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UNITED STATES AIR FORCE RESEARCH LABORATORY

FLIGHT SUIT SIZES FOR WOMEN

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This report has been reviewed by the Office of Public Affairs (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public.

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER

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This report documents the devi	elopment of a minimal set of	light suit sizes specific	cally for fem	ales. The project goal is to			
improve flight suit accommoda	ation for females across all ser	vices. Researchers us	ed fit test res	sults of existing prototypes			
to establish the relationship be	tween anthropometry and fit f	or women, and express	sed the prope	er proportioning as the			
degree of change from the prot	otypes. The prototypes were	the exiting flight suit s	sizes proporti	ioned for men. Analysis			
included fit test data of the Mo	dified Enhanced Air Force Fl	ight Suit (MEAFFS) c	ollected inde	pendently by the Air Force			
and Navy. The results indicate	that female sizes should have	e narrower shoulders.	smaller necks	s and waists, shorter upper			
torsos and shorter legs Resea	inchers examined neighboring	size data from the Air	Force fit tes	t and differences between			
male and female anthronometr	y to determine how much cha	nge was needed to gen	arate a base	female size Four more			
famela sizes are recommended	two larger than the base size	and two smaller then	the base size	These five sizes should			
Temale sizes are recommended	: two larger than the base size	and two smaller than	the base size	. These five sizes should			
be available in two lengths for	a total of ten female proportio	oned sizes. The estimation	ited grade for	r existing sizes can be			
applied to the female base size	to generate these sizes.						
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PREFACE

This study was carried out under contract F41624-93-C-6001 with Armstrong Laboratory, Wright-Patterson Air Force Base, Ohio. Funding was provided by the Defense Women's Health Research Program. Several clothing specialists were involved in this project. The authors wish to thank Margaret Altenau and Deborah Klensch of Human Systems Center for providing garment patterns and valuable instruction on pattern measurement and sizing system development. Holli Williams, Scena Proodian, and Colleen Swavely of the Naval Aircraft Warfare Center provided supportive data and collaboration. Bruce Bradtmiller of Anthropology Research Project, Inc. conducted parallel research for the Navy and was a good source of information. Patrick Files of Sytronics, Inc. was particularly helpful as our technical editor.

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CHAPTER I INTRODUCTION

A fit test is a method for quantitatively defining the relationship between 1) body size and shape (anthropometry), and 2) quality of fit for an item. Applying this information to a particular problem or problems, combined in some instances with other data, is useful in many applications. Some of the most important applications include:

- 1. determining the best proportions for an item,
- 2. ensuring accommodation of the population of users,
- 3. minimizing the number of sizes and adjustments (and the associated cost),
- 4. determining how many of each size to buy (the tariff),
- 5. developing a chart to help the wearers select their size,
- 6. removing fit as a confounder in other performance testing of an item.

Fit means much more than just comfort and appearance. It can include safety and performance criteria as well. The fit evaluation criteria varies depending upon the item. In the clothing industry, the way in which an item is expected or required to fit is called the "concept of fit." For a fit test, this concept of fit is translated into some consistent and measurable form by which fit can be evaluated. Some advanced questionnaire methods have been developed for comfort and appearance. Because safety and performance are also important aspects of fit, they too are recognized as fit indicators.

Fit tests conducted on all types of items from body armor (Zehner et al., 1987) to flight helmets (Blackwell and Robinette, 1993) indicate that, in practice, the anthropometry to which an item is designed is often not accommodated in it. In other words, the item often does not fit the people for which it was intended. One key cause for problems has been the assumption that, given anthropometry alone, the size of an item can be determined. This is a fallacious assumption. The correct proportioning of an item for a given body also requires knowledge about the relationship between the body and the fit of the item. For some items, extra room, or "ease," is needed. For example, if a suit coat's proportions were exactly the same as the wearer's body, the suit coat would actually be too small. It was found in a recent study of women's uniforms (Mellian et al., 1992) that the waist of a skirt or pair of slacks should be smaller than the body measurement for waist to fit best. Clothing has a long history of tailoring, so many of these fitting "rules of thumb" are fairly well established (at least for some segments of the population). For other items, particularly the latest high technology equipment, there is no fitting history to provide a knowledge base. Therefore, the relationship between fit and anthropometry for most new designs must be defined in order to determine the optimum number, assortment, and proportioning of sizes. This is done through fit testing.

Until recently, pilots were almost exclusively male. Consequently, most equipment used by pilots was designed for male proportions. With pilot training entrance requirements being modified in order to include more females, women are finding it difficult to fit into the currently available flight suit sizes. There has been considerable research into the area of accommodating women dating back as far as 1939, so much is known about the proportional differences between the sexes. Using the 1977 Survey of U.S. Army Personnel, these differences have been well illustrated (Robinette, 1995). Given equal stature and weight, a woman will have a hip breadth that is almost two inches larger than a man's, and her shoulder breadth is almost an inch smaller. Figure 1 demonstrates the fit problem for women in flight suits. The woman in the figure meets current pilot training entry requirements. She is wearing a size 38 regular flight suit-one of the sizes most widely used by men. It is clear that the hips of the suit are too wide and the shoulder area is too baggy. These fit problems can be an ejection hazard and can, at the very least, restrict reach and mobility. Increasing the size so that the hips fit better would only worsen the bagginess problem.

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Figure 1. Fit problem for women in flight suits.

Creating female flight suit sizes by simply scaling the men's proportions down clearly does not address the proportioning problem. Data from fit tests can be used to determine exactly how to reproportion the men's sizes so that women will be accommodated better.

In 1991 and 1992, Air Force investigators conducted a fit test of the MEAFFS (stock number 8415-01-351-0324) on 476 male and 71 female aircrew (Crist et al., 1995). Results of the analysis showed that while the current sizes fit men well, they do not fit women well. Extra-short sizes and some other sizes proportioned specifically for women were recommended. It was further recommended that a separate sizing system be developed for women.

The Navy women were also experiencing problems fitting into the MEAFFS. In late 1995, Navy investigators conducted a fit test of the MEAFFS on 89 female aircrew (Williams, in progress). Capitalizing on this effort in hopes of combining the Air Force and Navy data sets to obtain a larger sample, the two surveys were compared. A statistical comparison of the Air Force and Navy sample anthropometry indicated that the two samples were physically similar. This indicated that any changes recommended to better accommodate Air Force women would also better accommodate Navy women. Fit evaluation criteria were different enough that separate analyses for quality of fit were required, however. Coordination with the Navy Aviation program would ensure joint service acceptance and compatibility of the new female sizes.

The purpose of this study is to develop a sizing system for women based on the analyses of these two surveys. While the immediate goal is to better accommodate the Air Force population, the Navy data was used to strengthen results in hopes of providing joint service accommodation.

Finally, it should be pointed out that there is an even broader benefit from this research effort. The obvious benefit is that the recommendations contained in this report will provide a way to modify a MEAFFS that fits well on men into a MEAFFS that fits well on women. However, these recommendations could be applied to any well-fitting men's garment with a similar concept of fit to generate a well-fitting women's garment.

CHAPTER II APPROACH

The approach of this effort involved using male-based sizes and fit test data of women wearing these sizes to devise a set of changes to better accommodate women. The following questions were addressed: 1) Is there an overlap in sizes that can accommodate both men and women?, 2) How many new sizes are needed that are exclusively proportioned for women?, 3) How should these sizes be proportioned?, 4) How much should they be changed?, and 5) What is an estimate of the pattern measurements for the female sizes?

The numbered items below provide a brief summary of the approach:

1) Find out what data are already available and what is already known about male/female proportioning differences.

2) Locate and measure patterns for fit test suits.

3) Estimate size grade for current sizes.

4) Compare anthropometry and fit quality data for available samples to determine whether available samples can be grouped to increase the power of statistical analyses.

5) Conduct fit quality analysis to determine which male sizes (if any) also accommodate females, find how many female sizes are needed, and identify necessary proportional changes.

a) If samples can be grouped, combine all available survey data and conduct one quality of fit analysis.

b) If samples cannot be grouped, conduct separate quality of fit analyses for each sample and base overall decisions mainly on results of analysis of Air Force fit data. Use results from Navy fit analysis to modify decisions if necessary.

