the user from hazardous noise exposures. Three different eyeglass frame types (bayonet, cable, skull) were tested and the insertion loss (sound reduction) of the HGU-56/P Aircrew Integrated Helmet System (AIHS) worn with the frames was measured across the frequency range from 25 Hz to 20 kHz. All three types of eyeglass frames reduced the effectiveness of the AIHS to protect the wearer from noise exposure. While the limits on operational capabilities resulting from the use of cable- or skull-style eyeglass frames were minimal, the bayonet-style frames can reduce by more than half the maximum allowable time in which an individual may be exposed to high-levels of environmental noise without the added protection of insert earplugs. It is recommended that earplugs be used when bayonet-style eyeglass frames are worn with the HGU-56/P AIHS.					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL Chief, Science Support Center			22b. TELEPHONE (Include Area Code) (334) 255-6907		22c. OFFICE SYMBOL MCMR-UAX-SS

Table of contents

	<u>Page</u>
Introduction.....	1
Method	1
Results.....	4
Discussion.....	8
Conclusions.....	10
References.....	11
Appendices.....	13
A. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn without eyeglass frames measured IAW ANSI S12.42-1995.....	15
B. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with bayonet-style temples measured IAW ANSI S12.42- 1995.....	19
C. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle bayonet-style temples measured IAW ANSI S12.42-1995.....	23
D. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with cable-style temples measured IAW ANSI S12.42-1995	27
E. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle with cable-style temples measured IAW ANSI S12.42-1995.....	31
F. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with skull-style temples measured IAW ANSI S12.42-1995	35
G. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Air Force IAS with skull-style temples measured IAW ANSI S12.42- 1995.....	39

Table of contents (continued)

Page

List of figures

1. Gentex HGU-56/P AIHS	1
2. Eyeglass frames used in this protocol	2
3. Schematic representation of the equipment used for microphone-in-real-ear test	3
4. Mean insertion loss values (in dB) for the left and right ears of subjects wearing the HGU-56/P AIHS and different style eyeglass frames	5
5. Mean insertion loss values (in dB) for the left and right ears of subjects wearing the HGU-56/P AIHS and three different types of eyeglass frames	7
6. Mean difference in insertion loss values (in dB) between the HGU-56/P AIHS and the AIHS worn with the three different types of eyeglass frames	9

List of tables

1. Analysis of variance summary table for the bayonet-style eyeglass frames	6
2. Analysis of variance summary table for the cable-style eyeglass frames	6
3. Analysis of variance summary table for the skull-style eyeglass frames	6
4. Analysis of variance summary table for all eyeglass frames collapsed across test ear	9

Introduction

The HGU-56/P Aircrew Integrated Helmet System (AIHS) (Figure 1) is designed to provide impact protection and noise attenuation to U.S. Army rotary-wing aircraft crewmembers. It has replaced the 1980's vintage SPH-4B flight helmet and is used by most U.S. Army rotary-wing aircrew flying aircraft other than the AH-64 Apache (which uses a different helmet system). The ability of any helmet to attenuate environmental noise depends on an adequate seal between the earcup and the user's head. Any object or practice that interferes with the seal between the earcup and the head will compromise both helmet retention (with resultant effects on impact protection) and noise attenuation.

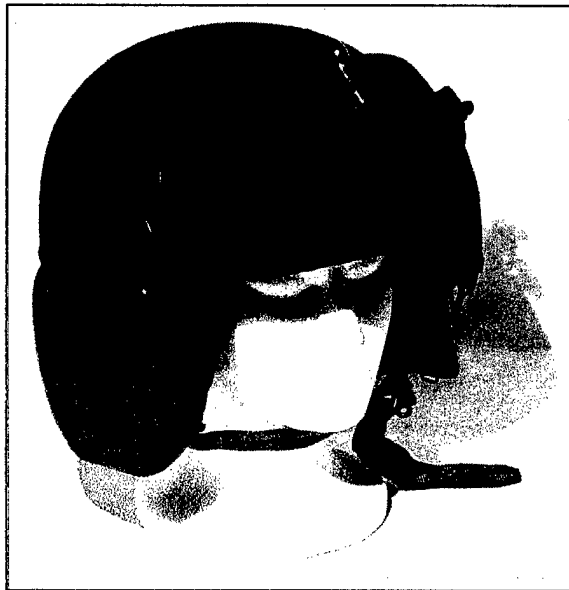


Figure 1. Gentex HGU-56/P AIHS.

Several investigations report that the use of eyeglasses can negatively affect the noise attenuation of an aviator's helmet (Mozo et al., 1974; Nixon and Knoblach, 1974; and Mozo and Murphy, 1997). This paper describes the noise attenuation of the HGU-56/P AIHS when used with six different eyeglass frames, using three different styles of temple pieces: bayonet-style, cable-style, and skull-style (see Figure 2 below).

Method

Testing was performed in accordance with (IAW) the American National Standard Microphone-in-Real-Ear and Acoustic Test Fixture Methods for the Measurement of Insertion Loss of Circumaural Hearing Protection Devices (ANSI S12.42-1995), Microphone-in-Real Ear (MIRE) method. Using miniature microphones positioned at the entrance to the ear canals, noise

levels were measured with and without the HGU-56/P AIHS in place. The difference in the two measurements provided a physical measure of the performance (insertion loss) of the device.

Subjects

Ten subjects (8 male, 2 female) recruited from U.S. Army Aeromedical Research Laboratory (USAARL) personnel were used. The purpose of the study was explained to each subject. Each subject read and signed an informed consent form and then completed a questionnaire regarding his/her hearing health. An otoscopic examination was performed and audiograms were collected on each subject before and after MIRE testing. At any time during this preliminary process, if a subject failed to qualify for ANSI S12.42 MIRE testing, he/she was released. No subjects failed to qualify for the study. Although subjects were permitted to withdraw from the study at any time, no subjects chose to withdraw from the study.

Devices tested

Six different eyeglass frames were tested. Each frame was individually fitted to each subject by an optical laboratory technician¹. The frames, shown in Figure 2, worn with the HGU-56/P AIHS were: Army HGU-4/P aviator spectacle with bayonet-style temples, Army HGU-4/P aviator spectacle with cable-style temples, Air Force Improved Aircrew Spectacle (IAS) with skull-style temples, Navy Flight Goggle (FG) with bayonet-style temples, Navy FG with cable-style temples, and Navy FG with skull-style temples. The order of testing of the frames was randomized. The insertion loss of the HGU-56/P AIHS was also measured when worn without eyeglass frames.

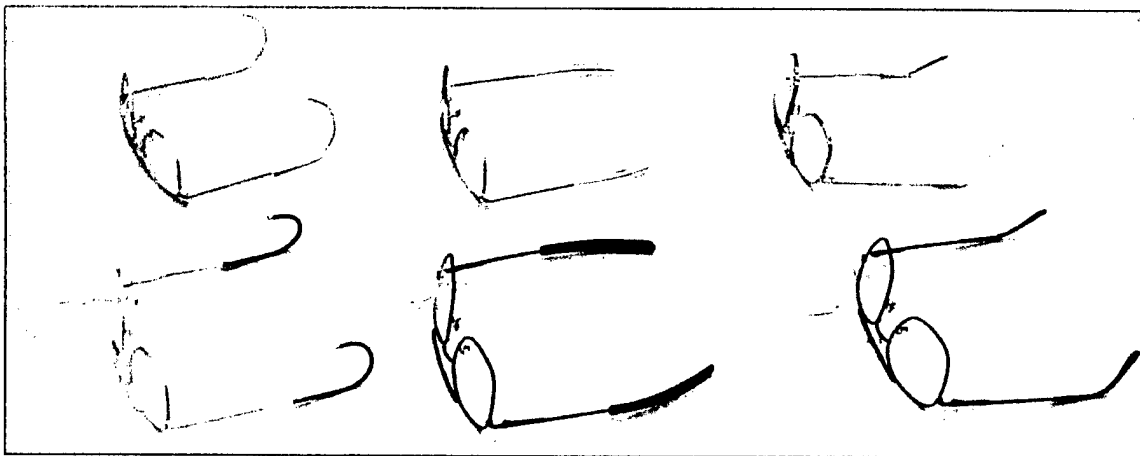


Figure 2. Eyeglass frames used in this protocol. Top row (left to right): HGU-4/P with cable-style temples, HGU-4/P with bayonet-style temples, IAS with skull-style temples. Bottom row (left to right): FG with cable-style temples, FG with bayonet-style temples, and FG with skull-style temples.

¹ We acknowledge the contributions of SSG Rafael Rodriguez in the conduct of this study.

Equipment

The MIRE test procedure utilized Knowles Model 1832 electret microphones, a Larson-Davis Model 3100 Real Time Analyzer (RTA), an Altec Model 1594 Power Amplifier, and three Altec Model 612C speakers. Figure 3 presents a schematic of the experimental setup: The sound field created by the system described satisfied the stimulus conditions mandated by ANSI S12.42-1995. Control of the test procedure was performed by a general-purpose computer running custom software developed at USAARL. The software directed the RTA to turn on and off a wide-band noise field and to retrieve the one-third octave band data from the RTA.

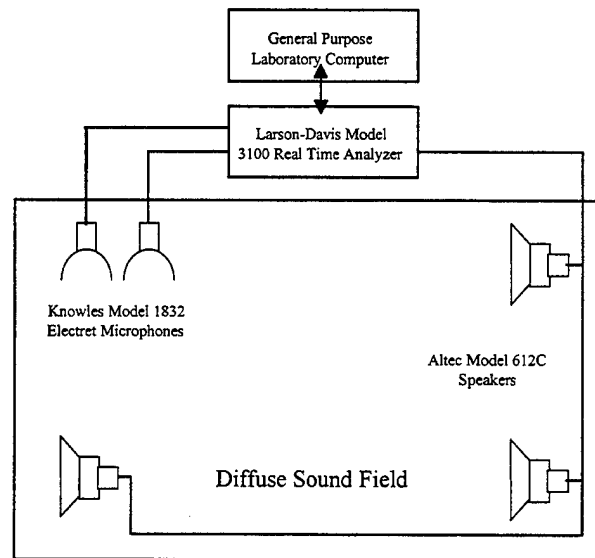


Figure 3. Schematic representation of the equipment used for microphone-in-real-ear test.

Procedure

At the start of a test session, each subject was fitted with silicone moldable earplugs (Flents Products, Silaflex™ No. 901), which served both as a hearing protector and a convenient medium for mounting the microphone. The subject was then seated in a hard-walled (reverberant) sound room. A non-directional sound field of wideband noise at approximately 105 dBA sound pressure level (SPL) was presented and unoccluded reference data were collected. To obtain these data, the noise signal was measured by the microphones in the subject's ears, the RTA performed the two-channel third-octave band analysis, and the results were retrieved from the RTA and stored by the computer for later analysis. Thirty third-octave bands with center frequencies from 25 Hz to 20,000 Hz were used. The sound field was then turned off and the subject donned the HGU-56/P AIHS with the selected eyeglass frames. The sound field again was turned on and the noise signal was measured, analyzed, and stored in a like manner. The noise was measured, analyzed, and results stored after the subject doffed and donned the helmet and eyeglass frames two additional times, thus providing three measures of unoccluded and three

measures of occluded noise levels for each subject. The algebraic difference between the mean of the three open and three occluded measurements for each one-third-octave band was defined as the insertion loss of the device IAW ANSI S12.42-1995.

The total noise exposure for each subject was approximately 6 minutes for the entire experiment. For the unprotected ear, Department of Defense (DOD_ Instruction 6055.12, "Hearing Conservation," limits allowable exposure time for a single 24-hour period for 105 dBA SPL (e.g., A-weighted SPL) to 32 minutes. The moldable earplug used in the measurement extended the maximum allowable exposure time to more than 16 hours. Thus, the subjects' hearing was not considered at risk from the noise exposures encountered during this experiment.

