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Female Hairstyle and Flight Helmet Accommodation: The AMELIA Project Phase I: Survey Study Part 1: Research Report

By

B. Joseph McEntire
Barbara A. Murphy
Ben T. Mozo
John S. Crowley

Aircrew Protection Division

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U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama 36362-0577

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Reviewed:

FOR JOHN S. CROWLEY
LTC, MC, MFS
Director, Aircrew Protection Division

JOHN A. CALDWELL, Ph.D.
Chairman, Scientific Review Committee

Released for publication:

for CHERRY L. GAFFNEY
Colonel, MC, SFS
Commanding

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Most personal protective equipment in current military aviation was designed with male aircrew in mind. To ensure that female aviator performance is not hampered by improperly fitted or sized equipment, the U.S. Navy (USN) established the Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) program. In this Phase I study, a novel questionnaire was distributed to a variety of USN and U.S. Marine Corps (USMC) aviation installations around the world to assess the effect of female hairstyles on flight helmet performance and safety. One hundred and one completed questionnaires were returned to the U.S. Army Aeromedical Research Laboratory (USAARL) resulting in a response rate of 21-40%. Possible reasons for the relatively low response rate are discussed. A variety of information concerning subject demographics, military experience, helmet usage, and ancillary equipment (e.g., night vision goggles (NVGs), spectacles, etc.) is reported. The most common hairstyle in the sample was short and straight, selected for reasons unrelated to safety. Despite switching hairstyles in the past, hot spots continued to occur frequently
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in these female respondents. This report (Part 1) contains the detailed report of the survey study methods and results, while Part 2 comprises the raw data.

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Introduction

Recent directives by Congress have increased opportunities for female personnel to occupy aviator and aircrew positions in the military. However, most personal protective equipment (e.g., flight helmets, survival vests, gloves, etc.) in current military use was designed with male aircrew in mind. Since there are considerable differences between male and female anthropometry, significant problems accommodating females in military aviation have become common. To ensure that female aviator performance is not hampered by improperly fitted or sized equipment, the U.S. Navy (USN) established the Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) program. Anthropometric differences aside, one generally consistent cross-cultural difference between males and females is in hairstyle. This is reflected in U.S. military regulations specifying standards of appearance--for example, females are allowed longer hair length as long as it is kept off the collar (Headquarters, Department of the Army, 1998). The focus of the present study is the effect of long hair worn in a variety of configurations, in combination with the different anthropometric characteristics of the female aviator head, on the performance of protective flight helmets. Aircrew protective helmets are designed to serve two basic functions. First, they must provide adequate protection for the head (in case of aircraft accident), and hearing (throughout day-to-day operations). Head protection is provided for bump, noise, impact, and windblast exposures, and helmet retention is obviously essential for adequate protection. Second, helmets serve as a mounting platform for audio and visual displays. To be effective in this regard, the helmet must remain stable throughout the flight environment and provide a comfortable fit for the mission duration. Any or all of these aspects of helmet performance could be affected by differences in head anthropometry or hair characteristics. No special guidelines on hair length and style exist for military female aviators, and no systematic review of the subject has been published to date. However, it is reasonable to assume that excessive hair bulk could adversely affect helmet performance throughout the flight regime, especially in the dynamic environment of a crash landing or ejection. It is, therefore, surprising that female aviators have been left to individually determine how to manage their hair while flying. It is likely that the aviator's choice of hairstyle is based primarily on comfort or convenience, and not safety or helmet performance. This survey study is Phase I of a USN-funded research program conducted at the U.S. Army Aeromedical Research Laboratory (USAARL) to study the effects of female head anthropometric and hairstyle differences on helmet performance and flight safety. The objective of Phase I is to assess current practices and attitudes of USN and U.S. Marine Corps (USMC) female aircrew in this regard.

Methods

Subjects

At the time the survey was distributed (1995), it was estimated that there were approximately 600 total female aircrew in the USN and USMC (personal communication, Ms. Colleen Swavely, Naval Air Warfare Center, Aircraft Division, Warminster, PA, 1995). Any female

aviator or aircrew was eligible for participation in the survey study, but it is not known exactly how many female aircrew were given the opportunity to respond. However, it is estimated that contact was made and questionnaires distributed to 250 potential subjects. The participants were instructed that the questionnaire was intended to provide a better understanding of the compatibility problems female aircrew have with existing aircrew helmets. Hair style was intentionally downplayed as an objective of the study to encourage participation by individuals with long hair (who might otherwise worry that their responses might lead to shorter hair regulations). All potential subjects were informed that their participation was completely voluntary.

Questionnaire

A novel questionnaire was constructed for this study (Appendix A). The questionnaire consists of five general sections: demographics, military experience, helmet usage, ancillary equipment and hairstyles. The "demographic" section collects basic descriptive information, while the "military experience" section focuses on the participants' aviation experience. The "helmet usage" section describes the current helmet use patterns by respondents. In the "ancillary equipment" section, respondents were queried regarding their use of various devices including skull caps, eye glasses, earplugs, chemical biological respirator (CBR) masks, oxygen masks, night vision goggles (NVGs), and helmet fitting systems. Finally, in the hairstyle section, participants were asked about their flight duty hairstyles, hair conditioning, and styling treatments. This section of the questionnaire was developed with the aid of a professional hair styling expert. A guide to hairstyle nomenclature is provided at appendix B.

Procedure

This survey was distributed in three different ways. The first occurred during an onsite visit with aircrew at Pensacola Naval Air Station (NAS) by representatives of the Naval Air Warfare Center - Warminster. During this effort, approximately 30-40 female aircrew participated in a fit assessment of anti-G garments. These aircrew were provided a copy of this survey and asked to return it completed. The second survey administration effort was performed at the squadron level by the Squadron Aviation Medicine Safety Officer (AMSO) or members of the Navy FAILSAFE Tiger Team. These individuals were instructed to administer the questionnaire to all female aircrew personnel in their squadron/unit individually or in groups in a way that would not interfere with normal operational duties. Over 200 copies of this survey were sent, but the actual number distributed to the female aircrew is unknown. The administrators distributed the questionnaires within 7 days of their receipt and asked the recipients to complete and mail their questionnaires within 7 days. The third survey administration effort occurred during site visits to five separate Navy facilities. At these site visits, 81 female aircrew volunteered to participate in a helmet performance and head anthropometry study. These volunteers were asked if they had received a copy of the questionnaire survey. If they had not, a copy was provided. All results were entered into a Microsoft Access database upon receipt at USAARL.

Results

One hundred and one completed questionnaires were received at USAARL. It was not possible to calculate a precise return rate, because of variability in local administration procedures. For example, it was evident that some aircrew had received locally reproduced questionnaires without the knowledge of the USAARL investigator team. It is possible only to say that the return rate was between 21 percent (101/600) and 40 percent (101/250).

The complete database (except for certain identifying information), showing each response by each subject, is contained in part 2 of this report (McEntire et al., 1998). The following section will present the principal findings of the study in summary form.

Demographics

The average age of the respondents was 26.5 years (range 19-41 years). Ninety-three percent were white (not of Hispanic origin), while three percent were Hispanic, one percent black, and one percent American Indian.

Military experience

Respondents represented 47 different units from a variety of aviation settings (unit designations are not provided to preserve anonymity). Approximately 75 percent of the respondents were officers (figure 1).

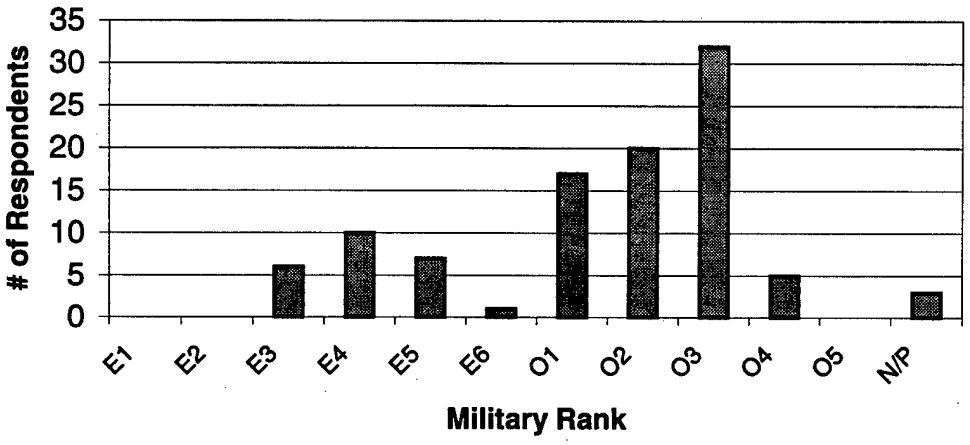

Figure. Rank distribution of survey respondents.