6) Determine amount of recommended proportional changes by:

a) examining the Air Force fit quality data of females with an overall unacceptable fit in the MEAFFS for sizes neighboring their best fitting size--the next smaller, larger, shorter, and longer sizes.

b) examining mean anthropometric differences between Air Force males who received an acceptable overall fit in the MEAFFS and Air Force females who did not receive an acceptable fit,

7) Estimate pattern dimensions for female sizes by applying proportional changes and size grade for current sizes.

The plan was to use existing patterns as a point of departure for the adaptation to women's sizing. There was an unanticipated complication with the patterns, however. Essentially, there were no measured patterns available for the suits tested. Each size of the MEAFFS currently is a separate size independent of the other sizes. The sizes were never graded, and the patterns were never computerized. The analysis could not be completed without accurate dimensions of the patterns. Consequently, pattern measurement was added to this effort. The Air Force version of the MEAFFS patterns were measured, because they are the patterns for the suits that were actually tested. Measurements were taken on patterns of all available sizes. One each of finished garment sizes 36S, 36R, 38S, and 38R was also examined to see how pattern pieces related to one another. One subject donning a size 36S was useful in deciding how to take some of the pattern measurements. Numerous consultations with clothing specialists took place during the measurement process.

The analytical effort began by comparing the Air Force and Navy sample anthropometric summary statistics and measurement descriptions. Furthermore, multivariate analyses were conducted to select the variables that most influence size. The degree of similarity between the surveys was used to decide how to proceed. While the anthropometry of the samples was quite similar, the samples were dissimilar in the fit data that were collected. Furthermore, the suits tested by the Navy were not the same as those tested by

the Air Force (probably due to manufacturing or pattern differences). Subsequent analyses on fit data were conducted for each survey separately.

Air Force and Navy fit quality data were analyzed to determine which of the current sizes accommodated women, how to adjust existing size to create new sizes specifically proportioned for women, and how many of these sizes were needed. To achieve this objective, the subjects were divided into acceptable and unacceptable fit categories by size. In comparing the results of this analysis, the areas that needed improvement were then identified, and the number of new sizes was estimated.

The Air Force survey included quality of fit data for distinct areas of the suit for each subject wearing various sizes of the suit. This data indicated which size provided each subject with an acceptable fit in each area. This neighboring size data, however, is limited to one size smaller, larger, shorter, or longer than the best fitting size. It provided a rough estimate of how much to change the sizes. Mean anthropometric differences between Air Force males with overall acceptable fits and Air Force females with unacceptable overall fits were used to determine whether the areas needed to be further changed by more than one size difference.

An estimation of the pattern measurements for the female sizes is provided to assist pattern makers. The various sizes were estimated by applying the appropriate amount of change in each reproportioned area and by applying the estimated pattern grade for the current sizes. The pattern maker may need to make some adjustments to the pattern measurements or size grade in order to fit the pattern pieces together properly and to attain an appropriate silhouette.

Using the above approach, it is reasonable to conclude that patterns generated using the recommendations given in this report will result in additional flight suit sizes that will provide good accommodation for female Air Force and Navy pilots with minimal cost.

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CHAPTER III FIT STUDY COMPARISON

The first step in this study was to compare the anthropometry and key variables for size selection of the two surveys.

Anthropometry

Two different sets of measurements were taken by the Air Force and Navy; therefore, not all measurements can be used to compare surveys. Furthermore, some measurements with the same name were actually measured differently. For example, waist measurements were taken at the preferred and omphalion levels by the Air Force, while the Navy took them at the level of natural indentation. These differences limit the depth of comparison. Tables 1 and 2 contain summary statistics for the anthropometry common to both surveys. As a matter of interest, Appendices A and B contain summary statistics for the entire set of anthropometry for both surveys.

A preliminary comparison of the corresponding anthropometry in the two surveys showed that the Navy was somewhat larger than the Air Force in almost all dimensions except Hip Circ Max and Shoulder Circ. Univariate and multivariate analysis indicates that Biacromial Breadth and Sleeve Length: Spine-Wrist are the only significantly different measurements between the two surveys at α =.05 (Appendix C). Biacromial Breadth is significant because its standard deviation is relatively small compared to the others. Sleeve Length: Spine-Wrist is probably the only measurement that actually is significantly different. One possible explanation for this difference is that the Air Force and Navy measured Sleeve Length differently. The Air Force measured Sleeve Length from the Cervicale landmark to the Wrist landmark. The Navy located the Cervicale landmark and drew a vertical line down from that landmark to a point, called Mid-Spine, where the tape would maintain a position parallel to the floor while measuring Sleeve Length. Sleeve Length was then measured from the Mid-Spine point to the Wrist landmark. Aside from the difference in the two endpoints, there may have been some variance in shoulder position contributing to the difference. Figure 2 shows a comparison of the distributions of Stature and Reported Weight which are quite similar. Figure 3 compares Sleeve Length and Biacromial Breadth.

TABLE 1

Air Force Flight Suit Women, Anthropometry in Common with Navy (Data are in inches)

Variable	Label	N	Mean	Std Dev
D16	REPORTED WEIGHT (LB)	71	140.07	17.92
X19	ACROMION HT	72	53.20	2.14
X24	BIACROMIAL BR	72	14.43	0.69
X18	CERVICALE HT	72	55.71	2.30
X8	CHEST CIRC	72	36.59	2.79
X12	CROTCH LTH**	72	26.73	1.83
X23	CROTCH HT	72	30.46	1.57
X4	HIP CIRC MAX	72	39.50	2.75
X5	HIP HT	72	31.60	1.81
X7	SHOULDER CIRC	72	40.99	2.27
X14	SLEEVE LTH TOTAL	72	31.46	1.28
X17	STATURE	72	65.01	2.35
X2	UPPER THIGH CIRC	72	23.27	1.81
X10	WAIST CIRC PREFER**	72	29.99	2.83
X22	WAIST HT PREFER**	72	39.73	1.83
X11	WAIST BACK**	72	15.69	1.15

TABLE 2

Navy Flight Suit Women Anthropometry in Common with Air Force (Data are in inches)

Variable	Label	N	Mean	Std Dev	Delta*
x1	Reported Weight	89	139.50	12.67	-0.57
Y1	Acromial Ht	89	53.53	2.32	0.33
¥2	Biacromial Br	89	14.72	0.61	0.29
¥4	Cervicale Ht	89	56.03	2.26	0.31
¥5	Chest Circ	89	37.09	2.26	0.50
¥7	Crotch Lth Total Nat**	88	28.08	1.70	1.34
Y8	Crotch Ht Adj	89	30.71	1.66	0.24
¥9	Hip Circ Max	89	39.44	2.16	-0.06
Y10	Hip Ht Max	89	32.03	1.73	0.43
Y11	Shoulder Circ	89	40.80	1.77	-0.19
Y12	Sleeve Lt: Sp-Wrist	89	32.18	1.22	0.71
Y13	Stature	89	65.44	2.46	0.43
Y14	Thigh Circ	89	23.43	1.65	0.16
Y16	Waist Circ**	88	28.61	1.98	-1.37
Y17	Waist Front Ht Nat**	88	41.13	1.98	1.41
Y19	Waist Back Lth Nat**	88	15.06	0.83	-0.63

*A positive delta indicates that the Navy is larger in that dimension. A negative delta indicates that the Air Force is larger in that dimension.

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**These variables were not measured the same, but are included here as a matter of interest.



Air Force Flight Suit Females (.) Overlaid with Navy Flight Suit Females(*)

Figure 2. Stature and Reported Weight Distributions



NOTE: 13 obs hidden.

Figure 3. Sleeve Lth: Spine to Wrist and Biacromial Breadth Distributions

Anthropometry Influencing Size

Several analyses were conducted against the Navy and Air Force data to determine the anthropometric variables that best discriminate between best fitting sizes. These are the anthropometric variables that influence size.

<u>Navy</u>

The analysis sample included all subjects that were given an acceptable fit as rated by the fitter. There were 79 subjects in this category.