A head-positioning device consisting of a string suspended from the test booth ceiling down to a level approximately equal to the elevation of a subject's nose was used to maintain the subject's head at the stimulus reference point, the point where stimulus calibration was performed. During testing, subjects were observed over a closed-circuit television and notes made regarding correct use of the eyeglass frames and helmet.

Statistical analyses were performed using STATISTICA[®] Release 5 from StatSoft[®], Inc. The probability of a Type I error was set at 0.05 for all analyses.

Results

The insertion losses for the left and right ears of the HGU-56/P AIHS worn with the six different styles of eyeglass frames are illustrated in Figure 4. Three-way repeated measures analyses of variance with repeated measures on all factors (Ear $\times$ Frame $\times$ Frequency) were performed on the mean insertion losses within each frame style. Analysis of variance summary tables are presented in Tables 1-3. There were no statistically significant main effects of test ear or frame (HGU-4/P, IAS, FG) for any of the three analyses. There were statistically significant main effects of frequency in all three analyses, which is expected based on our knowledge of the frequency-specific noise attenuation of the HGU-56/P AIHS. There also were statistically significant interactions of test ear and frequency for the bayonet and cable frame types, indicating that there was an effect of ear for these type frames, but that effect was dependent on the third-octave band center frequency. To illustrate these differences, the mean left and right ear insertion loss of the AIHS when worn with the three frame types are presented in Figure 5. Duncan's multiple-range² post-hoc analyses revealed that, for the bayonet and cable frame types, the statistically significant interactions were the result of significantly greater insertion loss in the left ear for the three third-octave bands with center frequencies below 50 Hz. While the Ear $\times$ Frequency interaction for the skull-style eyeglass frames was not statistically significant, a similar post-hoc analysis of the skull-style frame left-right ear insertion loss data revealed statistically significant differences at the 25 Hz and 12,500 Hz third-octave band center-frequency test regions. We concluded that, while there were selected statistically significant differences in the insertion losses between the two ears at the extremely low third-octave band

² The Duncan's multiple-range test was used for post-hoc comparisons because only a limited set of comparisons, those between mean insertion loss at the same frequencies, were of interest in these analyses (see Keppel, 1973).

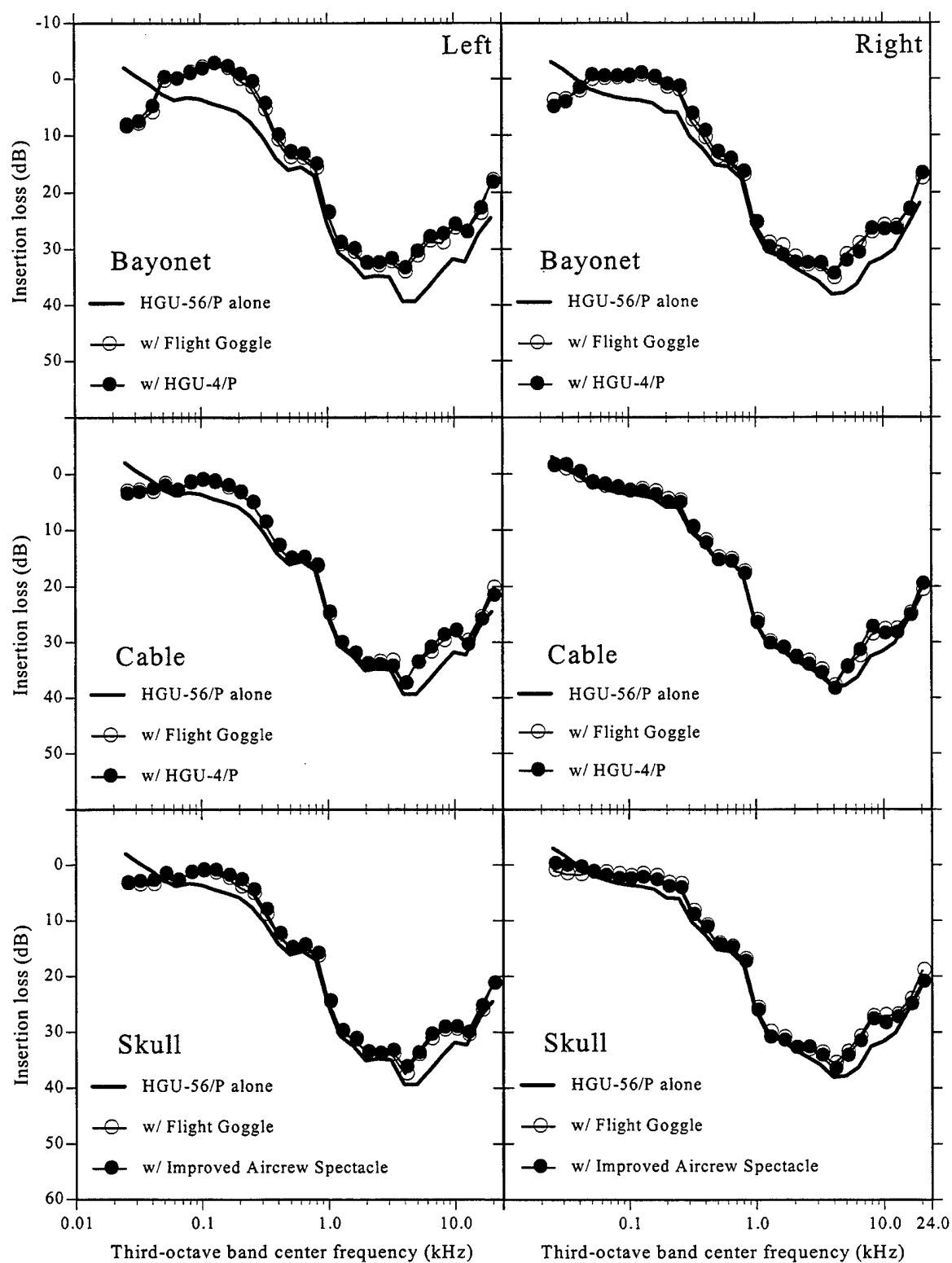


Figure 4. Mean insertion loss values (in dB) for the left and right ears of subjects wearing the HGU-56/P AIHS and different style eyeglass frames.

Table 1.

Analysis of variance summary table for the bayonet-style eyeglass frames.

Effect	<i>df</i> Effect	<i>MS</i> Effect	<i>df</i> Error	<i>MS</i> Error	<i>F</i>	<i>p</i>
Ear	1	2.944	9	131.8017	.0223	.884498
Frame	1	26.235	9	17.2761	1.5186	.249054
Frequency	29	6945.542	261	48.1365	144.2886	.000000
Ear × Frame	1	13.223	9	14.1169	.9367	.358421
Ear × Frequency	29	25.427	261	11.0905	2.2927	.000326
Frame × Frequency	29	2.290	261	2.3505	.9744	.507689
Ear × Frame × Frequency	29	1.749	261	1.7315	1.0101	.456149

Table 2.

Analysis of variance summary table for the cable-style eyeglass frames.

Effect	<i>df</i> Effect	<i>MS</i> Effect	<i>df</i> Error	<i>MS</i> Error	<i>F</i>	<i>p</i>
Ear	1	7.275	9	71.39978	.1019	.756859
Frame	1	1.802	9	18.24541	.0988	.760488
Frequency	29	7173.900	261	49.65783	144.4666	.000000
Ear × Frame	1	.026	9	14.84254	.0018	.967252
Ear × Frequency	29	27.895	261	9.62202	2.8991	.000004
Frame × Frequency	29	1.670	261	3.01198	.5545	.970690
Ear × Frame × Frequency	29	1.073	261	1.98879	.5394	.975901

Table 3.

Analysis of variance summary table for the skull-style eyeglass frames.

Effect	<i>df</i> Effect	<i>MS</i> Effect	<i>df</i> Error	<i>MS</i> Error	<i>F</i>	<i>p</i>
Ear	1	90.146	9	180.8641	.4984	.498062
Frame	1	.001	9	17.0004	.0001	.993299
Frequency	29	7044.092	261	55.6331	126.6170	.000000
Ear × Frame	1	50.307	9	15.8787	3.1682	.108785
Ear × Frequency	29	14.690	261	12.5827	1.1675	.260044
Frame × Frequency	29	1.707	261	2.1736	.7851	.779263
Ear × Frame × Frequency	29	1.683	261	1.1578	1.4533	.068218

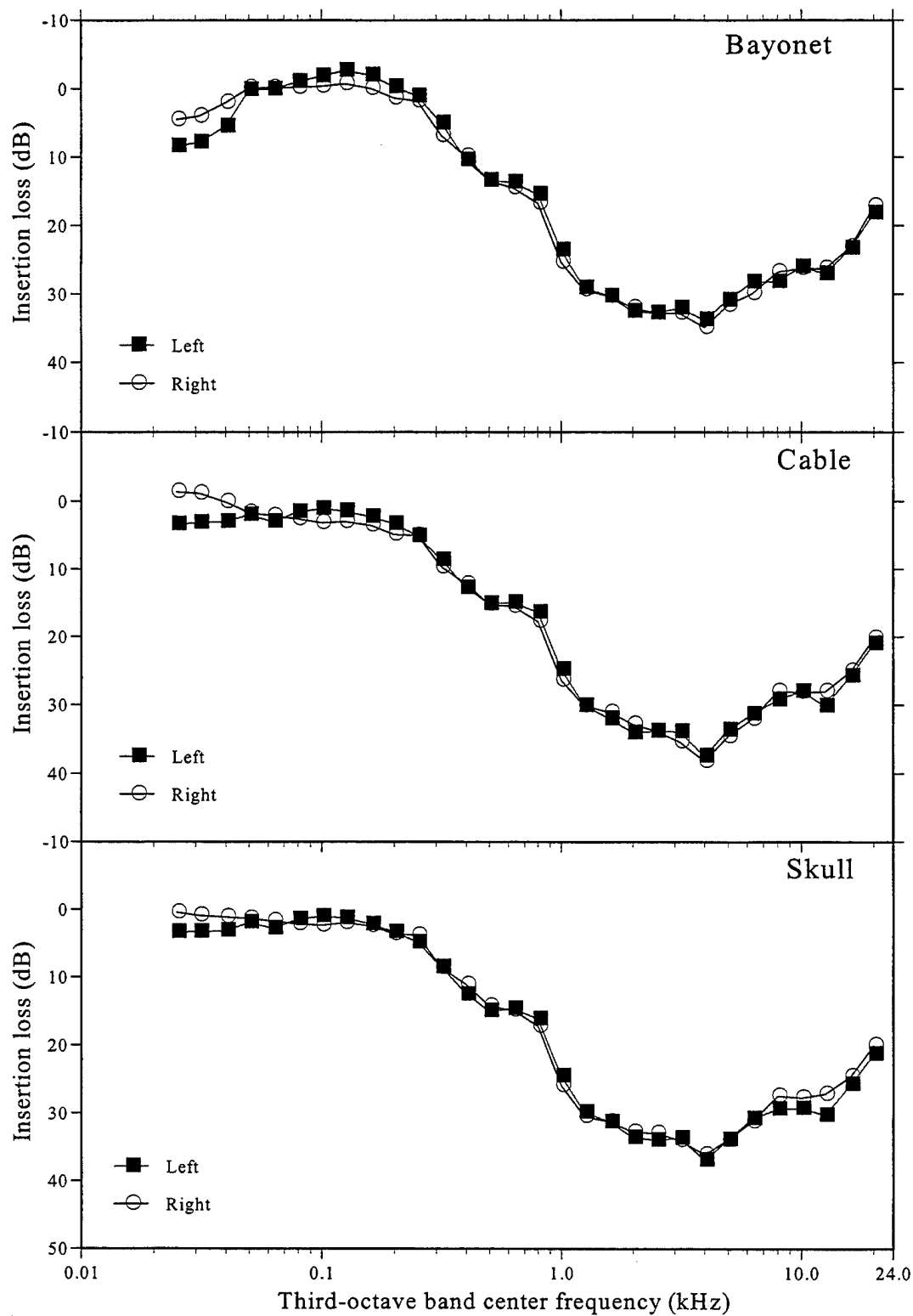


Figure 5. Mean insertion loss values (in dB) for the left and right ears of subjects wearing the HGU-56/P AIHS and three different types of eyeglass frames.

center-frequency test regions, these differences were not appreciable and would not affect decisions regarding the operational use of these devices.