The respondents indicated experience in a wide range of aircraft, including fixed and rotary-wing varieties used by Navy and Marine forces (table 1). Mean reported total flight time

for the sample was 586.4 hrs (range 4-4400). Reported duty titles cover a wide range of aircraft operations (table 2).

Table 1.
Assigned aircraft type for sample.

Aircraft	Number	Aircraft	Number	Aircraft	Number
AV-8	1	H-1	1	S-3	6
C-2	4	H-3	4	T-2	1
C-12	2	H-46	17	T-34	18
E-2	3	H-53	4	T-39	1
E-6	1	H-57	14	T-45	2
EC-130	1	H-60	6	N/P*	14
F-14	1	P-3	12	Physiologist	1

*N/P = response not provided.

Table 2.
Usual aircrew duty position for respondents sample.

Mission duties	**N**
Pilot/Copilot	40
Navigator/Weapons Officer	5
Crew Chief	13
Equipment Operator	7
Student	19
Observer	4
Physiologist	2
NFO	5
No response	6

Helmets

Most helicopter aircrew stated that they used either the SPH-3C, HGU-64/P, or HGU-84/P flight helmets, while virtually all fixed wing aircrew used the HGU-33/P flight helmet (table 3). When this questionnaire was distributed in 1995, the U.S. Navy was in the process of replacing the SPH-3C series helmet with the HGU-84/P helmet system and was beginning to replace the HGU-33/P with the HGU-68/P. Thus, the helmet rotary-wing usage pattern is undoubtedly different today.

Table 3.
Helmet configuration generally flown by respondents.

	Typically used in rotary-wing aircraft			Typically used in fixed wing aircraft		
Helmet type	SPH-3C & HGU-64/P	HGU-67/P	HGU-84/P	HGU-33/P	HGU-55/P	HGU-68/P
Rotary	17	1	20			
Fixed				46	2	3
Both	1			1		

The SPH-3 or HGU-64/P flight helmets can be equipped with either a dual integrated visor or a single visor with NVG mount; they also have three fitting system options--the standard adjustable sling assembly, a V-tec poured chemical system, or a thermoplastic liner (TPL™). Table 4 shows that 14 of the 17 SPH-3 and HGU-64/P users have a dual visor system, and that the most common fitting system was the original sling arrangement.

Table 4.
Visor type and fitting system variations reported by SPH-3C and HGU-64/P users.

	Adjustable sling suspension	V-tec liner (chemical poured)	Thermoplastic liner (TPL™)
Dual integrated visor	6	5	3
Single w/NVG mount	2	1	
Not identified	1		

Similarly, the HGU-33/P helmet has various visor and fitting system options. Table 5 shows that most HGU-33/P users reported using a single integrated visor with a rigid housing, and most

helmets were equipped with a pad-type fitting system. Two HGU-55/P users also reported that their helmets were equipped with TPL™-type fitting systems.

Table 5.
Visor type and fitting system variations reported by HGU-33/P users.

	Pad fit	V-tec liner (chemical poured
Dual integrated w/rigid housing	3	3
Single integrated w/rigid housing	33	3
Single snap-on	1	

Ancillary equipment

This section of the questionnaire was intended to determine usage rates of equipment that might affect helmet fit or comfort.

Skull cap

Table 6 shows that about 24 percent of respondents wear a skull cap under the flight helmet regularly while 3 percent use one occasionally. The most frequently cited reason for using a skull cap was to keep hair in place (table 7).

Table 6.
Respondents' use of skull cap under flight helmet.

Yes	No	Sometimes	No response
24	63	3	11

Table 7.
Reasons cited for skull cap use.

Keep hair in place	Absorb sweat	Comfort	Sanitation	Other
16	5	2	2	2

Spectacles

The survey asked a series of questions about spectacle use without differentiating between prescription eyewear and sunglasses. Eyeglasses were worn with the helmet by 28 percent of the

respondents (another 3 percent indicated that they "sometimes" wear eyeglasses). About 68 percent of eyeglass users use the straight bayonet style temples, while 21 percent use the partial or complete wrap temple (table 8). Forty-six percent of users reported discomfort associated with spectacles: nine cited hotspots and four complained of headache (table 9).

Table 8.
Style of temple piece reported by spectacle users.

Straight	Partial wrap	Complete wrap	Straight/partial	No response
19	4	2	1	2

Table 9.
Discomfort from eyeglass temples reported by spectacle users.

Discomfort		Number
Yes		13
Hot spots/pressure points	9	
Headaches	4	
No		13
No response		2

Earplugs

Fifty-eight percent of participants reported using earplugs "most of the time" while 7 percent use them "sometimes." Table 10 shows that 95 percent of the earplug users use the yellow foam type. Of those who use earplugs, 34 percent described some problem with the devices (table 11).

Table 10.
Types of earplug used by respondents.

Custom molded	Triple flange	Yellow foam	No response
1	1	62	1

Table 11.
Problems reported with earplug use.

Earplug discomfort		Number
Yes/other		22
Fall out of ears	14	
Can't hear	3	
Irritation	3	
No response	2	
No		40
No response		3

Chemical/biological protective mask

Only four respondents (4 percent) indicated that they had flown with a chemical/biological (CB) protective mask. Of these four, only one person described any fit problems or discomfort with the CB mask.

Oxygen mask

Approximately one-half of respondents wore an oxygen mask at least sometimes while performing flight duties (table 12). Most mask-wearers reported using the MBU-12/P (table 13), and most wore either a short- or medium-sized mask (table 14). Sixteen individuals described fit problems of some sort with the oxygen mask (table 15); these are described in detail in part 2 of this report.

Table 12.
Number of respondents using oxygen mask while performing flight duties.

Oxygen mask worn		Number
Yes		16
Sometimes		27
Above 10,000 feet	15	
During emergencies	5	
In-flight refueling	1	
Take-off	2	
No response	20	
No		46
No response		11

Table 13.
Oxygen mask type used.

MBU-12/P	MBU-5/P	Other	No response
34	3	2	5

Table 14.
Oxygen mask size worn.

Custom--small/narrow	Short	Medium	Long	No response
2	21	13	1	7

Table 15.
Oxygen mask fit problems, leakage, and pressure points.

Yes (over the nose)	No	No response
12	23	5

* *Comments located in Part 2 of this report.*

Night vision goggles

Only eight respondents stated that they had previously used NVGs. Five of these individuals had used AN/AVS-6 NVGs for a group total of 200 flight-hours. One individual had used a counterweight (10 oz.) and two reported helmet instability when using the NVGs.

Helmet fitting system

Respondents described a variety of helmet fitting systems (table 16), with most using foam pads or a TPL™. Unfortunately, some respondents were inconsistent in identifying their helmet's fitting system in the two parts of the questionnaire. No attempt was made to correct these inconsistencies, and the recorded responses are provided. Many respondents described hot spots, fit problems, and/or thermal discomfort (table 17). Respondents indicated on a head drawing the location of principal hot spots (appendix C).

Table 16.
Type fitting system installed in respondents' helmets.

Adjustable sling	Foam pads	TPL™ (heat-fit)	TPL™ (pre-fit)	V-tec (poured)	V-tec (unpoured)	Not sure	No response
1	43	2	24	12	2	1	14

New bubble	Air bubble
1	1

Table 17.
Problems reported with current helmet fitting system.

a. Pressure points (hot spots)						
Around ears	Forehead	Back	Crown	Top of head	None	No response
13	18	3	5	10	36	16

b. Poor stability resulting in helmet movement about the (pitch, yaw, roll) axis				
Pitch	Yaw	Roll	All	No response
22	4	4	10	61

Table 17 (Continued).

c. Thermal discomfort					
Always	High workload periods	Hot environments	Other	Never	No response
10	22	36	3	9	21

d. Overall fit								
Fitting system response	Total	Foam pads	TPL™ (pre-fit)	TPL™ (heat-fit)	V-tec (poured)	V-tec (unpoured)	Sling	Not specified
Difficult to adjust	15	6	4	1	3	0	0	1
Difficult to fit	11	5	5	0	1	0	0	0
Not adjustable enough	27	16	5	1	4	0	1	0
Too wide	17	7	2	0	4	1	1	2
Too long	9	2	1	1	3	1	1	3
Too narrow	3	2	0	0	1	0	0	0
Too short	2	1	1	0	0	0	0	0
Too tight	20	12	5	0	1	1	0	0
Too loose	7	1	2	0	3	0	1	0
Other	15	7	6	0	2	0	0	0
Fits good	2	2	0	0	0	0	0	0
No response	39	10	9	1	5	1	0	13

Hair style

Hair characteristics

Hair length was distributed fairly evenly across the sample (table 18). Most respondents reported blond, light brown, or brown hair (table 19), and most described their hair as straight (table 20) (Healy and McCaig, 1993).