First, a Multivariate Analysis of Variance (MANOVA) was conducted including all the anthropometric variables. The best fit number size, letter size, and the interaction between the two are the independent variables in the model. The interaction was insignificant at α = .05. Number size and letter size are significant at that level. The associated eigenvectors show that Waist Back Height Natural, Maximum Hip Height, and Maximum Hip Circumference contrasted with Crotch Height explains 65% of the variation in number size. Weight explains nearly 18% of the variation. Weight alone explains 88.3% of the variation in letter size. Waist Back Length Natural contrasted with Wrist Circumference explains 11.7% of the variation in letter size. These results are listed in Appendix D. The interpretation is that number size is greatly affected by the level and size of the buttock area. While the interpretation of number size seems reasonable, the idea that Weight or Wrist Circumference could be key in distinguishing between letter sizes is not. Because of the unstable nature of the eigenvectors' coefficients due to high correlation among the variables (multicolinearity), further analyses were conducted.

Several alternative indicators of variable importance appear in the literature. One of these alternatives is to examine the correlation between each anthropometric variable and the scores for each of the significant eigenvectors (Huberty, 1984). The idea behind this is that a highly correlated variable will produce a similar separation to that of the eigenvector itself. For our purposes, only the first eigenvectors were examined. Maximum Hip Circumference (.85), Thigh Circumference (.79), and Crotch Length Total Natural (.80) are well correlated with the scores for the number size eigenvector. Acromial Height (.74), Stature (.69), and Cervicale Height (.68) are well correlated with the scores of the letter size eigenvector. (See Appendix E.)

Another statistic to examine is the F-to-remove index produced during backward stepwise discriminant analysis with all the variables entered in the analysis (Huberty, 1984). A large F-to-remove statistic implies that omitting the variable from the analysis will greatly decrease group separation. For number size, Maximum Hip Circumference has the largest F statistic (reasonable). For letter size, Waist Circumference has the largest F statistic (unreasonable). (See Appendix F.)

Factor Analysis (principal component method) is proposed here as a third alternative. Factor Analysis uses a small number of underlying factors to explain the correlation between the anthropometric variables. A varimax rotation is recommended to separate variables with large loadings from variables with loadings as close to zero as possible, and to aid in factor interpretation. Variables with large loadings are considered most important in explaining the nature of the factor. Anthropometric variables with large factor loadings in Factor 1 are all related to the height or length of an individual. They are: Waist Back Height Natural (.959), Cervicale Height (.953), Waist Front Height Natural (.952), Crotch Height (.948), Stature (.942), Acromial Height (.915), Maximum Hip Height (.875), and Sleeve Length, Spine to Wrist (.83). The other factor loadings are .372 and below. Therefore, Factor 1 is interpreted as a measure of length size or letter size. The large factor loadings in Factor 2 are circumferences. They are: Maximum Hip Circumference (.90), Thigh Circumference (.883), Crotch Length Total Natural (.844), Reported Weight (.777), Crotch Length Back Natural (.744), Biceps Circumference (.544), Waist Circumference (.496), Chest Circumference (.486), Wrist Circumference (.353), and Shoulder Circumference (.347).

The other factor loadings are .190 and below. Factor 2 is interpreted as a measure of body circumference or number size. (See Appendix G.)

A MANOVA including only the variables that are common to both surveys resulted in Maximum Hip Circumference best discriminating between number sizes and Acromial Height best discriminating between letter sizes. (See Appendix H.)

An overall conclusion is reached by interpreting the results of all of the above analyses and studying bivariate plots for good visual discrimination between sizes. Since Maximum Hip Circumference is important in all the analyses related to number size, it is clearly a key factor in distinguishing sizes. The key factor in distinguishing letter size is not as clear. Letter size is usually a function of length, so attention was focused on length type variables that looked promising. Bivariate plots of Maximum Hip Circumference with Stature, Acromial Height, Cervicale Height, Crotch Height, and Maximum Hip Height were examined for discrimination between number size and letter size. The bivariate plot of Maximum Hip Circumference and Acromial Height appears to best discriminate between sizes (see Figures 4 and 5).

Air Force

The analysis sample included all subjects in the survey. There were only 21 out of 71 subjects with acceptable fitter ratings (none of them were excellent). As such, there were not enough subjects with acceptable ratings to do the analysis on them alone.

Results of an analysis based on MANOVA indicated that Crotch Height contrasted with Neck Height accounts for 79.3 percent of the variation in number size. Sleeve Inseam contrasted with Neck Height accounts for 83.1 percent of the variation in letter size (Crist et al., 1995). These functions were not questioned when they were calculated because they appeared logical. Given the new information about the reliability of such an analysis in the face of multicolinearity, further analyses were conducted.

The correlation between each anthropometric variable and the scores for each of the significant eigenvectors results in Weight being the best discriminator for number size (r = .96816) and letter size (r = .88819). However, Hip Circ Max was the next best discriminator for number size (r = .91538), and Hip Height and Stature were nearly tied as the next best discriminators for letter size at r = .79548 and r = .79540, respectively. (See Appendix I.)

Examination of the F-to-remove index produced during backward stepwise discriminant analysis results in Maximum Hip Circumference being the best discriminator for number and letter size with F = 2.809. (See Appendix J.)

Factor analysis indicates Crotch Height as the best discriminator for letter size with a loading of .94708 in Factor 1. Waist Circumference, Preferred is found to be the best discriminator for number size with a loading of .88670 in Factor 2. (See Appendix K.)

A MANOVA including only the variables common to both surveys results in Reported Weight having the largest coefficient in the eigenvectors associated with number and letter size. By this analysis, it is concluded to be the best discriminator for number and letter size. (See Appendix L.)

The confusing results reported for the Air Force may result from the inclusion in the sample of all subjects regardless of fit. How reliable are key variables that are based on unacceptable fits? An exact answer is unknown. Logically, however, greater consistency may have been achieved if only acceptable fits could have been studied. Unfortunately, there just were not enough of them to find significant results.



Plot of X15*X7. Symbol is value of NUMBER SIZE.

 $|\mathbf{q}_{i}| \geq 1$

Figure 4. Navy Flight Suit Women, Key Variables for Acceptable Fits



Plot of X15*X7. Symbol is value of SIZE LETTER.

NOTE: 3 obs hidden.

Figure 5. Navy Flight Suit Women, Key Variables for Acceptable Fits

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Summary

Clearly, no one method is best for determining which anthropometric variables most influence size. The difference in samples (*acceptable only* versus *all*) further complicates the issue. Given the large number of acceptable Navy fits and that the results supported each other to some degree, it is contended that the Navy results are more reliable.

It should be noted that the classification of unacceptable and acceptable fits was based on the fitter's overall rating. Later in this report, the fitter's rating will be shown to be somewhat inconsistent. Reanalysis of the data based on a standardized overall rating may produce different results.

Quality of Fit

There were not many similarities between the quality of fit data collected by the Air Force and Navy. The overall fitter's rating is the only relatively reliable similarity. It was rated on the same scale and given the same meaning. A few of the same garment areas were rated. However, they weren't rated in the same manner; the Air Force used a five point scale, while the Navy used a three point scale. The effect of this difference made it difficult to compare even the garment areas ratings common to both surveys.

Conclusion

While the Air Force and Navy samples are similar for anthropometry common to both surveys, the differences in quality of fit data are significant enough to warrant separate fit analyses.

CHAPTER IV RESULTS

Air Force

A description of survey and data collection methods are contained in Crist et al., 1995.

Overall Rating

Detailed definitions of the overall ratings appear in Crist et al., 1995.

After an initial review of the data, the subjects were divided into Acceptable and Unacceptable categories based on overall fitter's ratings, with a 1 or 2 being Acceptable and a 3 or 4 being Unacceptable. Problem areas were defined as areas where approximately 15% or more of the subjects received an extreme area rating (a 1, meaning too tight or too short, or a 5, meaning too loose or too long). Table 3 lists the problem areas:

TABLE 3

Problem Areas for the Acceptable and Unacceptable fits Based on Overall Fitter's Ratings

Percentage of Acceptable Fits	Area and Problem	Percentage of Unacceptable Fits
38%	Shoulder - Too Loose	34%
14%	Sleeves - Too Loose	24%
19%	Sleeves - Too Long	24%
19%	Waist - Too Loose	
19%	Torso - Too Long	16%
	Legs - Too Long	14%

An expert fitter identified the shoulders, chest, hips and torso length as areas critical to fit for Air Force flight suits. The shoulders and torso length are the only critical areas of the flight suits identified as having fit problems.