Of particular interest are the differences between the three styles of eyeglass frames. These differences can be best visualized by comparing the difference between the insertion loss of the HGU-56/P AIHS worn without the eyeglass frames and the insertion loss of the helmet when worn with the different frames. Such differences are illustrated in Figure 6. It is clear that the use of each type of eyeglass frame degrades the sound protection provided by the HGU-56/P AIHS. Table 4 presents the summary table for a two-way analysis of variance with repeated measures on both factors. In this analysis, data were collapsed across ear and frame type such that, for each subject, the three dependent variables were the mean of the left and right insertion losses for the two bayonet-, two cable-, and two skull-style eyeglass frames. Duncan multiple-range post-hoc comparisons of the means revealed no statistically significant differences in mean insertion losses between the cable- and skull-style eyeglass frames. The post-hoc comparisons did reveal differences between the mean insertion losses when wearing bayonet-style frames and when wearing the other two types of frames. The bars on the lower portion of Figure 6 indicate the statistically significant results of these comparisons. Thus, the use of the bayonet-style eyeglass frame with the HGU-56/P AIHS results in less noise protection than if the helmet is worn with the other types of frames through most of the frequency region except approximately 600 Hz to 2,500 Hz and at 8,000 Hz. Certainly head anthropometry and spectacle size will affect the AIHS noise protection, although it is likely that bayonet-style frames will impact the noise protection more than the other frame styles in most (if not all) cases.

Each of the eyeglass frames appears to improve the insertion loss of the HGU-56/P AIHS at the extreme lowest third-octave band center frequencies. One explanation for this result is that the normal acoustic pressures caused by reverberation of the earcup at very low frequencies is reduced as the eyeglass frame compromises the tight seal between the helmet earcup and the head. At very low frequencies, this reverberation is an important contributor to the noise measured at the ear canal, while at higher frequencies, earcup reverberation is quite minor and does not contribute to the acoustic energy inside of the earcup. It is likely, however, that the differences in helmet attenuation at the very low frequencies will not appreciably effect the operational capabilities of the AIHS since the A-weighted corrections at these third-octave band frequencies are -34.63, -39.44 and -44.70 dB for the 40, 31 and 25 Hz band center frequencies respectively (ANSI S1.4-1986).

Discussion

The use of ancillary devices with the HGU-56/P AIHS is known to degrade the sound attenuation of the flight helmet (Mozo & Murphy, 1997). The selection of eyeglass frame type for use with the HGU-56/P AIHS should be made with this knowledge in mind. If aircrew are using earplugs in addition to the sound-attenuating flight helmet as recommended for some aircraft [see the technical manual (TM 1-1520-237-10) for the UH-60A Black Hawk], then the selection of eyeglass frames will not impact the total noise protection appreciably (Berger, 1983). Under other circumstances, however, when earplugs are not required and/or used, the decision to use the different types of eyeglass frames will have an effect on operational

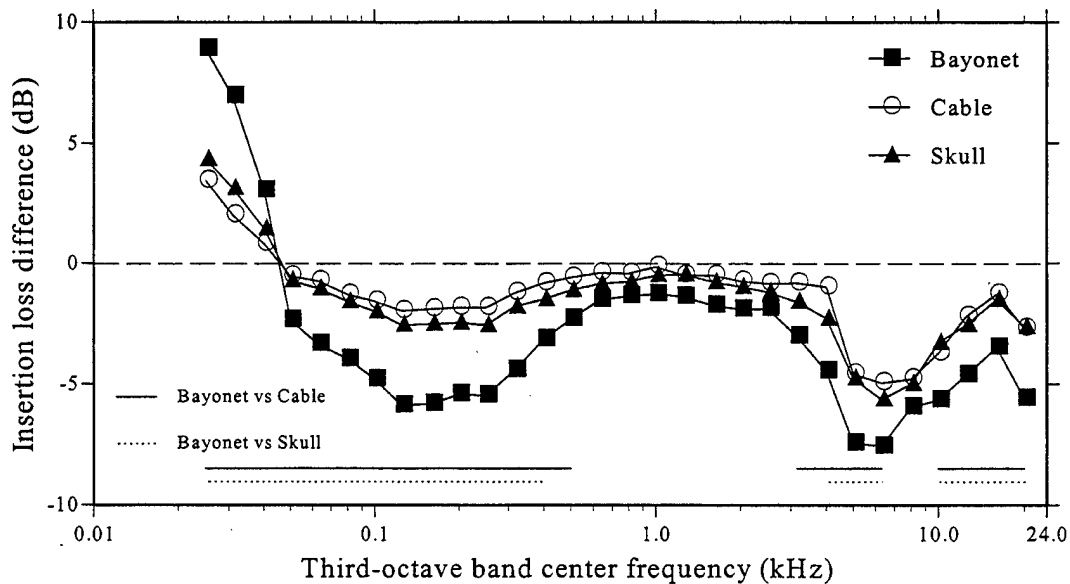


Figure 6. Mean difference in insertion loss values (in dB) between the HGU-56/P AIHS and the AIHS worn with the three different types of eyeglass frames.

Table 4.
Analysis of variance summary table for all eyeglass frames collapsed across test ear.

Effect	<i>df</i> Effect	<i>MS</i> Effect	<i>df</i> Error	<i>MS</i> Error	<i>F</i>	<i>p</i>
Frames	2	233.7228	18	17.29696	13.51236	.000261
Frequency	29	179.3233	261	12.03985	14.89415	.000000
Frames × Frequency	58	14.4485	522	2.02416	7.13800	.000000

capabilities. For example, IAW DODI 6055.12, the maximum duration that the co-pilot of an OH-58C can fly at 90 knots, with aircraft doors on, soundproofing (i.e., acoustical blankets) in, and heater off is essentially unlimited (e.g., 24 hr/day). Using the 3-dB time-intensity exchange rate recommended by DODI 6055.12, this duration is only slightly reduced when using cable-style eyeglass frames (23.7 hr/day) or skull-style frames (20.6 hr/day). However, the duration of maximum permissible safe exposure to this noise under the stated flight conditions is more than cut in half to 10.6 hours per day when bayonet-style eyeglass frames are worn with the HGU-56/P AIHS. Thus, the use of bayonet-style eyeglass frames can reduce the noise protection of the HGU-56/P AIHS in certain, perhaps not very unusual, circumstances. That is, in aircraft where double hearing protection is not mandated (e.g., OH-58C), the use of bayonet-style eyeglass frame can put the hearing of aircrew at risk. Aircrew should be cognizant of the limitations of the helmet to protect hearing when ancillary devices are worn and make responsible decisions regarding additional hearing protection (i.e., double-protection).

Conclusions

The use of ancillary devices such as eyeglass frames may result in sizeable reductions of the HGU-56/P AIHS noise attenuation. When the HGU-56/P AIHS is worn without the additional hearing protection afforded by pre-molded or expandable-foam earplugs or by the Communications Earplug (Mozo & Murphy, 1997), aircrew should select an appropriate eyeglass frame which will not reduce operational capabilities. USAARL recommends that bayonet-style eyeglass frames not be used with the HGU-56/P AIHS without the additional hearing protection afforded by earplugs.

References

- ANSI S1.4-1986 (R1998), "American National Standard Design Response of Weighting Networks for Acoustical Measurements" (American National Standards Institute, New York).
- ANSI S12.42-1995, "American National Standard Microphone-in-Real-Ear and Acoustic Test Fixture Methods for the Measurement of Insertion Loss of Circumaural Hearing Protection Devices" (American National Standards Institute, New York).
- Berger, E. H. 1983. "Laboratory Attenuation of Earmuffs and Earplugs Both Singly and in Combination," Am. Ind. Hyg. Assoc. J. 44(5), 321-329.
- Department of Defense. 1991, "Hearing Conservation" (Washington, DC: Department of the Defense. Department of Defense Instruction 6055.12).
- Department of Defense. 1990. "Use of Human Subjects in Research, Development, Testing And Evaluation" (Washington, D.C: Department of Defense. U.S. Army Medical Research and Material Command Regulation 70-25).
- Department of Defense. 1990. "Use of Volunteers as Subjects of Research" (Washington, D.C: Department of Defense. Army Regulation 70-25).
- Keppel, G. 1973. "Design and Analysis: A Researchers Handbook" (Prentice-Hall, Englewood Cliffs, New Jersey).
- Mozo, B. T., Croshaw, A. L., Patterson, J. H., Camp, R. T., Morrow, R., and Brand, H. C. 1974. "Investigation of the Effects of Three Types of Eyeglass Temples on Attenuation of the SPH-4 Helmet," U. S. Army Aeromedical Res. Lab., Bioacoustics Div., Rept. LR-75-14-2-6, Fort Rucker, AL.
- Mozo, B.T. and Murphy, B.A. 1997. "The Assessment of Sound Attenuation and Speech Intelligibility of Selected Active Noise Reduction Devices and the Communications Earplug When Uses with the HGU-56/P Aviator Helmet." U.S. Army Aeromedical Research Laboratory, Fort Rucker, Alabama, USAARL Report 97-08.
- Nixon, C. W. and Knoblach, W. C. 1974. "Hearing Protection of Earmuffs Worn Over Eyeglasses," Aerospace Medical Research Laboratory, Report No. AMRL-TR-74-61, Wright-Patterson AFB, OH. /1052.
- "Technical Manual Operator's Manual For UH-60A Helicopter, UH-60L Helicopter, EH-60A Helicopter," TM 1-1520-237-10, Change 4, 29 January 1999.

Appendices

- Appendix A. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn without eyeglass frames measured IAW ANSI S12.42-1995.
- Appendix B. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with bayonet-style temples measured IAW ANSI S12.42-1995.
- Appendix C. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle bayonet-style temples measured IAW ANSI S12.42-1995.
- Appendix D. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with cable-style temples measured IAW ANSI S12.42-1995.
- Appendix E. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle with cable-style temples measured IAW ANSI S12.42-1995.
- Appendix F. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with skull-style temples measured IAW ANSI S12.42-1995.
- Appendix G. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Air Force IAS with skull-style temples measured IAW ANSI S12.42-1995.

Appendix A. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn without eyeglass frames measured IAW ANSI S12.42-1995.