Table 18.
Self-assessment of general hair length.

Short	Medium	Long	X-long	No response
30	29	21	17	4

Table 19.
Self-assessment of natural hair color.

Auburn	Red	Blonde	Light brown	Brown	Dark brown	No response
7	7	26	28	24	5	4

Table 20.
Self-assessment of natural hair body.

Curly	Straight	Wavy
6	44	31

(NOTE: Subjects 1-20 not asked this question.)

Hair treatments

Respondents indicated that most (58 percent) routinely heat-treated their hair, most frequently by blow-drying (table 21). Somewhat fewer respondents indicated the use of chemical hair treatments (table 22).

Table 21.
Respondents' self-treatment of hair with heat.

Hair treatment			Number
Yes			47
	Blow dry	42	
	Curling iron	4	
	Hot curlers	1	
None			31
No response			3
Total			81

(NOTE: Subjects 1-20 not asked this question)

Table 22.

Respondents' self-treatment of hair with chemicals.

Treatment interval	1 mo.	2 mo.	3 mo.	4 mo.	5 mo.	6 mo.	9 mo.	12 mo.	18 mo.	24 mo	Total
Color	3	2	6	6		6	1	1	1		26
Permanents				1		5		7	1	1	15
Straighteners		1			1	1					3

Haircuts

The most popular interval between haircuts was 2 months, with 77 respondents (83 percent) getting a haircut at least every 4 months (table 23). Most respondents noted no difference in helmet comfort and performance between haircuts, although there were some comments. Four individuals noted that their helmets became too tight (n=4), some thought their helmet actually fit better (n=3), and two felt that their hair got in the way.

Table 23.

Interval between haircuts.

Haircut interval	1 mo.	2 mo.	3 mo.	4 mo.	5 mo.	6 mo.	7 mo.	8 mo.	12 mo.
Number of respondents	16	36	14	11	4	9	2	1	1

Hairstyle

The most common hairstyle worn under the flight helmet was"straight (short hair)." A French braid style was also popular, but less so (table 24). Comfort, convenience, and appearance were the top three reasons cited by respondents for choosing a hairstyle to wear under the flight helmet (table 25).

Table 24.
Respondents' hairstyle worn under the flight helmet.

#	Hairstyle
7	Braided
23	French braided
7	Straight, inside flight suit collar (long hair)
42	Straight (short hair)
4	Pinned up
9	Ponytail
1	Up in a bun
8	No response

Table 25.
Factors influencing respondents' selection
of hairstyle worn under flight helmet.

Rank	Factor	#1* rankings	Total Score
1	Comfort	56	69.0
2	Convenience	30	45.6
3	Appearance	12	26.3
4	Performance	9	19.4
5	Regulation	10	13.5
6	Environment	3	9.0
7	Recommendation	4	6.0
8	Safety	4	4.8
9	Sanitation	0	3.0
10	Directed	1	2.6
11	Instructed	0	1.4

**Respondents ranked each factor in order of importance. The sum of rankings at each level was divided by that rank number, and summed to derive a total score.*

Respondents indicated a wide range of flying experience with their current hairstyle, ranging from 2 flight hours to 3700 hrs (mean 404.8 hrs). Most respondents did not change their flight hairstyle due to environmental conditions (table 26); hot weather was cited by 11 respondents as the most frequent environmental cause for changing hairstyle.

Many respondents had tried other hairstyles under their flight helmets (table 27), and cited several problems with these hairstyles (table 28).

Table 26.
Proportion of respondents who changed flight hairstyle based on environmental conditions.

Change hair style?		Number
Yes		12
Hot--humid (cut short or pull back)	11	
Cold (wear close to head)	1	
No		85
No response		4

Table 27.
Other hairstyles worn under flight helmet.

Other hair styles tried under helmet	Number
Braided	10
French braided	20
Straight, inside flight suit collar (long hair)	8
Other (short, permed)	1
Straight (short hair)	10
Pinned up	3
Ponytail	3
Up in a bun	3
No response	43

Table 28.
Problems experienced with other hairstyles.

Problems experienced*	Number
Hotspots/pressure points	16
Messy	5
Uncomfortable	16
Bad fit	1
Safety	4
None	8
No response	51

**Verbatim responses are located in Part 2 of this report.*

Discussion

Methods for assessing the occupational environment include a survey or interview of some type--in the workplace or over the telephone, for example. Surveys have the advantage of being potentially anonymous, which may entice some reluctant witnesses to provide more honest and complete information than if there is the possibility of being identified (Berdie and Anderson, 1974). If we could be sure of a representative sample, comparisons could be made both within this sample (e.g., among units or rank groups), and with external comparison groups (e.g., other civil or military aviation organizations). This was the logic in deciding how to survey this particular military environment. Unfortunately, the low response rate in this study limits its external validity.

The poor response rate (21-40 percent) is most likely due either to faulty questionnaire distribution or to respondent noncompliance. As stated earlier, local personnel who no doubt had varying levels of training and motivation were asked to distribute the questionnaire. This may have resulted in inconsistent sampling. It is also possible that the population of interest, female flight crews, has been over-sampled in recent years, and has grown tired of being studied. Although our intent was to encourage response by ensuring respondent anonymity, the consequent inability to follow-up was problematic.

In any event, it is clear that the results of this survey should be interpreted as the opinions of a select minority, who, for whatever reason, chose to respond. We cannot assume that their thoughts are representative of the majority who did not respond (Chatfield, 1988). However, despite the low survey return rate, the respondent sample included a wide variety of ranks, duty

position, aircraft type, etc. This is somewhat reassuring and indicates that these data do not reflect opinions of, say, only one aircraft or helmet user population.

Given this limitation, we can make a few general observations:

First, the most common hairstyle in this sample of female aircrew is short and straight. As expected, respondents selected their flying hairstyle based on factors unrelated to safety--the top three reasons cited were comfort, convenience, and appearance.

Second, despite switching hairstyles in the past, for reasons of comfort and convenience (tables 25 and 28), hot spots continue to occur frequently in these female respondents. Whether this occurs at a higher rate than males is unknown.

Finally, while the main purpose of this survey was to gather information on hairstyle practices around Naval Aviation, a wealth of other information was gathered that may be of interest to other program managers. For example, user observations regarding helmet fit should be of interest to life support equipment (LSE) program managers.

Conclusions

Although a low response rate limits the external validity of this questionnaire study, it is apparent that female aircrew in this sample have considerable problems with helmet fit and comfort. Their detailed responses describe a variety of issues for further study in the follow-on experimental phases of Project AMELIA. Additionally, many LSE issues unrelated to gender were brought to light. This study will be useful to managers of aircraft and LSE programs in the U.S. Navy, as well as aviation human factors practitioners, regardless of affiliation.

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Appendix A.

Female aircrew helmet accommodation questionnaire

FEMALE AIRCREW HELMET ACCOMMODATION
QUESTIONNAIRE

INSTRUCTIONS: Please take your time to answer the following questions. All answers are completely voluntary and will be held in confidence. You may leave any question unanswered, but we encourage you to respond to all questions. The questions were generated with the intent of better understanding the effects between the various helmet configurations and female aircrew and to identify helmet deficiencies. The information to be gleaned from the questionnaire will help Navy ALSS engineers identify and better understand the helmet problems you are experiencing so that solutions may be attained. All responses will be held confidential.