New Weighted Overall Ratings

A closer inspection of the data revealed that the fitter's overall ratings did not agree with the area ratings. For example, 38% of the Acceptable fits had shoulders too loose (a rating of 5) and 19% had torso length too long (a rating of 5). Therefore, a new "weighted" system of assigning an overall score was developed. The weighted system was based on the four critical areas (shoulders, chest, hips, and torso length):

- If all four of the critical area ratings were 3s and all of the other ratings were either 2, 3, or 4, then the subject received an overall rating of 1 (Excellent Fit; Acceptable).
- If all of the area ratings, including the four critical area ratings, were either 2, 3, or 4, then the subject received an overall rating of 2 (Good Fit; Acceptable).
- If all four of the critical area ratings were either 2, 3, or 4, with no restrictions on the other area ratings, then the subject received an overall rating of 3 (Fair Fit; Unacceptable).

• If the subject failed in any one critical area (with an area rating of 1 or 5), regardless of the other area ratings, then the overall rating was 4 (Poor Fit; Unacceptable).

Problem areas were re-determined using the weighted rating system. Under the weighted system, there were 35 subjects with acceptable fits and 36 subjects with unacceptable fits. There were no problem areas for subjects with acceptable fits; only subjects with unacceptable fits had problem areas.

Changing the definitions of overall ratings did not change which critical areas were problems; shoulders and torso length were still problematic. However, some other non-critical areas were added to the problem list. Table 4 lists problem areas identified with the weighted system.

TABLE 4

Area and Problem	Percentage of Unacceptable
Coller Too Loose	10%
Collar - 100 Loose	1970
Shoulders - Too Loose	<u>69%</u>
Sleeves - Too Loose	42%
Sleeves - Too Long	44%
Waist - Too Loose	28%
Torso - Too Long	33%
Lower Leg - Too Loose	17%
Legs - Too Long	19%

Problem Areas for the Unacceptable Fits Based on the Weighted Ratings

<u>Analysis</u>

Fequency tables arranged by Best Fit Size (BFSize) and Best Fit Length (BFLength) indicated fit problems that were concentrated or consistent across sizes. All sizes (with the exception of 36L, worn by just one subject) displayed all fit problems. Some sizes were only slightly large (with area ratings of 4), but a large majority of subjects in those sizes had problems.

Sizes 34 S/R, 36 S/R/L, 38 S/R, and 40 S/R/L were examined in detail since most of the subjects wore those sizes. For all of those sizes, the shoulders should be narrower and the torso should be shortened. The chest could be made slightly larger in circumference for sizes 34 S/R, 36 S/R/L, and 38 S/R. Sleeves were too loose in general, and need to be tapered more, since women's arms are less muscular than men's arms.

It appeared that the flight suits were fitted for subjects based on hip dimensions. Almost everyone (76%) had an area rating of 3 for the hips, with only 17% slightly tight (2) and 3% too tight (1). However, all of these subjects had garments that were too big for them in almost every other area which was rated. If we assume the subjects wore appropriate sizes, then the other areas need to be scaled down to fit women.

Resizing

Resizing a garment requires not only knowing which areas to resize, but also requires considering how changing one area will affect related areas. For example, how will narrowing the shoulder affect the

sleeve lengths, or how will tightening the waist affect the torso length? The best way to examine the effect of changes is to examine the fit data for the next smaller or shorter size. This information was available from the original fit test and was used here. Frequency tables were prepared for each best fit size, as well as next smaller, next larger, next shorter, and next longer sizes. Within each area rated, comparisons of accommodation frequencies were made between the best fit and neighboring sizes to find where most subjects received acceptable fits. For areas such as the length of the torso, hip circumference, thigh circumference, and chest circumference, if ratings were not all 3's (okay fit with no changes), then it was preferred that the ratings were slightly loose instead of slightly tight. Some of this is due to comfort in those areas; others were due to the idea that it was easier to "take in" a garment than to "let it out."

Recommended Corrections

In general, it is recommended that all flight suit dimensions except the chest, hip, thigh, and waist height and crotch height decrease with respect to all other dimensions. Table 5 illustrates these changes in terms of existing sizes. Most areas change one size down in dimension.

Previous study recommendations (Crist et al., 1995) for female flight suit sizing were based on the fitter's overall rating. These recommendations included: adding an XS (Extra Short) length to the sizing system to accommodate subjects needing a shorter waist height (leg outseam) and crotch height (leg inseam), dropping the L (Long) length, and making the shoulders and waists smaller in circumference with respect to hip circumference.

The review of neighboring size data, however, indicates that the XS length is unnecessary, since subjects with length problems could be accommodated with a different size. Thus, we recommend no changes to the waist height or crotch height are recommended. Less than 3% of the females wore L length, and these subjects received a similar or better fit in other sizes. It is not anticipated that this length requirement will change; therefore, the L length can be eliminated. Overall, the frequency tables indicated that area ratings for shoulders and waist were better in next smaller sizes.

TABLE 5

Sizes
Existing
Ferms of
zes in]
smale Si
is for Fe
cification
Spe

40RW	<38R	<38R	40R	38R	38R	<38R	40R	(<40R)	40R	(38R)	40R	38R	40R
40SW	38S	38S	(42S) ⁻	38S	38S	38S	40S	38S	40S	40S	40S	38S	40S
38RW	36R	(38R)	38R	<36R	(38S)	36R	38R	(38S)	38R	· 38R	38R	36R	36R
38SW	36S	36S	(40S)	36S	<36S	36S	38S	36S	38S	38S	38S	36S	36S
36RW	34R	34R	36R	34R	34R	(<36S)	36R	(36S)	36R	36R	36R	(36S)	34R
36SW	34S	<34S	36S	<34S	34S	34S	36S	34S	36S	(34S)	36S	<34S	34S
34RW	32R	(34S)	34R	32R	32R	32R	34R	32R	34R	34R	34R	32R	32R
34SW	32S	32S	(36S)	32S	(34S)	32S	34S	32S	34S	34S	34S	32S	32S
32RW*	30R	30R	32R	30R	30R	30R	32R	30R	32R	32R	32R	30R	30R
32SW*	30S	30S	32S	30S	30S	30S	32S	30S	32S	32S	32S	30S	30S
	Collar	Shoulder	Chest	Sleeve C	Sleeve L	Waist C	Waist Ht	Torso L	Hip Circ	Crotch H	Thigh C	Lo Leg C	Leg Lth

< indicates that the exact measurement has not been determined, but it will be less than the measurement for the given size.

* indicates that the size specifications are estimated.

** indicates that dimensions for these areas do not change.

() indicates that the proposed dimension does not follow trend or violates smooth grade

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Sizes Needed

The sizes required to accommodate the Air Force female aircrew population are listed in Table 6. It shows that ten existing sizes currently accommodate a subset of the female population. Furthermore, ten additional sizes proportioned specifically for females are needed to accommodate the remainder of the population. Size titles for the female proportioned sizes indicate, for example, that an existing size 32S should be reproportioned for females. These size titles are not intended to dictate what the female sizes should be called.

TABLE 6

38S, 38R

40S, 40R

Population	
Existing	Female
Sizes	Proportioned
	Sizes
32S, 32R	32S, 32R
34S, 34R	34S. 34R
36S, 36R	36S, 36R

38S, 38R

40S, 40R

Sizes of the MEAFFS Necessary to Accommodate the Air Force Female Population

It may be possible to delete more sizes from the above system. However, it is necessary to consider the needs of the Navy subjects before any final decisions are made.

Navy

Figure 6 contains a copy of the data collection form used for collecting the fit assessment data for this survey. Several types of data were collected, including the best fitting size or final size, an overall rating of the quality of fit as determined by the evaluator and the subject, ratings of the fit quality in distinct areas of the flight suit while the subject stood erect, and ratings of the sleeves and thighs while the subject assumed certain poses. Williams, in progress, provides for detailed descriptions of the rating meanings.