Subject Number	Test Ear	Third-octave test band center frequency									
		25 Hz	31 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
01	Left	-8.97	-3.63	2.77	5.53	5.90	6.13	5.80	7.57	8.07	8.70
	Right	-12.87	-10.60	-2.93	7.40	9.07	10.87	10.67	10.50	10.03	13.27
02	Left	-6.73	-1.30	-3.70	1.77	2.93	3.13	3.87	4.20	4.57	4.57
	Right	-9.77	-9.47	-5.90	1.63	0.90	0.63	0.97	-0.27	-0.13	2.77
03	Left	6.57	6.50	7.17	3.10	2.03	0.13	0.47	-0.63	-0.07	2.93
	Right	6.03	4.40	4.23	-0.10	0.27	0.17	0.47	-1.37	-0.87	-1.37
04	Left	-1.83	-1.73	0.93	5.40	8.70	5.47	4.17	4.37	5.23	7.23
	Right	-7.57	-5.23	0.70	3.87	6.80	7.83	8.60	10.90	11.77	13.87
05	Left	7.47	8.47	6.03	-2.93	-2.57	-2.87	-3.93	-4.80	-4.50	-2.57
	Right	9.63	9.17	4.47	-1.27	-1.13	-1.43	-2.97	-4.07	-4.37	-3.93
06	Left	-5.30	-6.67	-6.03	1.60	4.63	4.43	5.63	6.83	7.73	6.43
	Right	-2.70	-3.50	-2.87	0.63	1.93	1.93	2.50	4.73	6.70	7.70
07	Left	-8.37	-7.27	-3.57	3.07	7.43	8.47	9.50	10.80	12.17	10.90
	Right	-12.83	-7.23	-0.40	7.20	9.03	10.37	11.67	11.17	11.03	11.67
08	Left	-0.37	-0.23	1.60	1.23	0.87	1.73	2.97	4.07	4.43	6.37
	Right	2.10	4.93	3.07	-2.30	-2.07	-1.20	-1.60	-2.17	-1.97	-0.13
09	Left	-1.43	2.13	5.27	7.90	6.37	4.23	5.73	7.27	8.43	9.43
	Right	-0.73	0.37	1.80	1.80	1.60	1.67	2.83	4.37	5.67	7.80
10	Left	-0.07	-0.03	0.97	1.80	3.03	3.30	2.90	5.30	5.93	5.43
	Right	-0.23	1.33	1.53	0.70	1.40	3.23	4.57	5.70	7.03	8.60
Insertion Loss (L)	Mean	-1.90	-0.38	1.14	2.85	3.93	3.42	3.71	4.50	5.20	5.94
	s	5.70	5.08	4.44	2.97	3.37	3.20	3.59	4.42	4.68	3.80
Insertion Loss (R)	Mean	-2.89	-1.58	0.37	1.96	2.78	3.41	3.77	3.95	4.49	6.02
	s	7.75	6.65	3.40	3.28	4.05	4.62	5.05	5.72	5.86	6.33

Appendix A (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz
01	Left	10.90	12.77	14.73	14.90	15.33	18.53	24.73	28.30	33.40	34.57
01	Right	15.03	18.33	19.00	18.30	16.80	19.23	26.47	30.87	35.37	35.83
02	Left	6.80	7.93	12.13	14.10	13.03	13.13	22.13	26.83	28.80	30.27
02	Right	3.50	7.90	9.60	11.80	10.97	12.90	20.10	27.50	30.10	32.27
03	Left	-0.03	3.70	10.40	14.17	12.53	14.60	22.20	30.33	33.27	35.47
03	Right	-1.03	3.33	6.90	11.30	12.27	15.60	25.53	28.33	29.27	33.40
04	Left	9.67	15.97	16.80	17.77	14.27	17.13	24.40	27.63	28.90	31.07
04	Right	12.83	17.13	16.93	20.40	17.77	18.53	27.70	33.03	31.20	31.33
05	Left	-1.90	1.30	8.27	12.67	14.97	14.43	23.63	28.33	33.17	37.23
05	Right	-3.23	1.70	4.27	9.13	11.07	11.63	19.93	24.63	30.60	34.97
06	Left	11.03	12.70	18.83	21.00	21.77	21.33	28.27	33.97	37.60	39.27
06	Right	8.37	12.63	15.63	19.03	20.83	23.07	31.33	33.70	34.03	33.97
07	Left	13.77	16.83	18.57	20.53	22.97	25.03	33.43	38.00	36.97	38.00
07	Right	11.53	16.60	20.93	22.83	24.67	27.47	35.03	34.33	31.70	34.53
08	Left	9.47	11.43	14.73	16.27	12.07	15.53	25.13	31.60	33.93	40.40
08	Right	1.17	5.93	9.83	13.47	13.13	15.17	21.83	28.67	33.30	34.43
09	Left	9.43	12.23	14.93	16.83	16.57	17.37	25.93	36.17	30.73	32.93
09	Right	6.20	10.47	12.23	15.47	16.60	19.40	29.03	31.83	28.70	30.00
10	Left	8.10	9.90	12.53	14.27	13.33	14.97	23.30	26.93	30.07	33.13
10	Right	7.37	9.53	10.07	12.00	12.73	15.43	25.97	32.60	31.37	31.93
Insertion Loss (L)	Mean	7.72	10.48	14.19	16.25	15.68	17.21	25.32	30.81	32.68	35.23
	s	4.96	4.96	3.42	2.81	3.79	3.64	3.38	4.01	3.08	3.45
Insertion Loss (R)	Mean	6.17	10.36	12.54	15.37	15.68	17.84	26.29	30.55	31.56	33.27
	s	6.06	5.81	5.41	4.55	4.52	4.78	4.84	3.15	2.12	1.83

Appendix A (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz
01	Left	40.20	44.50	46.90	49.57	46.10	44.93	33.03	32.37	30.27	29.97
01	Right	43.33	44.53	46.83	49.67	50.47	46.67	37.47	36.73	33.77	29.87
02	Left	31.63	35.37	39.37	34.97	30.00	24.33	24.63	28.77	26.07	20.00
02	Right	29.70	31.93	33.37	26.17	25.53	22.23	28.20	29.23	25.37	21.17
03	Left	32.07	28.83	35.57	35.00	31.00	32.43	32.33	33.07	27.10	20.00
03	Right	29.17	25.77	30.17	25.33	25.57	22.93	25.53	24.07	22.53	16.67
04	Left	38.43	35.87	39.43	35.87	37.03	30.97	25.87	28.97	27.37	26.57
04	Right	33.17	36.43	41.87	41.13	40.40	43.53	39.87	34.03	27.20	29.83
05	Left	23.77	23.60	32.97	33.60	28.17	28.83	31.90	27.87	27.53	20.20
05	Right	27.33	29.07	26.83	29.37	31.03	28.33	30.50	28.07	21.07	10.00
06	Left	39.43	40.63	41.37	38.53	35.70	31.90	25.97	29.10	25.90	29.80
06	Right	36.17	40.07	43.00	43.30	36.93	32.00	31.87	31.30	26.23	22.93
07	Left	37.23	40.63	44.17	47.77	45.83	41.03	38.67	36.63	29.37	30.00
07	Right	39.13	43.37	50.60	51.57	46.90	43.37	35.90	26.60	23.53	29.73
08	Left	35.83	32.10	40.40	44.83	42.77	41.07	37.23	35.80	25.60	20.00
08	Right	34.40	33.37	39.97	40.67	40.73	32.33	29.37	32.13	28.13	20.00
09	Left	36.93	34.80	34.83	32.13	29.43	33.00	37.20	37.23	28.30	26.70
09	Right	39.23	38.83	34.60	33.27	24.23	24.80	25.70	25.63	23.80	20.03
10	Left	33.43	34.63	39.37	42.67	43.73	34.13	32.47	34.33	27.13	23.23
10	Right	33.83	35.53	35.17	39.43	42.63	30.70	33.27	34.73	28.17	20.00
Insertion Loss (L)	Mean	34.90	35.10	39.44	39.49	36.98	34.26	31.93	32.41	27.46	24.65
	s	4.90	6.07	4.23	6.26	7.16	6.28	5.04	3.55	1.50	4.45
Insertion Loss (R)	Mean	34.55	35.89	38.24	37.99	36.44	32.69	31.77	30.25	25.98	22.02
	s	5.05	6.04	7.51	9.22	9.39	8.93	4.87	4.21	3.63	6.40

Appendix B. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worm with U.S. Navy FG with bayonet-style temples measured IAW ANSI S12.42-1995.

Subject Number	Test Ear	Third-octave test band center frequency									
		25 Hz	31 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
01	Left	7.83	9.17	7.27	-1.23	-1.47	-1.20	-1.80	-1.90	-1.97	-0.73
01	Right	-4.00	-5.27	-1.40	-0.27	0.30	1.93	3.00	6.60	7.43	8.43
02	Left	10.10	9.63	5.13	2.30	0.57	-1.43	-2.90	-4.43	-3.97	-3.07
02	Right	-1.70	-0.87	-1.67	2.27	0.70	-0.43	-1.20	-3.27	-2.70	-0.93
03	Left	12.30	12.23	9.83	2.17	1.63	-0.67	-1.13	-2.37	-1.93	0.00
03	Right	2.73	2.23	4.70	1.73	1.40	1.20	1.27	0.37	0.80	1.70
04	Left	12.83	11.17	7.70	2.07	1.33	-0.60	-1.67	-3.97	-2.37	3.17
04	Right	-1.07	-2.53	-2.33	-1.13	0.17	0.43	2.33	4.17	5.43	8.43
05	Left	9.07	9.00	7.77	-2.63	-2.53	-2.63	-2.60	-4.30	-5.33	-5.67
05	Right	9.43	9.40	4.97	-0.90	-1.13	-1.63	-2.27	-4.53	-5.43	-5.07
06	Left	9.40	8.17	7.77	2.70	1.40	-0.67	-4.23	-7.70	-7.47	-6.00
06	Right	12.83	11.23	5.43	0.37	-0.67	-0.93	-2.13	-3.60	-2.27	-0.10
07	Left	-7.67	-8.03	-6.30	0.17	2.23	1.50	1.83	4.57	6.80	9.23
07	Right	-5.43	-2.60	-1.80	0.67	0.90	1.17	1.63	4.07	6.27	6.33
08	Left	10.77	9.50	6.70	-1.97	-2.20	-2.70	-3.00	-2.30	-0.83	1.47
08	Right	7.00	8.63	4.57	-1.37	-1.23	-1.13	-2.13	-3.50	-3.77	-3.07
09	Left	9.77	10.83	9.17	2.77	2.07	-0.33	-0.70	-1.47	0.17	3.53
09	Right	8.07	7.47	5.20	1.33	0.77	-0.17	-0.63	-2.47	-1.97	0.50
10	Left	11.20	8.50	5.53	-1.87	-2.10	-2.03	-3.43	-2.60	-1.30	-0.43
10	Right	11.73	10.10	5.33	0.43	-0.27	-0.83	-1.90	-3.27	-2.33	0.10
Insertion Loss (L)	Mean	8.56	8.02	6.06	0.45	0.09	-1.08	-1.96	-2.65	-1.82	0.15
	s	5.89	5.78	4.57	2.19	1.94	1.24	1.72	3.12	3.78	4.57
Insertion Loss (R)	Mean	3.96	3.78	2.30	0.31	0.09	-0.04	-0.20	-0.54	0.15	1.63
	s	6.71	6.24	3.55	1.24	0.89	1.18	2.05	4.05	4.59	4.65