DATE: _____

1. MILITARY EXPERIENCE

1.1 What is your MOS/Designator? _____

1.2 What is your rank?

Enlisted:	E1	E2	E3	E4	E5	E6	E7	E8	E9
Warrant:	W1	W2	W3	W4	W5				
Officer:	O1	O2	O3	O4	O5	06	07	08	09

1.3 Date of rank? _____

1.4 Assigned squadron/unit? _____

1.5 Currently assigned aircraft? _____

1.6 Number of flight hours in this aircraft? _____

1.7 Total number of accumulated flight hours? _____

1.8 Normal aircrew position? _____

1.9 Normal mission duties:

a.	Pilot in command	f.	Crew chief
b.	Copilot	g.	Flight mechanic
c.	Flight engineer	h.	Test pilot
d.	RIO	i.	Instructor pilot
e.	Sonar operator	j.	Other (describe) _____

2. DEMOGRAPHIC

2.1 What is your age? _____

2.2 What is your race? (Please circle)

a. Alaskan Native

b. American Indian

c. Asian or Pacific Islander

d. Black, not of Hispanic origin

e. Hispanic

f. White, not of Hispanic origin

g. Other (please specify): _____

3. HELMETS

3.1 What helmet configuration do you generally fly with? (Please circle)

ROTARY WING HELMETS

a. SPH-3C & HGU-64/P series (basic rotary-wing helmet) – **Please go to question 3.2**
Based on the traditional rotary wing helmet shell with large eardomes. Various visor assemblies And fitting systems are available in these configurations.

b. HGU-67/P (new AH-1 helmet configuration) – **Please go to section 4.**
Has a TACAIR helmet profile, an integrated chin/nape strap, polystyrene energy liner, pre-Formed thermoplastic liner (TPL™), tapered earcups, leather edgeroll, snap-on single visor, an HTS attachment, and a common mounting block for ANVIS and the helmet sighting reticle.

c. HGU-84/P (new basic rotary wing helmet) – **Please go to section 4.**
Identical to the HGU-67/P except without the HTS attachment block.

FIXED WING HELMETS

a. HGU-33/P series (basic fixed wing/TACAIR helmet) – **Please go to question 3.3.**
Basic fixed wing helmet with various mission and aircraft specific configurations..

b. HGU-55/P (USAF fixed wing basic helmet) – **Please go to question 3.4.**
Has a fiberglass shell, snap on single visor assembly, gray leather edgeroll, and either a pad Fitting system or a thermoplastic liner.

c. HGU-66/P (Night attack helmet) – **Please go to section 4.**
Similar to the basic HGU-55/P except the shell is pre-drilled to accommodate a CATS-EYES Night vision goggle mount and has an integrated chin and nape strap retention assembly.

d. HGU-68/P (New TACAIR helmet) – **Please go to section 4.**
Has a profile similar to the HGU-33/P and HGU-55/P series helmets. New features include a Graphite/nylon helmet shell, a low profile 600 knot single visor system, integrated chin and nape Strap retention harness, thermoplastic liner (TPL™) fitting system, leather covered earcups, and a Black leather edgeroll.

e. HGU-85/P (night attack helmet) – **Please go to section 4.**
Same features as the HGU-66/P except based on the HGU-68/P helmet shell and thermoplastic liner (TPL™) fitting system.

3.2 Please answer the following if your basic helmet is the SPH-3C or HGU-64/P

a. Which visor configuration is mounted on your helmet?
   i. Dual integrated (basic visor system)
   ii. Single with the Helmet Sight Assembly (used in the AH-1 aircraft)
   iii. Single with the Night Vision goggle mount (for SANVIS-6 NVGs)
   iv. Other (describe) _____

b. Which fitting system configuration is installed on your helmet?
   i. Adjustable sling suspension (basic system)
   ii. Leather covered custom liner, chemical poured (V-tec liner)
   iii. Leather covered custom liner, not chemical poured (V-tec liner)
   iv. Thermoplastic liner (TPL™), i.e., bubble wrap
   v. Other (describe) _____

3.3 Please answer the following questions if your basic helmet is based on the HGU-33/P series helmet.

a. Which visor configuration is mounted on your helmet?
   i. Dual integrated with rigid housing
   ii. Single integrated with rigid housing
   iii. Single snap-on visor with leather cover
   iv. Other (describe) _____

b. Which fitting system configuration is installed on your helmet?
   i. Pad fit (basic system)
   ii. Leather covered custom liner, chemical poured (V-tec liner)
   iii. Leather covered custom liner, not chemical poured (V-tec liner)
   iv. Thermoplastic liner (TPL™), i.e., bubble wrap
   v. Other (describe) _____

3.4 If your helmet is an HGU-55/P, which fitting system configuration is installed?
   i. Two-piece leather covered custom liner.
   ii. Thermoplastic liner (TPL™), i.e., bubble wrap
   iii. Other (describe) _____

4. ANCILLARY EQUIPMENT

4.1 SKULL CAPS

4.1.1 Do you wear a skull cap with the helmet? Yes No Sometimes (please explain)

_____

_____

4.1.2 If you wear a skull cap, please explain why you do so? _____

_____

_____

4.2 EYEGLASSES

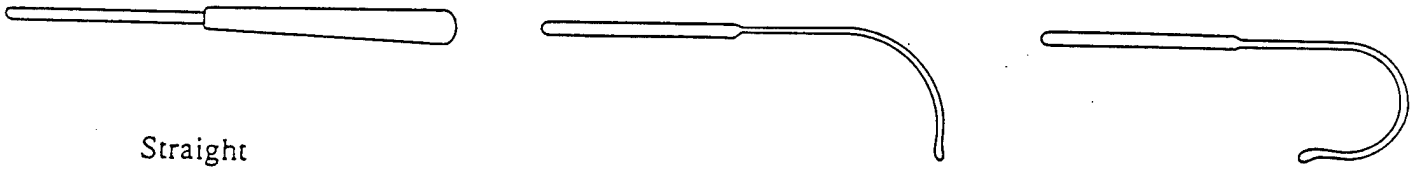
4.2.1 Do You wear eyeglasses (corrective lens or sunglasses) with the helmet?

Yes No Sometimes (If no, go to question 4.3. If sometimes, please explain.)

_____

_____

4.2.2 What type of temple bayonet do your eyeglasses have?



Straight

Partial wrap

complete wrap

4.2.3 Do you experience any discomfort, pressure points, or poor earcup earseal resulting from the eyeglasses temple bayonet? (Please explain) _____

_____

_____

4.3 EARPLUGS

4.3.1 Do you wear earplugs under your helmet? Yes No Sometimes (If no, please go to 4.4. If sometimes, please explain.) _____

_____

_____

4.3.2 What type of earplug do you routinely use?

E.A.R. (yellow foam)
Triple flange
Moldable wax
Custom fitted
Other (please identify or describe) _____

4.3.3 Do you experience any pain, discomfort or any other problems from the use of earplugs? (Please explain) _____

_____

_____

4.4. CBR MASKS

4.4.4 Which chemical/biological protective mask have you used (please approximate the number of flight hours)?

AR-5 _____ Other (specify) _____ None (go to 4.5)

4.4.2 Did you have any fit problems or experience any pressure points, hot spots, or other discomfort with the CBR mask? (Please explain and describe) _____

_____

_____

_____

_____

4.5 OXYGEN MASKS

4.5.1 Do you wear an oxygen mask while performing flight duties?

Yes No (if no, go to 4.6) Sometimes (please explain) _____

_____

_____

4.5.2 Which oxygen mask do you normally use?

a. MBU-5/P (Air Force custom made)
b. MBU-12/P (USN/USMC/USAF standard issue)
c. Other (Please identify or describe) _____

_____

4.5.3 What size is your oxygen mask?

Short Medium Long X-long

4.5.4 Do you have any fit problems, leakage, pressure points, or experience other discomfort with the oxygen mask? (Please explain or describe) _____

_____

_____

_____

_____

4.6 NVGs

4.6.1 Do you use night vision goggles (NVGs)? Yes No (If no, go to 4.7)

4.6.2 What type of NVGs have you used and approximately how many hours have you accumulated with them?

AN/AVS-6 _____ CatsEye _____ PNVS-5 _____ Other (list)_____

4.6.3 Do you use a counterweight with the NVGs? Yes No (:If no, go to 4.7)

4.6.4 What do you use as a counterweight? _____

4.6.5 Approximately how much does the counterweight weigh? _____ oz/lb/gm

4.6.6 Do you experience helmet instability when using the NVGs? Yes No

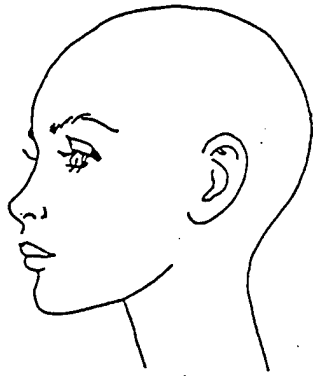
4.7 HELMET FITTING SYSTEM

4.7.1 What type of fitting system does your helmet have?

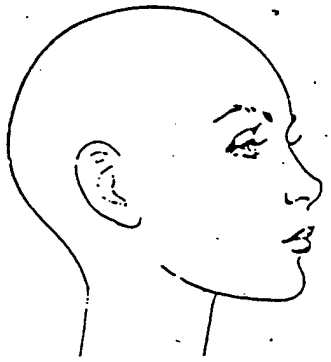
a. V-tec (unpoured)
b. V-tec (poured)
c. Foam pads
e. TPL™ (pre-fit, bubble wrap type)
f. TPL™ (heat fit, bubble wrap type)
g. Adjustable sling