GARMENT EVALUATION

FLIGHT COVERALL WITHOUT LONG UNDERWEAR

SUBJECT NO: _____

CHART SIZE _____

SIZE _____ SIZE _____

FINAL SIZE _____

FITTER 1 2	OVERALL I 3 4	<u>TT</u> SUBJECT 1	2 3 4
SHOULDER	TIGHT	OK	LOOSE
HIP	TIGHT	OK	LOOSE
THIGH	TIGHT	OK	LOOSE
SLV HEM W/ARM RAISED	SHORT	OK	LONG
CHEST	TIGHT	OK	LOOSE
WAIST	TIGHT	OK	LOOSE
TORSO EASE (BACK)	SHORT	ОК	LONG
WAIST TAB	HIGH	ОК	LOW
RISE	SHORT	ОК V	WRINKLED

COMMENTS:

RANGE OF MOTION

SITTING			
SLV	TIGHT	OK	LOOSE
TIGHT	TIGHT	OK	LOOSE
COMMENTS:			
SOLIATTING			
SLV	TIGHT	ОК	LOOSE
THIGH	TIGHT	OK	LOOSE
COMMENTS:			
BENDING			
SLV	TIGHT	OK	LOOSE
THIGH	TIGHT	OK	LOOSE
COMMENTS:			
CLIMBING			
SLV	TIGHT	ОК	LOOSE
THIGH	TIGHT	OK	LOOSE
COMMENTS:			

Figure 6. Data Collection Form

Best Fit Size

A size selection chart was used to pick the first size to try on. If that size appeared to fit well, it was the size tested. If it didn't appear to fit well, then other sizes were tried on until a 'good' fit was found. The Navy referred to this as the final size. It will be referred to as the best fit size in this document. Table 7 shows that subjects are concentrated around sizes 36R and 38R.

TABLE 7

Frequency Table of Best Fit Number Size By Best Fit Letter Size. Navy Flight Suit Women

LETTER	NUMBER						
Frequency Percent Row Pct Col Pct	321	, 341	361	38	40	421	Total
L	0 0.00 0.00 0.00	0 0.00 0.00 0.00 0.00	0 0.00 0.00 0.00	4 4.55 44.44 13.79	5.68 55.56 29.41	0 0.00 0.00 0.00	9 10.23
R	2 2.27 4.35 66.67	8 9.09 17.39 53.33	13 14.77 28.26 59.09	12 13.64 26.09 41.38	9 10.23 19.57 52.94	2 2.27 4.35 100.00	46 52.27
S	1 1.14 3.03 33.33	7 7.95 21.21 46.67	9 10.23 27.27 40.91	13 14.77 39.39 44.83	3 3.41 9.09 17.65	0 0.00 0.00 0.00	33 37.50
Total	3.41	15 17.05	22 25.00	29 32.95	17 19.32	2 2.27	88 100.00
			Frequency	Missing	= 1		

One subject was missing both number size and letter size.

Overall Rating

As with the Air Force survey, the overall rating takes into account only the fitter's expert opinion of the fit of the garment. Table 8 shows that most subjects received good or excellent fitter ratings, but most subjects rated the garment either fair or good. Clearly, the fitter's evaluations were more lenient than the subjects' evaluations.

TABLE 8

Frequency Table of Fitter By Subject Overall Ratings. Navy Flight Suit Women

FITTER	SUBJECT					
Frequency Percent Row Pct						
Col Pct	Poor 	Fair	Good 	Excellen t	Total	
Fair	2 2.35 33.33 40.00	2 2.35 33.33 8.70	2 2.35 33.33 4.17	0 0 0 0.00 0 0.00 0 0.00 0	6 7.06	
Good	2 2.35 5.26 40.00	14 16.47 36.84 60.87	20 23.53 52.63 41.67	2 2.35 5.26 22.22	38 44.71	
Excellent	1 1.18 2.44 20.00	7 8.24 17.07 30.43	26 30.59 63.41 54.17	7 8.24 17.07 77.78	41 48.24	
Total	5.88	23 27.06	48 56.47	9 10.59	85 100.00	
Frequency Missing = 4						

Three subjects are missing both fitter and subject overall ratings. One subject was missing only the subject overall rating. The fitter rating for this subject was excellent. Including this subject, there are actually 42 (nearly 49%) subjects with an excellent fitter rating.

Closer inspection of fitter and subject overall ratings indicate that they may be inconsistent. The fitter gave 42 subjects an excellent overall rating. Examination of the area ratings for these subjects shows that 29% had loose shoulders, 48% had short sleeves, and 60% had a short rise. These percentages indicate that several subjects who received Excellent ratings should have received a lesser rating.

Forty-eight subjects gave themselves a Good overall rating. However, 38% of them had loose shoulders, 40% had short sleeves, and 71% had a short rise. Again, the percentages are not indicative of a Good overall fit.

The inconsistency could be a result of the way the overall rating was assigned. Mentally summarizing area ratings to produce an overall fit rating is difficult in itself. Furthermore, the evaluator can be unconsciously influenced by a subject's comments, positively or negatively. Subject ratings are rarely consistent, because subjects usually are not completely aware of how the garment should fit, and what seems a good fit to one subject may not seem good to another.

In order to standardize the overall rating for this study, an overall rating weighted on critical areas of fit was computed. The ratings were assigned as follows:

E = All nine areas of the garment were rated okay.

G = All four critical areas were rated okay, and three or more non-critical areas were okay. F = All four critical areas were okay, and less than three non-critical areas were okay. P = Not all critical areas were okay.

Two sets of critical areas were used. One set (set 1) was made up of the shoulder, hip, thigh, and sleeve hem areas. The second set (set 2) was made up of the waist, hip, torso ease, waist tab, and rise. The frequencies of overall ratings are shown in Table 9. With E and G considered acceptable (A) fits, and F and P considered unacceptable (U) fits, Set 1 has fewer acceptable fits than set 2. Set 1 was used for further analyses.

TABLE 9

<u>Rate</u>	<u>Set 1</u>	<u>Set 2</u>		
Ε	5 (5.8%)	0 (0%)		
G	13 (15.1%)	27 (33.8%)		
F	0 (0%)		7	(8.8%)
Р	68 (79.1%)	46 (57.5%)		

Frequencies of Two Weighted Overall Rating Methods

(* Set 2 has six missing observations)

Table 10 shows this distribution of weighted overall ratings by best fit size.

TABLE 10

Frequency Table of Best Fit Size By Weighted Overall Rating. Navy Flight Suit Women E=All 9 Areas OK G=All 4 Critical Areas OK; 3 or 4 Non-Critical Areas F=All 4 Critical Areas OK; 1 or 2 Non-Critical Areas P=Not All Critical Areas OK

ЯŞ

RATING	BEST FIT	SIZE			
Frequency Percent Row Pct Col Pct	32R	32S	34R	34S	136
Excellent	00000	0000	1.16 20.00 12.50	00000	
			•		

86 100.00 5.81 13 15.12 68 79.07 Total 1.16 1.16 1.47 50.00 1 1.16 7.69 50.00 00000 2.33 42R . 3 3.49 4.41 100.00 0.000 00000 3.49 |40S $10.47 \\ 13.24 \\ 100.00$ 00000 0000 0000 0000 9 10.47 | 4 0 R 1.1620.00 20.00 11.167.69 20.00 3.49 3.49 4.41 60.00 5.81 5.81 |40L $\begin{array}{c} 1\\1.16\\20.00\\8.33\end{array}$ 2 2.33 15.38 16.67 9 10.47 13.24 75.00 .95 13 | 38S 2.33 40.00 16.67 4.65 30.77 33.33 6.98 6.98 8.82 50.00 12 13.95 | 38R 0000 1.16 7.69 33.33 2.33 2.94 66.67 3.49 |38L 00000 2 2.33 15.38 22.22 7 8.14 10.29 77.78 9 10.47 |36S 0.000 2 2.33 15.38 15.38 11 12.79 16.18 84.62 13 15.12 щł 8.14 10.29 100.00 00000 8.14 0.000 7 8.14 10.29 87.50 8 9.30 1 1.16 1.47 100.00 00000 1.16 1.16 _ _ _ _ _ 0000 2.33 2.33 2.94 100.00 2.33 2.33 Total Poor Good

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Problem Areas

Bivariate frequencies of the weighted overall rating by each area rating shows which areas contribute to providing an unacceptable fit. If 15% (an arbitrarily selected percentage) or more of the subjects did not get an okay area rating in one direction or the other (tight/loose, short/long, low/high), then the area was considered a problem area. The problem areas are shown in Table 11.