Appendix B (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz
01	Left	1.40	4.53	7.43	9.17	11.43	14.77	22.70	25.73	29.70	31.73
01	Right	10.47	14.93	16.63	16.83	16.87	19.23	26.73	30.07	32.97	34.43
02	Left	0.30	3.90	10.20	13.23	11.63	12.03	21.17	26.27	29.47	31.03
02	Right	-0.27	5.77	8.97	13.07	12.73	14.00	19.63	24.40	25.97	27.33
03	Left	-3.83	0.13	7.77	11.80	11.13	12.87	19.50	27.17	32.33	33.93
03	Right	1.23	5.70	10.03	14.67	14.40	17.30	28.00	27.90	28.17	31.73
04	Left	3.30	11.23	14.93	17.00	14.33	16.67	23.73	28.53	29.53	29.30
04	Right	9.13	13.93	14.33	16.03	15.47	16.87	25.77	33.10	29.67	29.77
05	Left	-6.63	-4.30	4.17	9.27	12.17	12.80	21.33	24.60	28.30	30.03
05	Right	-3.37	2.53	6.27	11.27	12.07	12.77	20.17	24.70	29.10	32.13
06	Left	-1.30	4.07	12.77	16.17	19.20	19.90	28.67	31.70	28.73	30.83
06	Right	1.40	6.57	9.77	14.47	18.57	21.20	30.20	32.57	32.20	32.27
07	Left	10.67	14.63	16.07	19.23	21.43	24.30	28.97	35.80	35.73	36.43
07	Right	4.63	11.60	15.73	17.60	20.10	23.43	30.47	31.00	29.03	35.30
08	Left	4.03	7.10	12.47	15.33	11.93	14.10	23.90	30.77	33.97	39.40
08	Right	-2.47	2.63	6.90	11.37	11.83	14.20	21.87	28.80	32.63	34.90
09	Left	3.73	8.33	12.27	15.43	15.20	16.17	24.47	34.03	28.03	31.17
09	Right	0.23	5.50	8.80	13.50	14.63	17.30	27.47	29.13	26.30	27.80
10	Left	4.37	5.90	10.67	13.03	12.53	14.73	22.50	28.67	30.53	32.67
10	Right	0.57	5.30	7.93	10.73	11.50	14.13	24.17	29.30	29.57	29.93
Insertion Loss (L)	Mean	1.60	5.55	10.87	13.97	14.10	15.83	23.69	29.33	30.63	32.65
	s	4.84	5.35	3.63	3.28	3.56	3.75	3.08	3.68	2.57	3.14
Insertion Loss (R)	Mean	2.16	7.45	10.54	13.95	14.82	17.04	25.45	29.10	29.56	31.56
	s	4.59	4.44	3.70	2.40	2.96	3.45	3.89	2.90	2.45	2.83

Appendix B (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz
01	Left	39.07	42.00	43.60	43.17	39.47	33.23	23.10	23.33	25.37	20.00
01	Right	43.47	44.57	46.93	44.10	43.53	35.23	28.87	28.10	29.00	20.00
02	Left	31.37	32.20	30.70	25.50	22.13	23.43	22.77	23.23	22.83	20.00
02	Right	28.23	30.23	32.90	26.30	24.90	24.13	23.53	26.00	23.93	19.87
03	Left	29.90	27.10	31.70	31.97	31.70	33.80	30.57	30.30	27.27	20.00
03	Right	31.67	28.83	34.30	28.37	24.70	28.03	28.07	26.53	24.87	16.67
04	Left	34.73	33.77	37.67	34.27	33.03	33.00	28.07	28.20	27.07	20.07
04	Right	33.20	33.53	40.50	38.83	34.47	36.40	34.13	33.40	27.33	20.00
05	Left	23.23	21.73	30.03	31.63	30.00	27.20	28.30	27.67	18.47	10.00
05	Right	24.20	26.13	28.43	30.43	32.43	24.37	25.27	27.57	19.83	10.00
06	Left	36.70	36.37	32.47	21.03	17.03	20.60	19.33	21.77	15.10	10.00
06	Right	34.83	36.53	36.30	28.53	23.93	23.73	27.10	28.00	23.27	20.00
07	Left	38.20	41.33	43.70	41.00	34.20	33.07	33.90	30.20	28.40	20.20
07	Right	40.20	42.27	41.87	38.40	29.07	29.33	27.63	19.67	18.53	20.00
08	Left	34.47	31.23	35.33	33.57	32.23	33.10	34.63	33.13	25.73	20.00
08	Right	31.83	30.47	35.17	32.40	34.67	24.30	23.17	28.03	20.67	10.00
09	Left	34.33	28.90	22.93	21.30	16.23	24.50	28.57	34.03	26.63	20.20
09	Right	32.97	27.97	26.90	21.93	17.27	23.03	22.00	23.73	22.00	20.03
10	Left	28.57	29.00	33.47	29.83	30.67	27.93	14.53	19.33	20.93	19.97
10	Right	29.47	29.67	29.63	21.97	26.63	22.73	19.73	20.40	21.10	20.13
Insertion Loss (L)	Mean	33.06	32.36	34.16	31.33	28.67	28.99	26.38	27.12	23.78	18.04
	s	4.85	6.29	6.31	7.38	7.65	4.90	6.39	4.99	4.36	4.24
Insertion Loss (R)	Mean	33.01	33.02	35.29	31.13	29.16	27.13	25.95	26.14	23.05	17.67
	s	5.58	6.21	6.35	7.37	7.37	5.05	4.12	4.03	3.32	4.17

Appendix C. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle bayonet-style temples measured IAW ANSI S12.42-1995.

Subject Number	Test Ear	Third-octave test band center frequency									
		25 Hz	31 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
01	Left	11.00	10.97	7.20	-1.73	-0.90	-1.47	-2.73	-4.20	-5.17	-4.03
01	Right	1.57	0.37	0.93	-2.80	-1.70	-1.57	-1.83	0.20	2.07	4.97
02	Left	10.03	10.13	5.50	2.40	0.47	-1.30	-2.30	-4.27	-3.73	-1.73
02	Right	1.97	1.10	-1.40	0.90	-0.23	-0.53	-0.73	-3.13	-3.70	-4.27
03	Left	11.17	11.27	9.40	2.20	1.00	-0.47	-1.37	-2.60	-1.77	0.87
03	Right	10.10	7.50	5.37	1.23	-0.20	-0.03	-0.67	-2.80	-2.37	-1.97
04	Left	8.83	7.03	3.63	0.33	1.03	-0.20	-1.80	-2.87	-1.87	1.60
04	Right	-1.47	-2.77	-3.03	-1.13	0.90	1.87	3.17	5.30	6.47	9.20
05	Left	8.63	8.57	6.77	-2.93	-2.33	-1.87	-2.23	-3.60	-5.13	-6.53
05	Right	9.67	9.37	4.73	-1.57	-1.23	-1.10	-2.07	-4.27	-5.50	-5.77
06	Left	9.30	8.73	7.47	2.90	1.67	-0.27	-2.80	-7.00	-7.30	-7.43
06	Right	11.70	8.27	5.37	1.93	0.73	-0.17	-1.10	-3.23	-2.23	0.63
07	Left	-3.87	-6.43	-7.37	-2.50	2.57	1.63	1.57	3.37	5.67	6.20
07	Right	-2.40	-4.40	-6.63	-1.97	-0.20	0.10	0.67	3.73	5.93	6.57
08	Left	7.83	5.57	1.70	-1.50	-1.87	-2.67	-1.47	-0.30	1.43	4.00
08	Right	6.37	7.77	3.30	-1.80	-1.73	-1.70	-1.63	-3.13	-3.73	-3.93
09	Left	11.07	12.60	10.17	1.73	1.30	-0.47	-0.80	-1.97	-0.87	0.73
09	Right	10.47	10.83	6.63	0.77	0.50	-0.30	-0.90	-2.53	-2.13	0.20
10	Left	9.07	8.40	5.60	-2.07	-1.70	-1.50	-2.87	-2.73	-2.07	-0.60
10	Right	2.97	4.63	2.30	-0.77	-0.03	0.40	0.47	1.27	3.20	5.67
Insertion Loss (L)	Mean	8.31	7.68	5.01	-0.12	0.12	-0.86	-1.68	-2.62	-2.08	-0.69
	s	4.43	5.38	5.02	2.27	1.69	1.18	1.33	2.73	3.69	4.36
Insertion Loss (R)	Mean	5.09	4.27	1.76	-0.52	-0.32	-0.30	-0.46	-0.86	-0.20	1.13
	s	5.23	5.35	4.29	1.61	0.95	1.04	1.56	3.31	4.27	5.20

Appendix C (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz
01	Left	-3.50	0.03	4.30	6.47	8.63	11.50	20.30	25.73	28.57	30.27
01	Right	6.80	11.53	12.77	14.30	14.93	18.50	24.37	28.43	33.27	34.23
02	Left	0.93	4.87	9.70	12.83	11.23	11.80	22.10	25.73	28.17	28.33
02	Right	-5.60	-0.07	3.40	8.27	9.33	10.80	17.77	26.27	26.93	28.07
03	Left	-3.27	0.20	7.57	11.97	11.23	12.57	20.37	28.70	34.13	36.40
03	Right	-2.50	0.87	4.93	9.27	11.20	14.37	25.50	31.37	31.87	34.27
04	Left	3.13	8.97	14.27	15.80	14.33	16.53	23.13	28.27	30.17	31.20
04	Right	9.53	14.97	16.00	18.53	17.33	18.10	27.27	31.63	31.47	30.97
05	Left	-8.87	-6.27	2.83	7.80	11.13	11.67	19.10	22.73	27.90	32.50
05	Right	-4.73	1.00	5.27	10.50	11.90	12.87	20.17	25.00	29.97	34.10
06	Left	-2.57	3.23	12.07	15.43	18.20	20.20	28.70	30.43	27.83	29.90
06	Right	1.90	7.47	11.43	16.23	19.73	22.00	32.80	35.73	35.83	33.03
07	Left	9.33	12.83	15.63	17.73	21.73	23.00	31.93	36.30	34.13	36.27
07	Right	7.23	12.20	16.30	18.13	21.00	23.50	32.20	32.97	32.00	35.87
08	Left	6.57	10.27	14.07	16.90	12.10	15.23	24.80	32.17	33.80	39.30
08	Right	-2.93	2.43	6.57	11.73	12.07	13.93	21.17	28.83	34.40	34.80
09	Left	1.90	6.73	10.73	13.20	13.37	15.43	23.90	34.07	28.03	30.27
09	Right	-0.10	4.67	7.67	12.57	13.30	17.20	27.67	28.30	25.57	28.13
10	Left	2.30	4.63	9.60	11.87	11.73	13.77	21.40	25.33	27.83	31.07
10	Right	5.37	8.67	9.47	11.07	12.20	14.17	24.50	29.20	30.43	31.87
Insertion Loss (L)	Mean	0.60	4.55	10.08	13.00	13.37	15.17	23.57	28.95	30.06	32.55
	s	5.32	5.61	4.23	3.70	3.87	3.86	4.03	4.29	2.82	3.55
Insertion Loss (R)	Mean	1.50	6.37	9.38	13.06	14.30	16.54	25.34	29.77	31.17	32.53
	s	5.46	5.37	4.60	3.61	3.87	4.06	4.89	3.20	3.15	2.73

Appendix C (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz
01	Left	37.03	36.73	37.80	38.40	34.90	31.30	22.83	23.43	24.40	20.00
01	Right	42.67	43.17	44.23	41.83	38.97	32.20	26.67	27.80	28.03	20.00
02	Left	29.57	33.97	30.23	25.13	20.93	20.63	18.47	22.50	21.70	20.00
02	Right	25.27	27.03	29.47	24.23	24.40	21.97	25.47	24.57	24.20	11.27
03	Left	30.73	26.60	31.17	32.37	28.70	31.03	31.67	31.20	26.43	20.00
03	Right	28.37	24.57	30.03	25.10	24.50	21.53	25.97	24.97	21.63	16.67
04	Left	37.47	32.70	36.80	32.60	33.43	29.53	28.83	28.63	26.40	20.00
04	Right	33.33	34.83	40.90	41.00	37.33	37.33	33.33	32.00	27.27	20.00
05	Left	22.10	21.87	29.57	29.37	27.70	25.17	26.90	24.93	20.63	10.23
05	Right	24.17	24.10	23.67	27.30	31.60	26.67	27.33	27.43	21.97	10.17
06	Left	36.20	35.20	31.97	21.07	16.63	19.87	19.73	24.03	15.17	10.00
06	Right	35.20	38.43	37.77	26.23	23.57	22.63	25.40	27.40	23.53	20.00
07	Left	36.83	42.03	43.43	40.97	38.43	33.97	32.37	32.67	26.70	23.47
07	Right	39.00	42.17	43.03	44.07	37.40	32.07	31.77	24.57	23.43	20.00
08	Left	35.37	33.13	37.33	34.70	32.77	32.03	33.60	32.07	25.73	20.00
08	Right	32.77	30.70	34.57	33.30	34.30	25.70	27.33	27.93	20.30	10.00
09	Left	31.93	27.03	23.10	21.93	18.30	24.97	28.90	32.73	25.63	20.23
09	Right	32.83	28.27	27.67	25.43	18.37	19.83	19.70	20.07	18.77	19.87
10	Left	28.40	29.03	32.97	28.70	27.67	25.97	14.20	17.87	16.37	19.87
10	Right	32.90	33.37	34.00	33.57	37.10	25.07	23.77	28.23	22.83	20.13
Insertion Loss (L)	Mean s	32.56	31.83	33.44	30.52	27.95	27.45	25.75	27.01	22.92	18.38
		4.98	5.81	5.63	6.61	7.32	4.87	6.60	5.17	4.29	4.49
Insertion Loss (R)	Mean s	32.65	32.66	34.53	32.21	30.75	26.50	26.67	26.50	23.20	16.81
		5.70	6.94	6.90	7.70	7.40	5.66	3.83	3.16	2.85	4.50

Appendix D. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with cable-style temples measured IAW ANSI S12.42-1995.