4.7.2 Which of the following do you experience with your helmet fitting system?

a. Pressure points (hot spots)? Yes No (If yes, please chart locations below)



left side



right side

b. Poor stability resulting in helmet movement about the _____axis (pitch, yaw, roll).

c. Thermal discomfort (i.e., heat buildup)
(1) Always
(2) Only during high workload periods
(3) Usually in hot environments (summer, tropical, etc.)
(4) Never
(5) Other (describe) _____

d. Overall poor fit, i.e., the fitting system is (please circle all that apply):
(1) Too narrow
(2) Too wide
(3) Too short
(4) Too long
(5) Too loose
(6) Too tight
(7) Not adjustable enough
(8) Difficult to fit
(9) Difficult to adjust
(10) Other _____

5. HAIR STYLES

5.1 What is the general length of your hair? (Please circle or sketch your hair line, if not illustrated.)

a. short – off the neck

b. medium – top of the shoulders

c. long – over the shoulders

d. extra long – below the shoulder blades

5.2 Which of the following best describes your natural hair color? (Please circle)

a. auburn	d. blonde	g. dark brown
b. red	e. light brown	h. gray
d. black	f. brown	

5.3 Which of the following best describes your natural hair body? (Please circle)

a. straight b. wavy c. curly

d. other (describe): _____

5.4 Do you routinely heat treat your hair? Yes No (If yes, please circle the method used most frequently)

a. blow dry
b. hood hair dryer
c. curling iron
d. flat iron
e. hot curlers
f. other (describe) _____

5.5 Do you chemically treat your hair with any of the following? Yes No (If no, go to 5.8) Please circle all that apply.

a. coloring
b. permanents
c. straighteners
d. other (describe): _____

5.6 Approximately how often do you chemically treat your hair with

a. coloring, every _____ months
b. permanents, every _____ months
c. straighteners, every _____ months
d. other, every _____ months

5.7 What differences in helmet comfort and performance do you notice between hair chemical treatments? _____

_____

_____

5.8 Approximately how often do you cut your hair? Every _____ months.

5.9 What differences in helmet comfort and performance do you notice between hair cuts?

_____

_____

5.10 Which of the following best describes your hair style under your flight helmet? (Please circle)

a. braided
b. french braid
c.. straight (short hair)
d. straight, inside the flight suit collar (long hair)
e. up in a bun
f. pinned up
g. pony tail
h. other (describe) _____

_____

5.11 What factors influenced your decision to use this hair style under your flight helmet? (Please rank all that apply in order of importance, 1 = highest importance, etc.)

_____ a. comfort
_____ b. appearance
_____ c. helmet performance
_____ d. convenience
_____ e. instructed to do so
_____ f. regulation
_____ g. directed to do so
_____ h. recommendation
_____ i. sanitation
_____ j. operational environment (hot/cold/humid)
_____ k. other (describe): _____

5.12 Approximately how many flight hours do you have with your current hair style? _____

5.13 Do you change your flight hair style for various environmental conditions (i.e., hot, cold, wet, humid, dry)? Yes No (If yes, please describe changes) _____

_____

_____

_____

5.14 What other hair style(s) have you tried under your helmet? (Circle all that apply)

a. braided
b. french braid
c. straight (short hair)
d. straight, inside flight suit collar (long hair)
e. up in a bun
f. pinned up
g. pony tail
h. other (describe): _____

_____

5.15 What problems did you experience with these other hair styles? _____

_____

_____

_____

_____

_____

Please add any additional comments you would like to make regarding ALSS: _____

_____

_____

_____

_____

_____

_____

Appendix B

A pictorial guide to hairstyle terminology

Examples of hairstyles worn by female aircrew

Figure B-1. Braid

Figure B-2. French braid-up

Figure B-3. French braid – down

Figure B-4. Ponytail

Figure B-5. Straight–short

Figure B-6. Straight–short

Figure B-7. Straight–long inside collar

Figure B-8. Pinned up

Appendix C

Location of "Hot Spots"

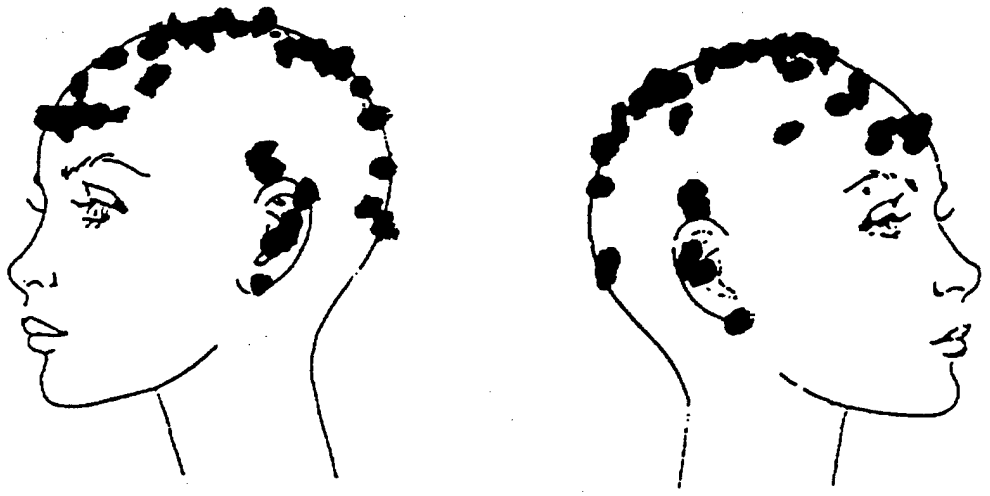


Figure C-2. HGU-33/P series fixed-wing helmet (n= 47).

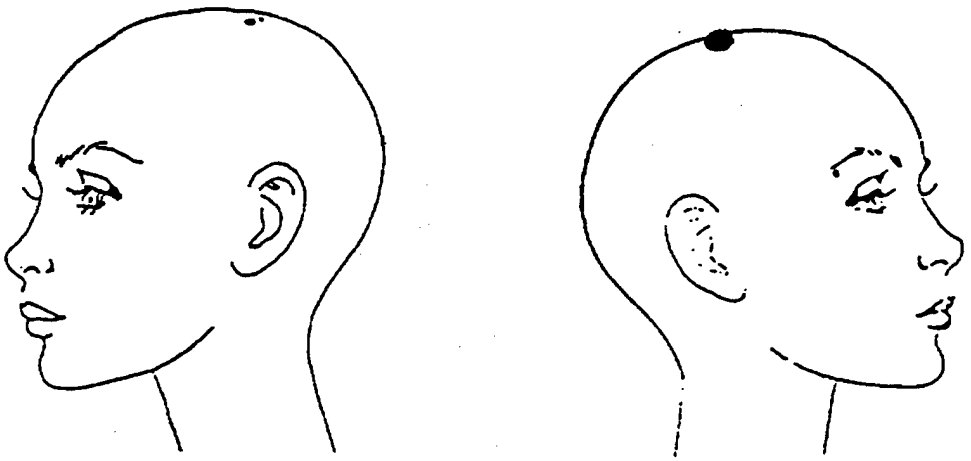


Figure C-3. HGU-55/P series fixed-wing helmet (n= 2).