TABLE 11

Problem Area Frequencies

	All Subjects	Acceptable Fits	Unacceptable Fits
Shoulder	41.8% loose	OK	52.9% loose
Hip	16.3% tight	OK	20.6% tight
Sleeve Hem	39.5% short	OK	50.0% short
Torso Ease	18.8% long	16.7% long	19.4% long
Waist Tab	18.1% high	16.7% high	18.5% high
Waist Tab	30.1% low	22.2% low	32.3% low
Rise	61.2% short	44.4% short	65.7% short

The areas with the greatest problem appear to be the rise, shoulder, and sleeve hem. For each problem area, two anthropometric variables were chosen. The selected variables were thought to be better correlated to the area than the others. A bivariate plot was produced for each problem area by number size and letter size. The axes consisted of the two selected anthropometric variables, and the observations were indicated by the area rating. The purpose of the plots was to determine how much to change the patterns by comparing the range of fit for Acceptable fits to the range of fit for Unacceptable fits. However, the number of Acceptable fits within a size was so small (maybe one or two), and their distribution so apparently random, that this comparison was impossible.

Range of Motion

Range of motion fit data were collected for the sleeve and the thigh areas. It may seem logical that while sitting with the arm raised above the head, a tight rating for sleeve hem would indicate that the sleeve length is the cause; however, it is possible that another area might be causing the problem. A subject was considered to have a sleeve range of motion problem if the sleeve was not rated okay while the subject sat, squatted, bent, or climbed. Thigh range of motion problems were found the same way.

Frequencies of area ratings for subjects with sleeve and/or thigh range of motion problems indicated that a short rise was probably causing a problem with tight thighs. This is verified by the fact that the thigh was not a problem area for standing subjects. Sleeve range of motion problems were probably caused by the sleeve being too short. (Sleeve problems may also have been caused by the sleeve circumference being too tight, but these data were not gathered).

Recommended Corrections

Examination of the problem area frequencies above suggest the following changes to all sizes:

1. Make the shoulder narrower.

- 2. Lengthen the sleeves.
- 3. Lengthen the waist to crotch dimension (rise), except on 40L.

A bivariate plot (Figure 7) indicates that hip fit seems to be more related to Hip Height Max than to Hip Circ Max. Therefore, even though the hip was tight on several subjects, no changes to the hip circumference are recommended.



T=Tight, O=OK, L=Loose Plot of X15*X16. Symbol is value of HIPFIT.

NOTE: 4 obs hidden.

Figure 7. Navy Flight Suit Females
Since a leg length rating was not taken, it is difficult to know how to solve the rise problem. For instance, if the leg length along with the rise were short, then the waist-to-crotch dimension could be lengthened. If only the rise were too short, then the inseam could be made shorter. With the limited data available, however, the correct solution is unclear.

Sizes Needed

Future flight suit sizes should continue to accommodate Navy subjects currently getting a good fit and further accommodate some of the Navy subjects currently getting a poor fit. The existing sizes that accommodate some females are: 34S, 34R, 36S, 36R, 38S, 38R, 38L, and 40L. Reproportioned versions of each of these sizes are expected to accommodate a great percentage of those females not accommodated by existing sizes. There is no indication that existing sizes 32S and 32R are needed, since all the subjects wearing that size had unacceptable overall fits.

Comparison of Results

Problem Areas (Unacceptable Fits)

A comparison of problem areas for subjects with unacceptable weighted overall ratings appears in Table 12.

TABLE 12

Comparison of Problem Areas

Area	Air Force	Navy
Collar	19% loose	not rated
Shoulder	62.9% loose	69% loose
Sleeve Circ	42% loose	tight during range of motion
Sleeve Lth	44% long (arm down)	50% short (arm over head)
Chest Circ	okay	okay
Waist Circ	28% loose	okay
Waist Tab Level	okay (adjusted to waist first)	18.5% high, 32.3% low (not adj)
Upper Torso	33% long	19.4% long
Hip	okay	20.6% tight
Thigh Circ	okay	okay, except in range of motion
Lower Leg Circ (Calf)	17% loose	not rated
Leg Length	19% long	not rated
Crotch Level	okay	not rated
Rise	okay crotch level implies okay	65.7% short
1	rise	

The Navy dimensions are larger than the Air Force dimensions almost everywhere except Hip Circ Max and Shoulder Circ. Many of the differences between the area ratings of the two surveys could be a result of this difference. However, univariately and multivariately, Sleeve Lth: Sp-Wrist is the only significantly different measurement between the two surveys. Again, however, this difference may be an artifact of the way the measurements were taken. Waist measurements, again, are not comparable, because they were measured differently.

The method of determining best fitting size could also affect problem area disclosure. For example, the Air Force did not find a hip problem, possibly because they selected best fitting size based on getting a good hip fit. The Navy may have selected best fitting size based on the closest they could get to a good shoulder and a good hip fit, thereby compromising the fit of both. This idea is further supported by the fact that the hip anthropometry for the two surveys is statistically similar.

Another cause of the differences may be due to differences in manufacturers. Navy suits and Air Force suits of the same size were measured in the rise area, from the bottom of the waist tabs to the crotch seam. The measurements in Table 13 show that the two sets of garments are very different from each other in that dimension. As such, a short rise rating in the Navy garment is not surprising. This is true even though the placement of the waist tabs may be inconsistent across garments, rendering the measurement unreliable. The differences are large enough to outweigh any measurement inconsistencies. These measurements underline the potential differences between the Air Force and Navy suits and confirm the notion that the test garments were not the same.

TABLE 13

Size	Air Force	Navy
36S	31.0 cm	24.5 cm
36R	31.1 cm	25.0 cm
385	30.3 cm	23.5 cm

Comparison of Rise Measurements

Exactly how many of the differences are due to manufacturing, or to size, or to methods is difficult to determine. The end result is clear: the fit test analysis results from the two surveys are not the same, because the test garments are not the same.

The Navy shows a need for a longer rise, while the Air Force does not. This is because the measured rise of the Navy suit was considerably shorter than that of the Air Force suit. Figure 8 is a bivariate plot comparing the sample distribution of related measurements (Waist Ht minus Crotch Ht equals Rise) for both services. Clearly, the two are similar, indicating that if the Navy suit rise was the same as the Air Force suit rise, a rise problem would have never been found.

Notabley, the exact same problem with rise was found among Air Force and Navy males. Results of the Air Force fit test found the rise to be fine for men. While Navy men have never actually been tested in the MEAFFS, their complaints have been so num erous that the men's suit is being changed over to a different design. This further verifies that the test suits were not the same and is indicative of either pattern differences or, more likely, manufacturing differences.



Delta between means (1.41) subtracted from Navy to account for measurement method differences

Figure 8. Air Force Flight Suit Females (.) Overlaid with Navy Flight Suit Females(*).

According to fit ratings, the Air Force needs shorter sleeves while the Navy needs longer sleeves. Refer to Figure 3. However, this difference can be explained by a difference in the tested suits. Assuming that the Air Force and Navy samples have similar Sleeve Lengths, anthropometrically speaking, a difference in the suits' sleeves could explain the difference in the fit ratings. Furthermore, the Navy evaluated the sleeve length with the arms raised overhead, so the sleeve length area ratings are not really comparable. For purposes here, assume that the sleeves on the Navy's test suits were shorter than the Air Force's, and consider that it is easier to shorten sleeves than lengthen them. It is, therefore, recommended that the sleeve length not be changed.