Subject Number	Test Ear	Third-octave test band center frequency										
		25 Hz	31 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	
01	Left	-0.67	1.77	5.20	3.23	2.37	2.10	2.17	2.33	2.97	4.93	
	Right	-12.43	-10.83	-2.93	6.23	7.23	9.10	10.63	10.27	10.10	12.70	
02	Left	3.10	5.43	1.87	4.77	3.57	0.47	0.60	0.53	1.53	2.47	
	Right	-3.53	-3.23	-2.37	0.77	0.23	-0.90	-0.67	-2.83	-2.73	-1.17	
03	Left	10.60	11.03	8.93	2.03	1.00	0.07	-1.10	-2.07	-1.43	-0.17	
	Right	5.37	4.77	5.13	0.83	0.53	1.27	0.30	-1.30	-0.77	-0.40	
04	Left	2.33	0.33	1.03	0.90	9.90	5.53	3.67	3.80	5.47	7.97	
	Right	-7.97	-7.10	-3.83	2.27	5.53	5.83	7.23	9.03	9.90	11.60	
05	Left	8.67	9.17	7.50	-1.90	-2.20	-2.30	-3.27	-4.43	-5.33	-5.43	
	Right	9.53	9.33	5.27	-0.43	-0.87	-1.03	-2.20	-3.97	-4.73	-5.17	
06	Left	7.90	2.97	1.10	0.77	1.60	-0.73	-1.73	-1.27	0.50	1.03	
	Right	1.90	-1.90	-0.87	0.47	1.87	1.57	1.87	2.43	3.73	4.97	
07	Left	-5.90	-7.00	-2.90	5.17	8.80	6.07	5.90	7.67	9.23	8.40	
	Right	-10.00	-6.40	-0.37	7.07	7.63	7.47	8.67	10.07	10.67	10.57	
08	Left	5.87	5.10	4.97	0.90	-0.23	-0.10	0.03	0.77	1.73	4.50	
	Right	4.57	7.07	3.90	-1.43	-1.73	-1.00	-1.60	-3.17	-2.87	-1.70	
09	Left	1.40	3.53	7.70	3.53	2.97	1.53	2.50	3.80	4.90	5.33	
	Right	5.17	4.83	4.47	1.10	0.83	0.70	1.53	1.97	2.77	5.33	
10	Left	-1.47	-2.33	-2.80	-1.30	1.87	2.43	2.03	4.50	5.10	4.77	
	Right	-6.80	-4.30	-3.53	0.93	2.37	4.23	5.30	5.90	6.90	9.70	
Insertion Loss (L)	Mean	3.18	3.00	3.26	1.81	2.96	1.51	1.08	1.56	2.47	3.38	
	s	5.14	5.27	4.25	2.39	3.75	2.66	2.73	3.58	4.07	4.11	
Insertion Loss (R)	Mean	-1.42	-0.78	0.49	1.78	2.36	2.72	3.11	2.84	3.30	4.64	
	s	7.66	6.82	3.79	2.75	3.32	3.71	4.54	5.65	5.90	6.41	

Appendix D (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz
01	Left	6.27	9.13	10.50	11.67	14.27	17.00	25.13	28.27	31.50	33.53
01	Right	14.47	17.67	18.97	18.73	18.33	21.20	28.20	31.47	34.90	35.00
02	Left	5.63	8.57	13.67	14.87	13.27	13.40	21.87	27.07	28.77	29.17
02	Right	0.17	5.43	7.57	10.37	10.03	12.37	20.07	27.87	29.57	31.53
03	Left	-2.30	0.97	8.90	12.77	11.30	12.33	20.13	27.67	32.13	34.23
03	Right	-0.33	3.93	8.03	12.47	13.10	16.70	27.47	30.80	31.23	34.73
04	Left	8.53	15.27	16.50	17.83	16.03	17.77	26.27	29.00	29.63	31.73
04	Right	11.53	16.63	16.50	18.63	17.07	17.57	26.93	32.67	31.37	31.67
05	Left	-5.57	-2.43	6.27	11.20	13.33	13.80	22.53	25.80	31.80	34.43
05	Right	-5.60	-0.13	3.37	8.43	10.03	11.23	18.70	22.93	27.63	32.70
06	Left	5.47	9.53	16.07	18.30	19.77	20.00	27.40	33.17	34.47	35.80
06	Right	6.00	11.53	14.83	18.83	20.97	23.13	31.47	33.23	35.20	34.23
07	Left	11.07	14.97	17.50	19.30	22.63	24.77	32.67	37.03	36.53	37.43
07	Right	10.33	15.60	19.43	21.43	23.70	26.00	34.87	33.93	32.23	34.60
08	Left	7.07	10.30	12.83	15.57	11.83	14.80	25.87	31.37	33.00	39.13
08	Right	-0.33	4.43	8.57	11.93	11.40	13.80	20.87	28.67	33.27	35.07
09	Left	6.33	10.33	12.60	14.23	14.83	16.67	25.03	34.67	32.43	31.57
09	Right	4.17	9.43	11.90	16.23	15.90	18.30	27.70	28.73	26.13	28.70
10	Left	9.20	10.33	13.33	15.23	13.03	14.93	23.40	27.43	30.43	32.97
10	Right	8.63	11.37	11.07	13.17	12.97	15.10	25.77	29.80	30.23	31.50
Insertion Loss (L)	Mean	5.17	8.70	12.82	15.10	15.03	16.55	25.03	30.15	32.07	34.00
	s	5.16	5.53	3.51	2.77	3.59	3.68	3.48	3.73	2.28	2.93
Insertion Loss (R)	Mean	4.90	9.59	12.02	15.02	15.35	17.54	26.20	30.01	31.18	32.97
	s	6.40	6.04	5.32	4.33	4.67	4.76	5.10	3.23	2.93	2.11

Appendix D (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz
01	Left	40.20	42.27	45.47	44.90	42.47	33.73	26.17	32.20	25.97	20.00
01	Right	43.13	44.20	47.97	46.30	46.43	36.17	32.23	33.63	29.40	29.80
02	Left	31.97	35.17	37.77	29.00	27.63	24.57	21.63	27.00	25.20	20.00
02	Right	28.20	29.37	31.40	24.80	27.40	23.43	25.03	25.47	24.07	17.87
03	Left	30.27	26.57	32.53	31.17	31.43	34.07	32.97	31.40	27.57	20.00
03	Right	30.07	26.67	32.77	26.23	25.47	23.93	27.63	21.93	22.87	16.67
04	Left	37.53	35.63	40.07	34.67	34.93	25.00	23.60	28.40	27.53	23.23
04	Right	31.60	35.70	41.17	41.40	37.50	38.17	33.30	32.50	27.63	23.27
05	Left	20.73	21.13	32.83	31.10	26.33	27.67	31.20	25.83	21.40	10.20
05	Right	26.67	27.93	27.27	28.57	28.37	28.47	28.70	25.67	21.47	10.07
06	Left	39.27	40.00	38.10	27.37	23.00	24.53	21.73	24.57	23.07	20.00
06	Right	35.37	41.43	42.17	31.83	27.10	21.70	25.07	30.73	26.10	20.00
07	Left	37.43	41.53	43.40	39.33	36.17	31.17	30.53	31.87	26.70	29.93
07	Right	38.23	43.27	47.93	46.77	39.57	36.03	31.70	26.73	24.13	29.70
08	Left	36.00	32.60	37.37	32.40	29.00	31.03	32.43	34.87	26.07	20.00
08	Right	33.03	32.47	37.33	31.07	30.00	25.90	24.57	28.57	25.63	20.00
09	Left	31.03	27.50	29.80	27.80	27.83	29.50	34.93	34.13	26.63	20.23
09	Right	35.77	33.90	31.77	31.57	25.17	24.27	22.63	21.93	21.57	19.93
10	Left	31.83	31.87	37.60	39.73	39.37	36.77	24.63	27.90	25.73	20.00
10	Right	33.33	36.10	39.77	36.60	39.37	29.27	27.30	30.10	26.27	20.20
Insertion Loss (L)	Mean	33.63	33.43	37.49	33.75	31.82	29.80	27.98	29.82	25.59	20.36
	s	5.78	6.92	4.84	5.83	6.22	4.33	4.98	3.55	1.96	4.76
Insertion Loss (R)	Mean	33.54	35.10	37.95	34.51	32.64	28.73	27.82	27.73	24.91	20.75
	s	4.88	6.28	7.10	7.94	7.44	6.02	3.63	4.09	2.58	5.86

Appendix E. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle with cable-style temples measured IAW ANSI S12.42-1995.

Subject Number	Test Ear	Third-octave test band center frequency										
		25 Hz	31 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	
01	Left	-0.23	3.00	5.73	4.40	3.50	2.93	2.80	2.90	3.30	4.77	
	Right	-11.03	-10.87	-5.77	3.47	5.57	7.37	9.73	10.23	9.67	11.83	
02	Left	6.27	7.03	2.53	2.80	1.70	-0.33	-1.70	-2.77	-1.77	-0.80	
	Right	-9.67	-8.57	-5.40	1.53	1.00	0.83	1.23	0.60	1.40	4.23	
03	Left	8.03	8.70	9.03	3.53	2.50	1.00	-0.17	-1.43	-0.77	0.27	
	Right	5.03	4.50	4.83	2.17	1.43	1.67	1.10	-1.33	-0.90	-0.93	
04	Left	6.90	5.13	4.10	3.17	5.07	2.00	0.47	0.40	2.17	6.53	
	Right	-2.53	-3.37	-0.13	1.60	3.07	3.67	5.63	7.30	8.30	10.33	
05	Left	8.77	9.10	7.30	-3.00	-2.83	-3.03	-3.90	-4.47	-5.07	-4.30	
	Right	9.53	9.53	5.67	-0.27	-0.60	-1.10	-2.63	-4.57	-5.23	-5.33	
06	Left	7.80	2.63	0.63	5.20	4.33	1.07	0.13	0.83	2.47	1.67	
	Right	1.80	-1.10	-0.30	3.20	3.27	3.33	3.47	4.17	5.67	7.07	
07	Left	-8.90	-9.43	-7.27	2.63	6.63	5.80	6.73	8.27	9.87	9.57	
	Right	-7.23	-7.07	-4.57	3.37	4.50	5.47	7.30	8.40	9.30	9.10	
08	Left	13.63	11.90	7.90	-3.00	-3.53	-3.30	-3.43	-3.83	-3.70	-1.73	
	Right	5.73	6.83	4.10	-1.50	-2.30	-2.00	-1.93	-2.63	-2.13	-1.03	
09	Left	-4.43	-3.17	-1.07	3.97	6.60	4.43	5.00	6.20	7.60	9.43	
	Right	-4.73	-4.83	-3.37	1.17	1.93	2.60	3.50	4.40	5.40	7.70	
10	Left	-1.63	-1.83	-1.13	2.47	7.13	6.20	5.83	7.20	7.57	7.60	
	Right	0.20	0.03	2.50	1.23	2.20	3.20	5.13	5.70	6.77	8.97	
Insertion Loss (L)	Mean	3.62	3.31	2.78	2.22	3.11	1.68	1.18	1.33	2.17	3.30	
	s	7.04	6.54	5.08	2.87	3.77	3.31	3.78	4.65	5.06	4.94	
Insertion Loss (R)	Mean	-1.29	-1.49	-0.24	1.60	2.01	2.50	3.25	3.23	3.82	5.19	
	s	6.93	6.77	4.38	1.60	2.32	2.82	3.91	4.98	5.21	5.75	