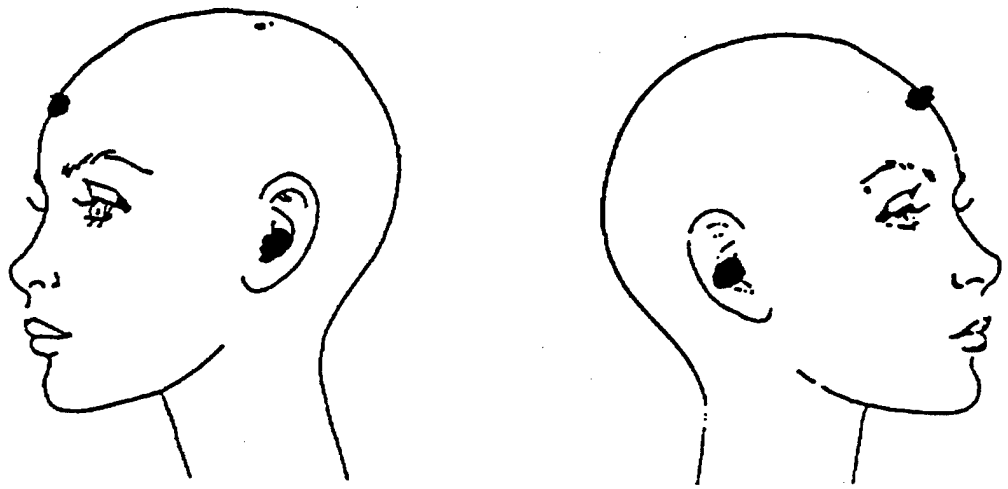


Figure C-4. HGU-67/P series fixed-wing helmet (n=2).

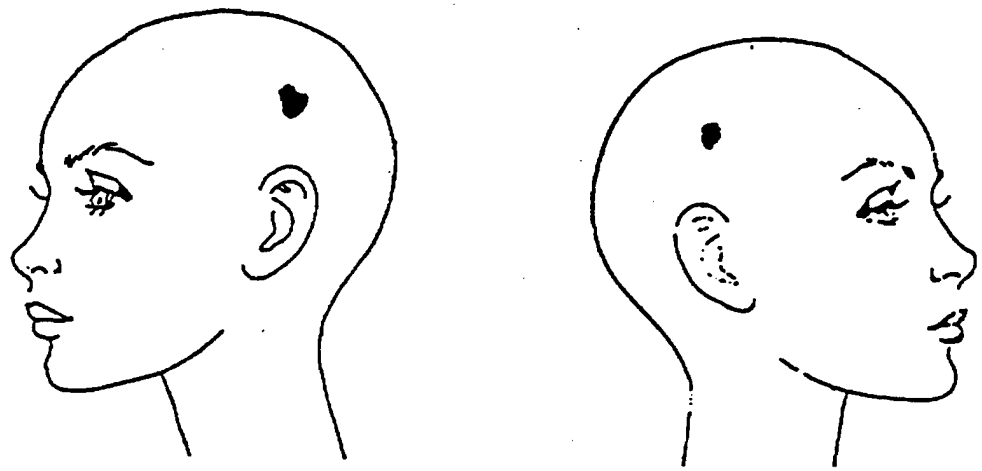


Figure C-5. HGU-68/P series fixed-wing helmet (n=2).

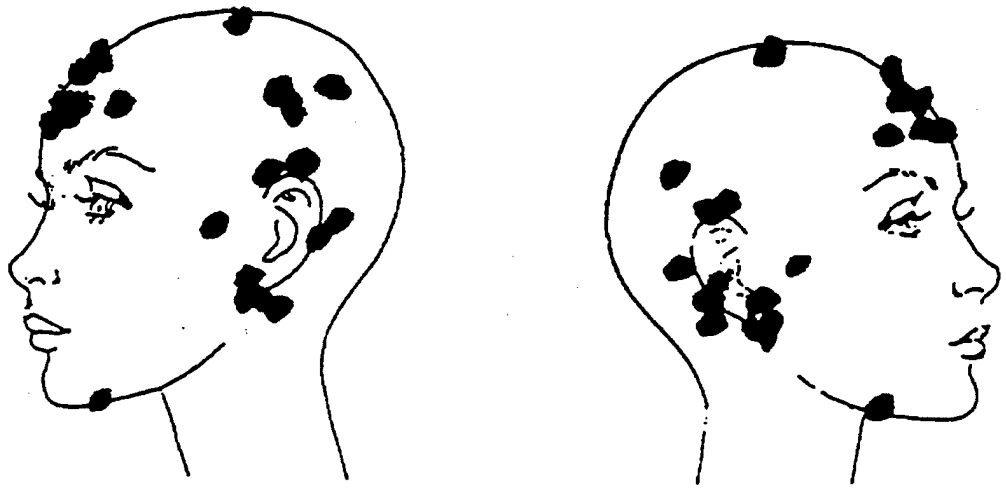


Figure C-6. HGU-84/P series rotary-wing helmet (n=20).

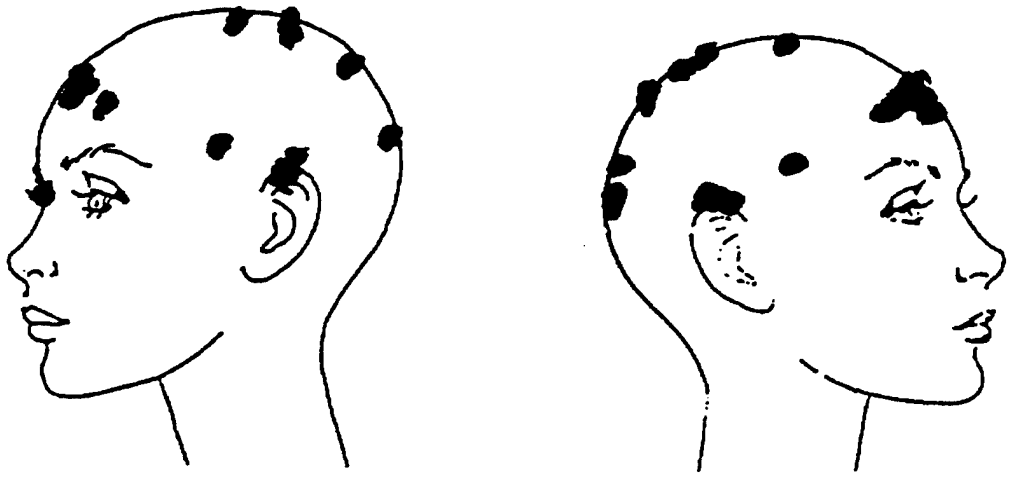


Figure C-7. SPH-3C and HGU-64/P series rotary-wing helmet (n=17).

II. Hot Spot location based on type of helmet fitting system.

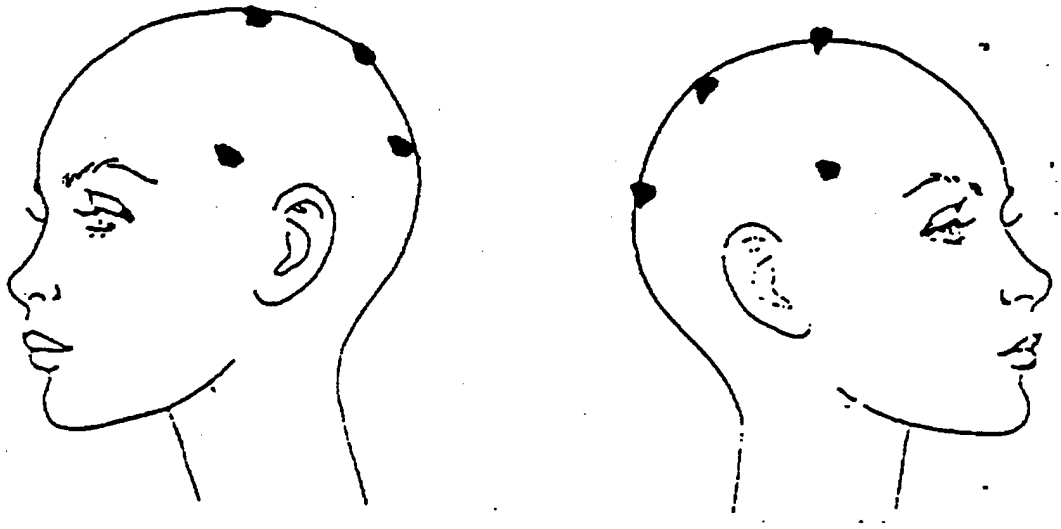


Figure C-8. Adjustable sling harness type fitting system (n=2).