While the Navy provided valuable data to enhance the Air Force data set, during data analysis it became apparent that their tested flight suit was not the same as the Air Force's tested flight suit. Furthermore, the Navy was unable to provide the pattern by which their garments were manufactured. As such, the source of the difference was not discernible. Given these limitations, it is recommended that the specifications for female sizes be based on the Air Force's pattern. As previously shown, the Navy and Air Force samples are similar anthropometrically. Therefore, applying the Air Force's pattern to the Navy sample is a reasonable solution. By adopting this pattern, the Navy will correct some of the problems that were not detected with the Air Force garment. This includes the Navy's problem with rise. Actual pattern measurements for the current sizes are located in Appendix M. Appendix N contains descriptions and diagrams of how the patterns were measured. Pattern measurements are summarized in Appendix O. If desired, finished garment measurements for the current sizes can be estimated by subtracting appropriate seam allowances and pleats from the pattern measurements.

9 B.

Neighboring size data from the Air Force survey were used to determine how the female sizes must be proportioned. The data shows exactly which sizes provided subjects with proper fits in each area. From this information, it was clear that the female sizes must have smaller necklines, waists, and calfs, and narrower shoulders. Since most subjects got a best fit in length S, there was no next size shorter neighboring size data to examine. However, area ratings for length S indicate that females need shorter upper torsos, and leg inseams. Area ratings were examined taking into consideration that it is easier to make a garment smaller than larger. As such, the area ratings indicate that most areas need only be reduced by one size. The area ratings also indicate that the shoulders should be, the sample anthropometry of Air Force males with acceptable fits was compared to the Air Force females with unacceptable fits. Also data from past studies show that the difference in the shoulders between males and females is approximately an inch to an inch and a half (Robinette, 1995; McConville et al., 1981; Sirvart A. Mellian, personal communication). It is, therefore, recommended that the shoulders be brought in an inch. Summary statistics of the anthropometry for these samples are given in Appendices P and Q. These statistics will also give the pattern designer an idea of who fits into what size.

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CHAPTER V CONCLUSION

Figure 9 indicates the current sizes that accommodate males only and the current sizes that accommodate both males and females. Five female sizes, each available in two lengths, are recommended. While the two length sizes are referred to as Short (S) and Regular (R), it is left to the pattern maker to name the five remaining sizes. These sizes should be added to the current set of male sizes, but they should be proportioned for women instead of men. It is suspected that many women who are getting an acceptable fit in a current male proportioned size will be even better accommodated by a female proportioned size. Fit testing of the female size prototypes would confirm this.

The pattern for the center or base female size is based on the reproportioning of the pattern measurements for current size 36, summarized in Appendix O. Table 11 provides the changes that need to be made to the current pattern for size 36 to create the female base size. These changes can be used to transform any men's garment that fits well into a garment that fits well on females, given that the garment has a similar concept of fit to that of the flight suit. Two female sizes are needed on either side of the base size. The estimated grade for the current patterns as given in Appendix O may be useful in determining the appropriate grade for the female sizes. Appendix R contains the estimated pattern dimensions for five female sizes: the female base size, two sizes smaller than the base size, and two sizes larger than the base size. The two smaller and two larger sizes were generated by applying the grade for the current sizes to the female base size. Finished garment measurements for the new sizes can be estimated by subtracting appropriate seam allowances and pleats from the pattern measurements. Finished garment measurements can also be estimated by subtracting the difference between the current and new sizes from the finished garment measurements of the current sizes.

Depending on the available software, the pattern designer may alter the computer digitized version of the pattern for size 36 to create the pattern for the female base size as recommended in Table 14. The rest of the female sizes are based on altering the pattern for the female base size. The pattern designer may decide to make adjustments to these dimensions so that the pattern pieces will sew together properly. Adjustments may also be required so that the finished garment has an appropriate shape or silhouette.

	ſ	Number Size							
Length Size	32	34	36	38	40	42	44	46	48
Long									
Regular									
Short									

Males Only Males and Some Females Only Females

Figure 9. Male Flight Suit Size Accommodation

TABLE 14

Recommended Changes to Current Sizes to Create Female Sizes

•	
Neckline (Torso)	3/4" smaller
Shoulder (Front)	1" smaller
Shoulder (Back)	1" smaller
Waist	2 1/4" smaller
Calf	1/2" smaller
Hem	1/2" smaller
Upper Torso (Front)	1/4" shorter
Upper Torso (Back)	1/4" shorter
Leg Inseam	1 1/2" shorter
Leg Outseam	1 1/2" shorter
Sleeve Hole	3/4" smaller
Sleeve Cuff	1/4" smaller
Sleeve Cuff	1/4" smaller

Chest, Hip, Thigh, Rise, and Sleeve Length do not change.

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APPENDIX A AIR FORCE ANTHROPOMETRY

Kurtosis -0.110.16 0.67 0.42 0.42 0.42 0.42 0.53 0.53 $\begin{array}{c} 0.19\\ -0.07\\ -0.07\\ -0.07\\ -0.039\\ -0.039\\ -0.039\\ -0.024\\ -0.039\\ -0.024\\ -0.024\\ -0.024\\ -0.024\\ -0.024\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.020\\ -0.00\\$ 0.34 Skewness Maximum Minimum 942.14 944.1494.14 944.14 944.14 944.1494.14 944.14 944.1494.14 944.14 944.1494.14 944.14 944.1494.14 944.14945.14 945.14 945.14 Std Dev 140.07 639.76 639.76 639.76 639.76 1003.26 1003.26 802.720 Mean z BUTTOCK CIRC HIP CIRC MAX HIP HIP HT NECK CIRC SHOULDER CIRC WAIST CIRC MAPH WAIST CIRC PREFER WAIST CIRC PREFER WAIST CIRC PREFER WAIST CIRC PREFER CROTCH LTH VTC SLEEVE UTTERAM SLEEVE UTTERAM SLEEVE UTTERAM SLEEVE UTTERAM SLEEVE UTTERAM STATURE REPORTED_WEIGHT (LB) UPPER THIGH CIRC VEIGHT Label Variable

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APPENDIX B NAVY ANTHROPOMETRY

$\begin{array}{c} -0.39\\ -0.38\\ -0.32\\ 0.32\\ -0.42\\ -0.42\\ -0.42\\ -0.42\\ -0.42\\ -0.42\\ -0.43\\ -0.28\\ -0.28\\ -0.28\\ -0.28\\ -0.28\\ -0.28\\ -0.28\\ -0.28\\ -0.35\\ -0.35\\ -0.35\\ -0.35\\ -0.33\\ -0.$ Kurtosis 0.50 0.50 0.56 0.035 0.035 0.035 0.035 0.035 0.035 0.035 0.026 0.035 0.03Skewness Maximum Minimum $\begin{array}{c} 12.67\\ 2.56\\ 2.556\\ 5.577\\ 5.5$ Std Dev 139.50 66.15 66.15 66.15 165.25.56 11625.56 1044.77 769.88 942.12 942.12 942.12 942.12 1036.38 1036.38 1036.38 1036.38 1036.38 1133.63 340.40 713.13 378.52 379.81 3378.52 709.81 200.26 10.39 340.40 713.13 379.50 713.13 379.50 713.13 379.50 713.13 370.50 713.13 370.50 713.13 370.50 713.13 370.50 713.13 370.50 713.13 370.50 713.13 370.50 713.137 Mean z Reported Height Reported Chest Size Number Stature Cervicale Ht Acromial Ht Waist Back Ht Nat Waist Front Ht Nat Crotch Ht Biacromial Br Shoulder Circ Waist Circ Waist Circ Waist Circ Wrist Circ Wrist Circ Sleeve Lt: Sp-Wrist Biceps Circ Waist Front Lth Nat Waist Front Lth Nat Crotch Lth Back Nat Thigh Circ Waist Inches Rise Inches Reported Weight Label Variable

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APPENDIX C STATISTICAL COMPARISON OF AIR FORCE AND NAVY ANTHROPOMETRY