Appendix E (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz
01	Left	7.23	9.03	10.83	11.67	14.67	17.30	25.17	29.30	33.27	34.73
01	Right	13.47	16.20	17.87	17.63	17.50	20.57	28.17	32.53	35.63	36.30
02	Left	3.07	6.93	12.17	14.70	11.83	13.13	22.37	28.20	31.23	31.17
02	Right	4.83	8.57	10.23	12.77	11.43	12.60	20.13	26.13	26.93	28.97
03	Left	-1.53	2.13	9.10	13.43	11.60	12.80	20.63	29.33	34.57	36.57
03	Right	-1.30	2.17	6.57	11.90	12.77	15.73	26.43	29.20	28.80	32.20
04	Left	7.20	14.97	15.23	16.43	13.70	15.97	23.60	27.17	28.43	29.63
04	Right	10.30	15.43	16.30	18.67	16.33	17.23	26.83	33.40	31.17	31.70
05	Left	-4.63	-1.93	6.20	10.27	12.83	13.07	22.23	24.70	29.17	31.90
05	Right	-5.40	0.77	4.47	9.23	11.77	12.63	20.37	25.23	29.20	32.50
06	Left	6.23	10.87	17.90	20.50	21.43	21.40	28.10	33.77	35.57	36.80
06	Right	7.40	13.03	16.17	20.17	21.77	24.13	33.37	34.27	35.03	35.23
07	Left	11.00	15.30	17.37	19.67	22.63	23.37	30.97	35.87	33.77	36.20
07	Right	8.87	14.43	19.47	21.50	23.37	26.60	34.70	32.27	30.73	34.40
08	Left	0.93	2.87	10.33	12.50	10.13	12.43	23.13	29.00	32.90	38.30
08	Right	0.10	5.07	9.20	13.07	12.40	14.63	21.03	27.93	34.87	35.37
09	Left	9.87	13.57	15.17	17.40	17.13	18.07	25.97	35.83	31.30	32.90
09	Right	5.87	11.17	13.60	17.47	17.07	20.13	28.77	31.40	28.07	29.37
10	Left	11.57	12.67	13.97	15.40	13.30	15.30	24.63	28.43	30.37	33.97
10	Right	8.23	11.17	10.97	12.57	13.03	15.23	27.03	31.10	30.43	31.40
Insertion Loss (L)	Mean	5.09	8.64	12.83	15.20	14.93	16.28	24.68	30.16	32.06	34.22
	s	5.48	5.97	3.76	3.37	4.20	3.78	3.06	3.74	2.34	2.80
Insertion Loss (R)	Mean	5.24	9.80	12.48	15.50	15.74	17.95	26.68	30.35	31.09	32.74
	s	5.80	5.50	4.99	4.09	4.23	4.78	5.06	3.09	3.10	2.53

Appendix E (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz
01	Left	40.87	43.37	46.27	42.77	41.87	32.00	23.73	31.63	25.60	20.00
01	Right	42.53	44.40	47.63	43.70	42.03	31.50	27.73	31.13	28.33	29.40
02	Left	31.10	33.37	32.90	26.83	25.20	22.90	25.10	28.40	25.10	20.00
02	Right	29.13	32.83	35.50	28.00	28.60	24.13	28.17	28.90	26.73	21.17
03	Left	31.63	27.50	33.33	31.40	30.83	32.03	31.37	32.53	26.60	20.00
03	Right	28.77	24.37	31.20	26.37	27.13	26.53	28.97	24.57	22.67	13.33
04	Left	34.80	34.10	38.43	34.23	31.77	26.23	22.57	26.43	25.90	20.07
04	Right	34.03	35.17	40.13	40.23	36.23	31.83	32.77	32.50	26.63	20.00
05	Left	22.83	23.70	33.70	33.03	29.77	30.80	31.07	28.83	23.70	13.57
05	Right	24.80	26.43	27.10	27.77	26.17	26.00	27.53	25.87	21.77	10.10
06	Left	39.13	39.83	38.37	27.47	22.73	21.87	20.50	24.63	23.80	20.00
06	Right	36.83	41.43	43.13	34.20	27.90	23.00	26.90	26.93	24.97	20.00
07	Left	36.67	42.33	44.90	43.90	38.47	30.47	33.77	35.40	29.90	30.00
07	Right	38.77	42.07	46.60	44.33	35.70	29.77	31.13	25.07	22.27	26.47
08	Left	33.00	29.93	32.50	32.17	27.13	27.67	29.83	32.07	25.83	20.00
08	Right	33.40	32.93	38.67	32.67	30.30	31.20	28.23	30.17	25.30	16.67
09	Left	36.50	32.77	32.87	29.40	27.27	32.00	35.47	37.13	27.77	26.77
09	Right	38.93	38.53	35.83	33.47	25.43	26.73	26.33	26.87	26.03	20.10
10	Left	34.57	37.27	41.37	35.33	34.73	32.00	27.80	28.30	25.70	26.57
10	Right	34.63	38.77	39.07	36.27	36.10	23.03	28.13	32.33	27.67	20.00
Insertion Loss (L)	Mean	34.11	34.42	37.46	33.65	30.98	28.80	28.12	30.54	25.99	21.70
	s	5.03	6.39	5.25	5.79	5.97	3.93	5.00	3.93	1.82	4.73
Insertion Loss (R)	Mean	34.18	35.69	38.49	34.70	31.56	27.37	28.59	28.43	25.24	19.72
	s	5.42	6.64	6.44	6.46	5.57	3.48	1.95	2.98	2.31	5.62

Appendix F. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with skull-style temples measured IAW ANSI S12.42-1995.

Subject Number	Test Ear	Third-octave test band center frequency									
		25 Hz	31 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
01	Left	-1.23	0.60	2.33	3.63	2.53	2.30	2.53	3.27	4.07	6.03
01	Right	-13.50	-11.70	-4.57	6.73	6.87	9.10	10.83	10.43	9.80	13.30
02	Left	0.93	3.97	-0.40	3.80	2.97	0.53	1.20	2.03	3.33	4.03
02	Right	-4.33	-3.43	-1.90	0.60	-0.13	-0.93	-0.73	-2.53	-2.50	-1.27
03	Left	10.60	11.57	9.50	2.60	1.87	-0.10	-0.93	-1.83	-1.07	1.40
03	Right	9.27	7.13	5.60	0.60	0.13	-0.23	-1.07	-2.77	-2.10	-2.20
04	Left	2.57	0.13	1.90	4.20	9.77	4.53	2.67	3.47	4.50	7.23
04	Right	-1.37	-1.77	1.90	2.27	3.43	4.27	5.27	7.73	9.20	10.33
05	Left	8.53	9.07	6.93	-1.37	-1.53	-2.43	-3.20	-4.93	-5.57	-5.00
05	Right	9.60	9.33	5.43	-0.27	-0.53	-1.33	-2.13	-4.47	-5.30	-4.93
06	Left	12.10	7.17	4.20	2.47	0.53	-0.83	-2.27	-2.60	-1.33	-1.60
06	Right	11.27	9.73	4.23	-1.77	-2.17	-1.80	-2.73	-3.87	-4.10	-3.03
07	Left	-10.90	-10.20	-6.33	2.93	8.07	6.60	7.30	8.40	9.77	11.23
07	Right	-11.10	-7.37	-3.70	4.60	6.47	6.83	8.67	10.13	10.57	10.07
08	Left	4.97	4.60	5.13	0.20	-0.30	-0.03	0.23	1.33	2.73	5.37
08	Right	5.87	7.73	4.30	-1.13	-1.47	-1.27	-1.73	-2.93	-2.63	-2.30
09	Left	3.33	6.73	8.47	3.73	3.03	1.40	2.30	3.60	5.17	6.43
09	Right	5.63	5.63	4.30	0.43	0.30	-0.20	0.10	-0.13	0.90	3.63
10	Left	3.53	2.70	4.03	0.57	2.33	2.07	1.73	2.27	3.10	5.07
10	Right	-0.87	1.33	2.73	1.20	1.83	3.10	4.80	5.53	6.80	9.60
Insertion Loss (L)	Mean	3.44	3.63	3.58	2.28	2.93	1.40	1.16	1.50	2.47	4.02
	s	6.58	6.05	4.61	1.86	3.51	2.64	2.97	3.79	4.22	4.65
Insertion Loss (R)	Mean	1.05	1.66	1.83	1.33	1.47	1.75	2.13	1.71	2.06	3.32
	s	8.74	7.49	3.82	2.60	3.16	3.86	4.88	6.06	6.32	6.88

Appendix F (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz
01	Left	7.87	10.57	12.37	12.97	14.23	16.87	24.40	30.17	31.73	32.83
01	Right	14.83	18.80	19.10	17.67	16.80	19.93	26.53	30.90	35.23	35.90
02	Left	6.90	8.30	12.13	14.23	13.77	14.00	22.10	26.80	28.50	28.67
02	Right	-0.97	4.33	6.87	10.33	9.47	12.00	19.43	27.33	29.90	32.33
03	Left	-2.00	1.87	9.03	12.97	11.10	12.97	20.00	27.47	30.70	32.13
03	Right	-1.90	2.00	6.33	11.00	12.40	15.20	25.93	30.20	29.93	33.70
04	Left	9.23	16.30	16.07	16.93	14.27	17.13	25.27	26.97	28.57	31.70
04	Right	10.73	16.07	16.60	19.60	17.43	17.63	26.07	30.77	30.57	30.63
05	Left	-6.50	-2.37	6.17	11.13	13.07	13.30	22.60	27.13	32.63	33.27
05	Right	-5.17	0.43	3.77	8.87	10.47	11.60	20.20	24.83	29.70	33.67
06	Left	4.37	8.00	16.00	18.70	20.00	20.43	26.67	31.33	34.40	37.17
06	Right	-1.63	4.47	8.27	13.87	16.77	19.20	28.60	33.10	32.60	30.50
07	Left	12.10	16.70	16.80	19.57	21.63	23.80	30.77	36.90	35.40	37.47
07	Right	10.23	15.27	19.33	21.07	24.03	26.80	35.10	31.97	30.67	34.17
08	Left	7.10	10.83	13.93	16.20	12.37	14.80	24.83	31.40	33.97	39.73
08	Right	-1.27	4.10	8.20	11.80	11.47	13.30	21.30	28.47	34.23	35.90
09	Left	6.67	10.50	13.30	15.10	15.63	17.27	25.50	36.23	29.27	31.33
09	Right	2.93	7.90	10.87	14.70	15.43	18.67	27.83	29.97	27.33	29.53
10	Left	6.53	9.07	11.60	13.23	12.73	13.97	23.03	25.20	27.27	32.13
10	Right	7.40	10.13	10.70	13.33	14.03	16.07	26.93	32.80	30.50	32.27
Insertion Loss (L)	Mean	5.23	8.98	12.74	15.10	14.88	16.45	24.52	29.96	31.24	33.64
	s	5.49	5.79	3.31	2.72	3.38	3.47	2.93	4.05	2.82	3.39
Insertion Loss (R)	Mean	3.52	8.35	11.00	14.22	14.83	17.04	25.79	30.03	31.07	32.86
	s	6.79	6.43	5.51	4.07	4.28	4.53	4.63	2.56	2.33	2.21