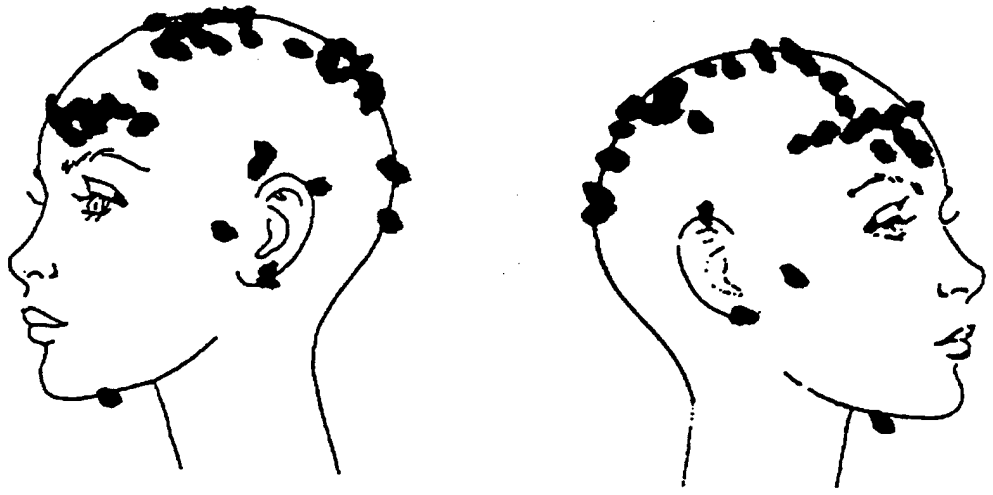


Figure C-9. Foam pad type fitting system (n=43).

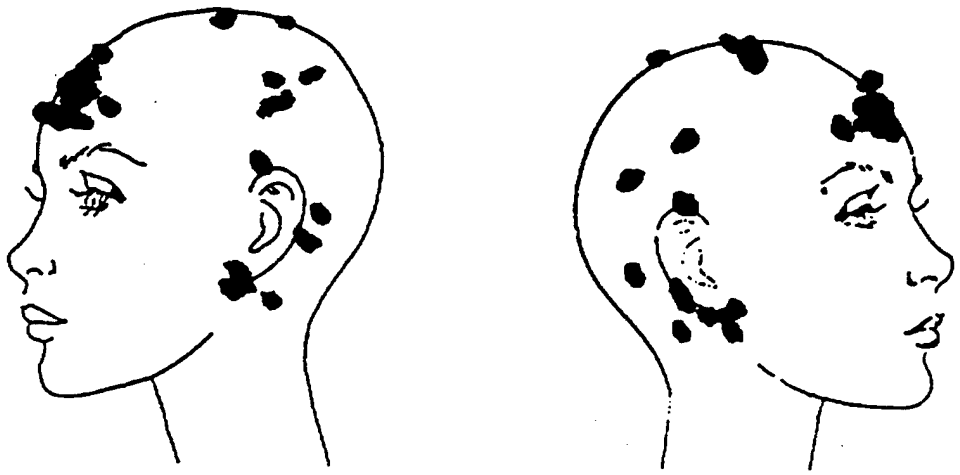


Figure C-10. TPL™ type fitting system (pre-fit)(n= 26).

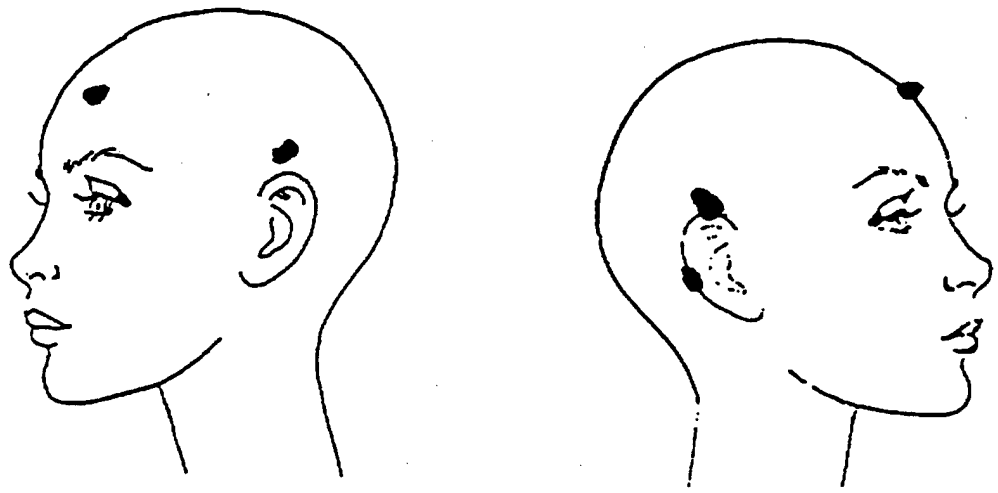


Figure C-11. TPL™ type fitting system (heat-fit)(n= 2).

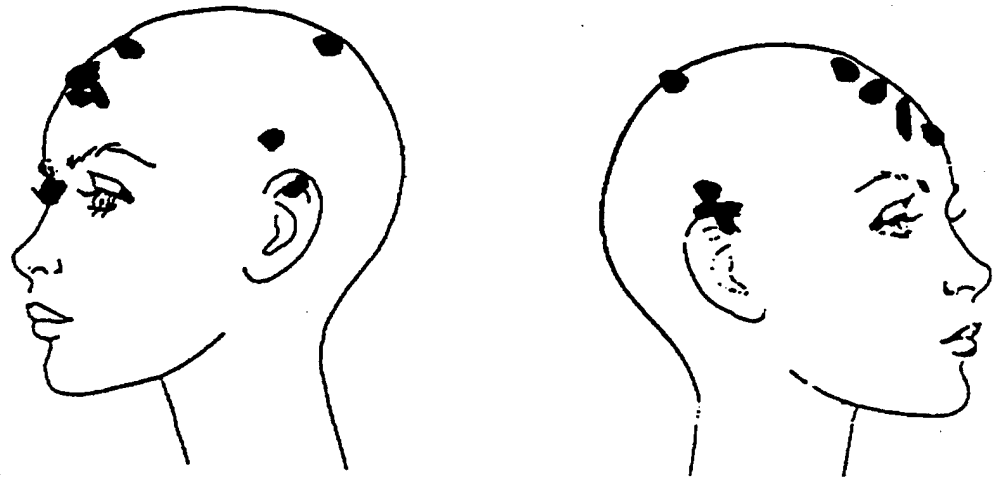


Figure C-12. V-tech type fitting system (poured)(n= 12).

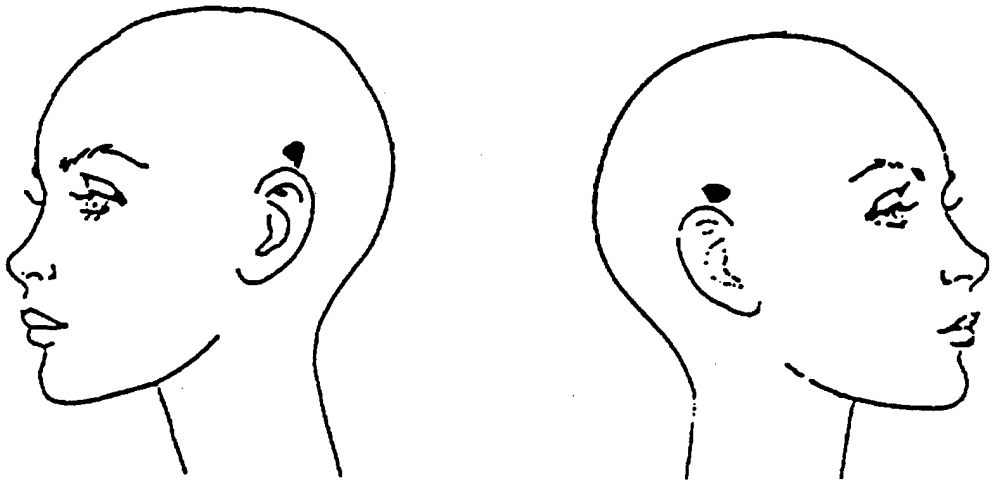


Figure C-13. V-tech type fitting system (unpoured)(n= 2).

III. Hot Spot location based on hair style.

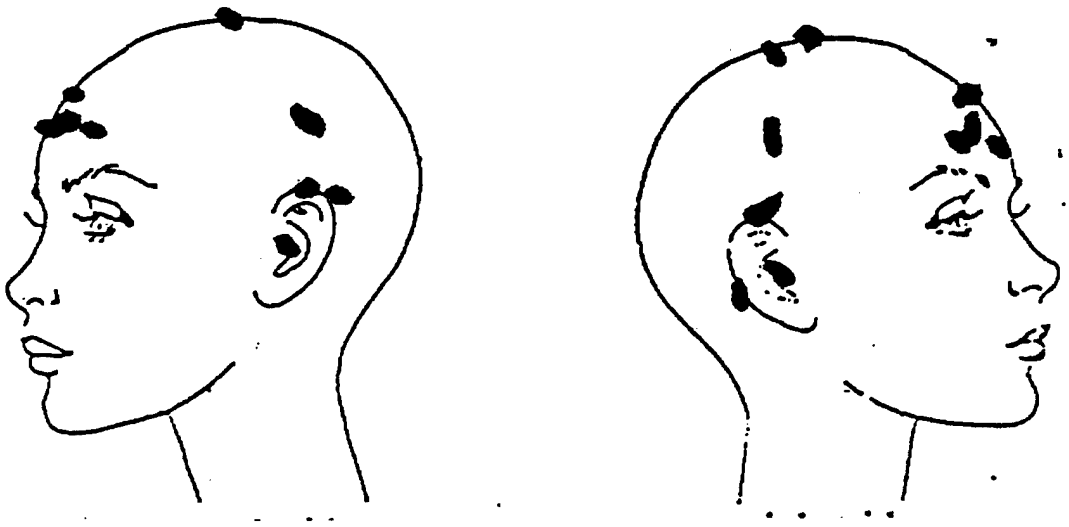


Figure C-14. Braid hair style (n= 7).

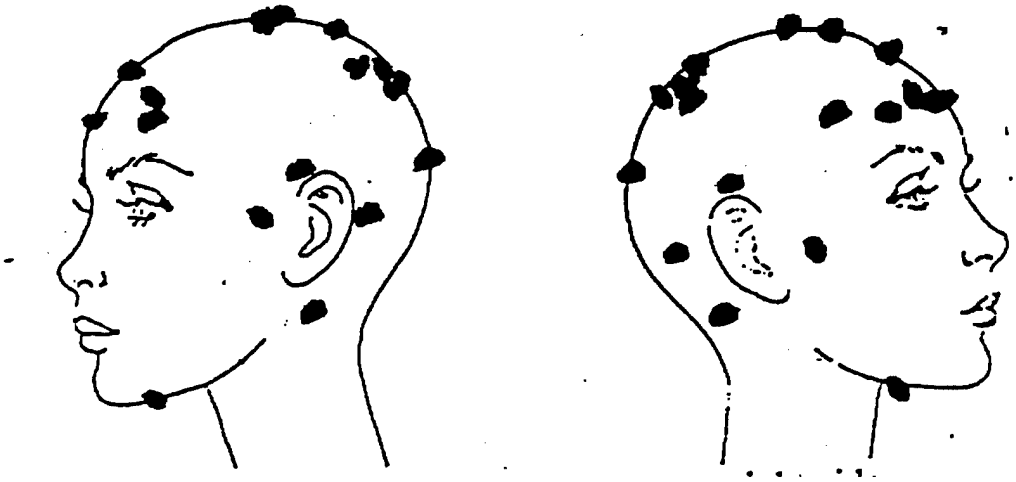


Figure C-15. French braid hair style (n= 11).

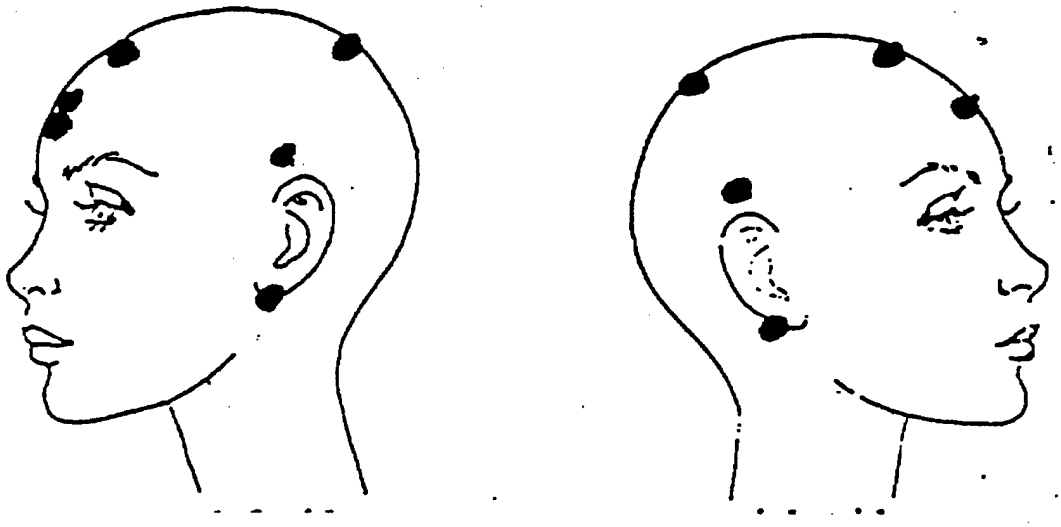


Figure C-16. Pony tail hair style (n=4).

Figure C-17. Straight, short hair style (n=20).

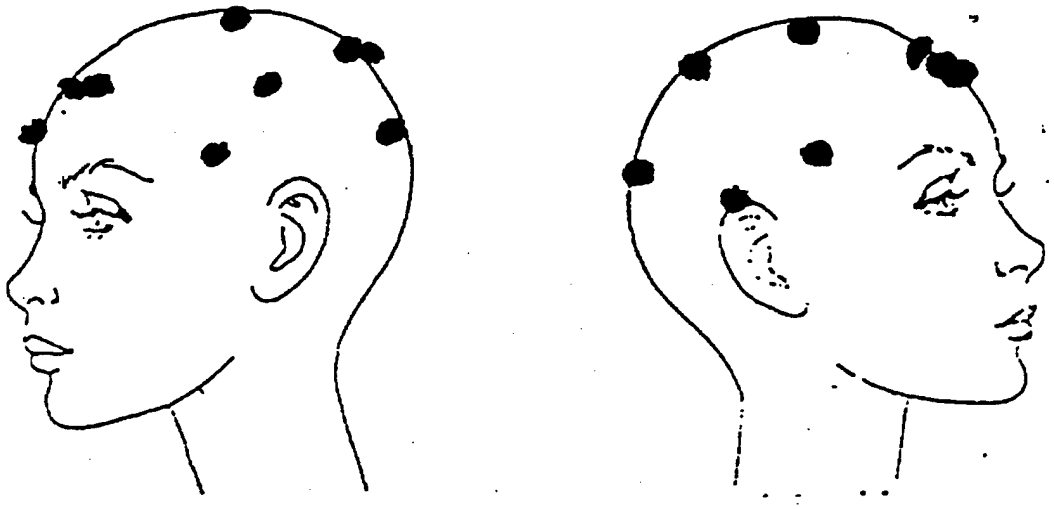


Figure C-18. Straight, long hair style, worn inside flight suit collar (n= 5).

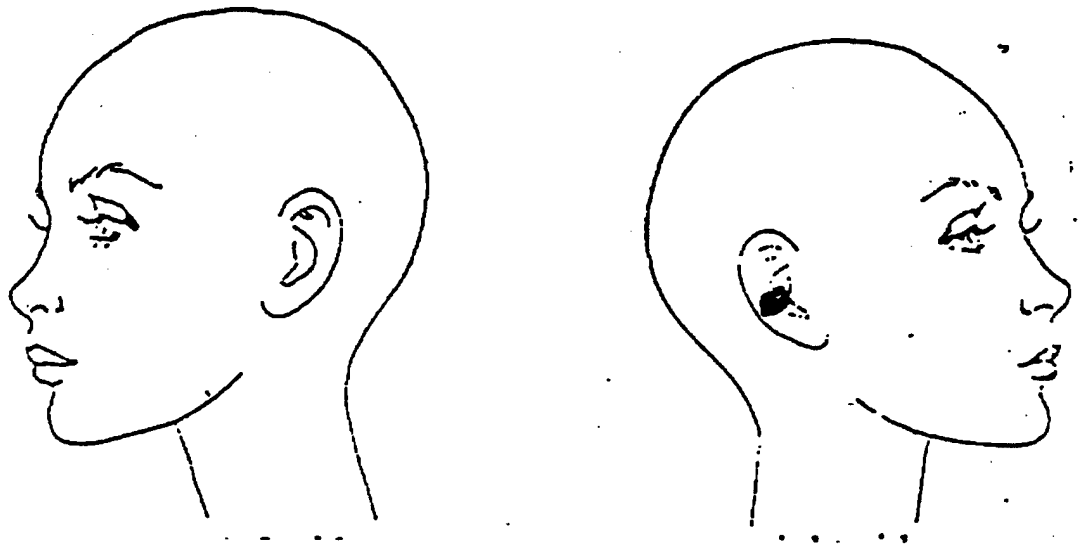


Figure C-19. Pinned up hair style (n= 1).