Appendix F (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz
01	Left	40.30	41.30	42.60	40.60	38.03	32.13	30.33	30.40	25.07	23.23
01	Right	42.70	44.70	45.97	47.00	47.93	39.97	32.10	33.23	31.67	29.77
02	Left	31.47	36.33	38.87	31.27	27.70	25.03	23.47	27.40	24.77	20.00
02	Right	26.53	28.30	30.63	23.50	23.87	21.17	23.10	24.27	25.13	18.13
03	Left	30.20	26.60	32.13	32.83	29.57	32.67	31.87	30.30	27.67	20.00
03	Right	28.57	24.47	29.97	24.33	22.43	20.03	26.57	20.60	21.00	16.67
04	Left	38.73	36.17	39.57	35.67	35.17	26.50	23.77	28.93	26.73	26.57
04	Right	32.70	35.63	40.70	38.83	35.87	35.83	32.30	30.73	26.10	20.00
05	Left	21.30	21.77	31.73	29.10	25.93	25.93	31.37	26.13	25.73	16.93
05	Right	27.00	28.07	26.87	27.67	28.83	27.30	26.13	24.60	20.77	10.00
06	Left	37.20	38.33	38.30	26.60	23.30	25.20	24.73	25.53	23.20	20.00
06	Right	31.67	32.90	32.00	31.40	21.53	19.37	22.73	28.73	22.07	13.33
07	Left	37.60	40.70	44.50	42.70	38.27	33.30	34.33	34.53	30.00	26.70
07	Right	38.57	40.90	46.13	44.20	37.10	32.97	31.93	24.53	21.27	25.70
08	Left	36.07	33.93	37.87	35.60	32.60	35.13	34.73	36.00	26.23	20.00
08	Right	33.53	32.07	37.27	32.53	31.97	29.80	26.40	28.60	25.07	16.67
09	Left	36.93	33.23	33.17	29.20	26.23	29.33	32.00	35.77	26.93	20.20
09	Right	36.03	33.07	30.33	31.23	22.10	22.07	21.60	22.77	21.60	19.90
10	Left	31.40	32.27	36.93	37.53	35.77	31.67	28.67	30.40	25.53	20.00
10	Right	35.07	38.07	37.00	35.83	37.30	24.07	27.87	31.93	27.03	20.00
Insertion Loss (L)	Mean	34.12	34.06	37.57	34.11	31.26	29.69	29.53	30.54	26.19	21.36
	s	5.65	6.10	4.26	5.25	5.43	3.77	4.21	3.80	1.84	3.15
Insertion Loss (R)	Mean	33.24	33.82	35.69	33.65	30.89	27.26	27.07	27.00	24.17	19.02
	s	5.14	6.19	6.85	7.88	8.73	7.17	3.99	4.23	3.51	5.66

Appendix G. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Air Force IAS with skull-style temples measured IAW ANSI S12.42-1995.

Subject Number	Test Ear	Third-octave test band center frequency									
		25 Hz	31 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
01	Left	6.57	7.03	4.10	-1.03	-0.70	-0.37	-0.97	-1.37	-2.20	-1.43
01	Right	-12.53	-11.40	-6.03	4.57	6.40	8.30	8.73	10.03	9.77	12.47
02	Left	0.87	4.47	1.70	3.67	2.50	1.17	0.53	1.03	2.10	2.67
02	Right	-4.37	-3.47	-2.97	-1.23	-1.03	-0.57	-1.23	-1.90	-1.60	0.50
03	Left	14.23	12.23	9.13	1.07	0.03	-0.70	-1.77	-2.37	-1.87	-0.70
03	Right	9.77	9.43	5.77	0.73	-0.53	-0.07	-1.00	-3.33	-3.70	-5.37
04	Left	2.03	-0.53	0.80	2.53	10.53	5.50	4.10	4.07	5.93	7.00
04	Right	-4.63	-5.80	-0.97	3.83	6.23	7.83	8.07	9.13	10.17	11.60
05	Left	8.43	8.53	6.73	-1.00	-0.97	-1.33	-3.10	-5.07	-5.60	-4.70
05	Right	9.27	9.27	5.50	-0.20	-0.37	-0.33	-2.13	-4.63	-5.23	-5.27
06	Left	9.87	7.47	5.20	1.07	0.10	-1.87	-3.47	-5.20	-4.10	-4.37
06	Right	8.60	7.10	3.00	-0.90	-0.97	-1.70	-2.10	-2.43	-0.80	0.87
07	Left	-11.17	-10.33	-7.43	2.73	8.67	7.23	8.27	9.07	10.60	9.73
07	Right	-10.87	-8.60	-4.63	4.07	7.70	7.60	9.63	10.57	11.30	11.03
08	Left	2.00	1.63	2.27	-0.53	-0.47	-0.63	0.37	1.63	2.70	4.80
08	Right	3.93	5.20	2.07	-1.07	-1.17	-1.03	-1.37	-2.73	-3.03	-1.97
09	Left	0.20	1.37	4.70	5.43	5.40	2.87	3.57	4.97	7.17	8.83
09	Right	0.13	-0.33	0.67	1.13	1.40	1.53	2.30	3.17	4.60	6.93
10	Left	-0.13	-1.23	1.07	2.50	2.60	3.17	2.37	4.03	4.70	5.63
10	Right	-0.43	0.37	2.50	3.40	2.60	4.20	5.47	5.57	6.80	9.03
Insertion Loss (L)	Mean	3.29	3.06	2.83	1.64	2.77	1.50	0.99	1.08	1.94	2.75
	s	6.99	6.39	4.47	2.13	4.13	3.09	3.65	4.62	5.29	5.29
Insertion Loss (R)	Mean	-0.11	0.18	0.49	1.43	2.03	2.58	2.64	2.34	2.83	3.98
	s	8.07	7.47	4.06	2.32	3.50	4.03	4.87	6.07	6.39	7.02

Appendix G (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz
01	Left	-0.17	2.80	6.63	8.43	10.13	12.50	21.23	26.93	30.20	31.53
01	Right	13.87	17.90	18.27	18.07	15.93	20.07	26.90	32.43	35.60	37.17
02	Left	5.67	8.23	13.47	14.67	13.23	13.30	22.27	27.20	29.50	29.67
02	Right	0.93	5.93	7.47	10.10	10.07	12.03	19.90	28.33	28.33	30.30
03	Left	-3.03	0.20	7.60	11.70	11.50	12.83	21.30	29.83	35.13	34.70
03	Right	-5.83	-2.10	2.60	7.77	10.67	13.90	23.33	28.77	31.97	33.10
04	Left	8.57	15.37	16.90	19.03	15.73	17.33	26.33	30.00	30.93	33.33
04	Right	11.07	17.77	17.13	20.40	17.83	18.57	27.90	33.10	31.93	32.27
05	Left	-4.03	-0.57	7.37	11.97	13.90	14.30	23.13	26.50	31.73	33.97
05	Right	-4.77	1.03	4.73	9.97	11.20	12.67	20.23	25.07	30.03	33.80
06	Left	1.23	5.87	14.10	17.23	18.00	18.57	26.47	28.30	31.00	33.67
06	Right	2.13	8.10	11.03	15.63	18.23	20.43	30.33	33.40	33.53	32.30
07	Left	12.63	16.07	17.83	19.57	21.27	23.93	32.57	37.77	34.83	36.73
07	Right	11.07	15.37	18.90	22.03	24.13	27.20	35.57	34.70	32.43	34.67
08	Left	7.70	10.43	13.50	16.03	12.37	15.13	24.13	30.87	33.03	38.33
08	Right	-0.50	4.43	8.50	11.80	12.77	14.53	22.10	30.20	33.13	35.07
09	Left	8.97	12.87	14.43	16.83	15.73	17.23	25.23	35.27	30.93	33.03
09	Right	5.83	10.80	12.67	15.43	16.10	19.17	28.10	31.60	28.27	29.60
10	Left	8.03	9.87	12.50	14.27	13.30	14.90	24.00	25.43	27.47	31.53
10	Right	8.20	10.80	11.50	13.23	13.33	16.20	27.40	32.63	30.43	30.53
Insertion Loss (L)	Mean s	4.56 5.66	8.11 5.95	12.43 3.95	14.97 3.50	14.52 3.28	16.00 3.45	24.67 3.35	29.81 3.97	31.48 2.35	33.65 2.54
Insertion Loss (R)	Mean s	4.20 6.87	9.00 6.84	11.28 5.61	14.44 4.72	15.03 4.34	17.48 4.59	26.18 4.87	31.02 2.92	31.57 2.32	32.88 2.38

Appendix G (continued):

Subject Number	Test Ear	Third-octave test band center frequency									
		2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz
01	Left	38.13	38.17	39.53	40.37	34.67	33.77	31.90	31.77	25.10	20.00
01	Right	42.67	44.73	45.83	45.50	43.97	43.60	34.60	33.80	32.73	29.77
02	Left	32.53	35.57	38.03	29.37	27.90	24.23	22.87	27.10	26.27	20.00
02	Right	26.50	29.20	32.03	26.70	25.70	22.13	26.10	28.70	26.00	21.30
03	Left	30.67	25.90	30.87	30.20	27.57	31.87	31.53	29.40	28.83	20.00
03	Right	25.00	21.00	24.70	19.13	18.87	17.73	23.60	19.70	19.83	10.00
04	Left	38.67	36.67	40.20	37.77	35.97	24.13	25.83	31.10	26.17	29.83
04	Right	32.40	37.10	41.50	46.77	41.03	35.60	32.13	31.80	27.10	29.83
05	Left	22.70	23.13	32.90	31.57	27.30	30.17	31.30	26.17	25.60	16.93
05	Right	26.20	26.90	26.70	25.23	27.17	25.43	27.67	23.17	20.90	10.13
06	Left	38.20	37.43	35.30	26.57	19.60	21.43	22.03	25.77	21.30	16.67
06	Right	32.67	35.70	35.67	34.67	24.37	21.83	26.13	28.13	24.93	20.00
07	Left	37.07	41.57	43.67	42.10	37.40	33.47	31.60	32.63	26.27	29.97
07	Right	38.90	42.80	49.17	46.70	41.17	37.63	33.37	25.77	23.23	29.53
08	Left	34.67	32.43	36.83	35.33	32.93	34.77	32.77	34.83	25.77	20.00
08	Right	33.40	31.83	38.00	30.13	32.60	26.77	26.77	27.27	27.30	20.00
09	Left	36.10	30.90	30.20	27.47	25.80	31.60	34.90	36.07	27.10	20.20
09	Right	36.83	36.00	34.87	33.00	22.90	24.80	25.73	27.03	24.73	20.17
10	Left	30.53	32.17	35.37	37.50	35.50	26.53	27.00	26.53	21.67	20.00
10	Right	33.57	37.93	38.13	35.33	39.07	22.07	28.63	28.87	24.10	20.00
Insertion Loss (L)	Mean	33.93	33.39	36.29	33.82	30.46	29.20	29.17	30.14	25.41	21.36
	s	4.99	5.69	4.26	5.52	5.70	4.73	4.42	3.72	2.30	4.69
Insertion Loss (R)	Mean	32.81	34.32	36.66	34.32	31.68	27.76	28.47	27.42	25.09	21.07
	s	5.74	7.23	7.72	9.57	9.04	8.33	3.66	4.01	3.62	7.23