Univariate Analyses of Variance

Dependent	Variable: N1 Re	eported Weight	Mean		
Source	DF	Squares	Square	F Value	Pr > F
Model	1	12.8505502	12.8505502	0.06	0.8142
Error	158	36622.647887	231.7889107		
Corrected	Total 159	36635.498437			
	R-Square	C.V.	Root MSE		N1 Mean
	0.000351	10.89394	15.2246		139.753
``````````````````````````````````````			X C		<b>D</b> ec. <b>1</b>
Source	DF'	Type IV SS	Mean Square	F Value	$\Pr > F$
SURVEY	1	12.8505502	12.8505502	0.06	0.8142
Dependent	Variable: N2 Ac	romial Ht			
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3.99624837	3.99624837	0.79	0.3744
Error	158	795.72737886	5.03624923		
Corrected	Total 159	799.72362723			
	R-Square	C.V.	Root MSE		N2 Mean
	0.004997	4.203220	2.24416		53.3914
				1	
Source	DF	Type IV SS	Mean Square	F Value	$\Pr > F$
SURVEY	1	3.99624837	3.99624837	0.79	0.3744
Dependent	Variable: N3 Bi	acromial Br			
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3.21293173	3.21293173	7.65	0.0063
Error	158	66.34035891	0.41987569		
Corrected	Total 159	69.55329063			
	R-Square	C.V.	Root MSE		N3 Mean
	0.046194	4.441162	0.64798		14.5903
Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	3.21293173	3.21293173	7.65	0.0063
Dependent	Variable: N4 Ce	ervicale Ht			
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F

Model	1	3.48880147	3.48880147	0.67	0.4141
Error	158	822.05473983	5.20287810		
Corrected Total	159	825.54354131			
	R-Square	C.V.	Root MSE		N4 Mean
	0.004226	4.080910	2.28098		55.8940
Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	3.48880147	3.48880147	0.67	0.4141
2011/21					
Dependent Variabl	le: N5 Che	est Circ Sum of	Mean		
Source	DF	Squares	Square	F Value	Pr > F
Model	1	8.60836767	8.60836767	1.36	0.2449
Error	158	998.24389558	6.31799934		
Corrected Total	159	1006.8522632			
	R-Square	C.V.	Root MSE		N5 Mean
	0.008550	6.814601	2.51356		36.8850
Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY		8.60836767	8.60836767	1.36	0.2449
Donobi					
Dependent Variabl	le: N6 Cro	otch Ht Sum of	Mean		
Source	DF	Squares	Square	F Value	Pr > F
Model	1	2.26168029	2.26168029	0.86	0.3563
Error	158	417.43593762	2.64199961		
Corrected Total	159	419.69761791			
	R-Square	C.V.	Root MSE		N6 Mean
	0.005389	5.311549	1.62542		30.6017
Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	2.26168029	2.26168029	0.86	0.3563
Dependent Variab	le: N7 Hip	circ Max Sum of	Mean	<b>D T</b> 1	
Source	DF	Squares	Square	F Value	Pr > F
Model	1	0.43894414	0.43894414	0.07	0.7858
Error	158	935.65841462	5.92188870		
Corrected Total	159	936.09735875	<b>_</b>		
	R-Square	C.V.	Root MSE		N7 Mean
	0.000469	6.162910	2.43349		39.4861

Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	0.43894414	0.43894414	0.07	0.7858
Dependent Vari	able: N8 Hij	Sum of	Mean		<b>.</b> .
Source	DF	Squares	Square	F Value	$\Pr > F$
Model	1	6.04613266	6.04613266	1.97	0.1628
Error	158	485.73820983	3.07429247		
Corrected Tota	11 159	491.78434249			
	R-Square	C.V.	Root MSE		N8 Mean
	0.012294	5.503138	1.75337		31.8612
Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	6.04613266	6.04613266	1.97	0.1628
Dener Jack Mani	able. NO Ch	ulder Circ			
Dependent vari	able: Ny Sho	Sund of	Mean	E Value	Dr \ F
Source	DF	1 54100720	1 E4100720	r vaiue	0 5303 ET > E
Model	150	1,54100728	1.54100728	0.00	0.5592
Error	158	642.92258988	4.06913032		
Corrected Tota	11 159	644.46359/16			NO 16
	R-Square	c.v.	ROOT MSE		N9 Mean
	0.002391	4.933268	2.01/21		40.8899
Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	1.54100728	1.54100728	0.38	0.5392
Dependent Vari	able: N10 S	loono It. Co Mo			
Dependente vari		leeve ht: SD-WL	ist		
Source	DF	Sum of Squares	ist Mean Square	F Value	Pr > F
Source Model	DF 1	Sum of Squares 19.7091788	ist Mean Square 19.7091788	F Value 12.57	Pr > F 0.0005
Source Model Error	DF 1 158	Sum of Squares 19.7091788 247.7884625	ist Mean Square 19.7091788 1.5682814	F Value 12.57	Pr > F 0.0005
Source Model Error Corrected Tota	DF 1 158 al 159	Sum of Squares 19.7091788 247.7884625 267.4976414	ist Mean Square 19.7091788 1.5682814	F Value 12.57	Pr > F 0.0005
Source Model Error Corrected Tota	DF 1 158 al 159 R-Square	Squares 19.7091788 247.7884625 267.4976414 C.V.	ist Mean Square 19.7091788 1.5682814 Root MSE	F Value 12.57	Pr > F 0.0005 N10 Mean
Source Model Error Corrected Tota	DF 1 158 al 159 R-Square 0.073680	19.7091788 247.7884625 267.4976414 C.V. 3.930029	ist Mean Square 19.7091788 1.5682814 Root MSE 1.25231	F Value 12.57	Pr > F 0.0005 N10 Mean 31.8652
Source Model Error Corrected Tota	DF 1 158 al 159 R-Square 0.073680	Sum of Squares 19.7091788 247.7884625 267.4976414 C.V. 3.930029	ist Mean Square 19.7091788 1.5682814 Root MSE 1.25231	F Value 12.57	Pr > F 0.0005 N10 Mean 31.8652
Source Model Error Corrected Tota Source	DF 1 158 al 159 R-Square 0.073680 DF	Sum of Squares 19.7091788 247.7884625 267.4976414 C.V. 3.930029 Type IV SS	ist Mean Square 19.7091788 1.5682814 Root MSE 1.25231 Mean Square	F Value 12.57 F Value	Pr > F 0.0005 N10 Mean 31.8652 Pr > F
Source Model Error Corrected Tota Source SURVEY	DF 1 158 159 R-Square 0.073680 DF 1	Sum of Squares 19.7091788 247.7884625 267.4976414 C.V. 3.930029 Type IV SS 19.7091788	ist Mean Square 19.7091788 1.5682814 Root MSE 1.25231 Mean Square 19.7091788	F Value 12.57 F Value 12.57	Pr > F 0.0005 N10 Mean 31.8652 Pr > F 0.0005
Source Model Error Corrected Tota Source SURVEY Dependent Var:	DF 1 158 al 159 R-Square 0.073680 DF 1 iable: N11 5	Sum of Squares 19.7091788 247.7884625 267.4976414 C.V. 3.930029 Type IV SS 19.7091788 tature	ist Mean Square 19.7091788 1.5682814 Root MSE 1.25231 Mean Square 19.7091788	F Value 12.57 F Value 12.57	Pr > F 0.0005 N10 Mean 31.8652 Pr > F 0.0005
Source Model Error Corrected Tota Source SURVEY Dependent Var: Source	DF 1 158 al 159 R-Square 0.073680 DF 1 iable: N11 S DF	Sum of Squares 19.7091788 247.7884625 267.4976414 C.V. 3.930029 Type IV SS 19.7091788 tature Sum of Squares	ist Mean Square 19.7091788 1.5682814 Root MSE 1.25231 Mean Square 19.7091788 Mean Square	F Value 12.57 F Value 12.57 F Value	<pre>Pr &gt; F     0.0005 N10 Mean     31.8652 Pr &gt; F     0.0005 Pr &gt; F</pre>

• .

Error	158	921.14563844	5.83003569		
Corrected	Total 159	927.79992172			
	R-Square	c.v.	Root MSE		N11 Mean
	0.007172	3.700111	2.41455		65.2561
Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	6.65428328	6.65428328	1.14	0.2870
Dependent	Variable: N12 7	high Circ	Mean		
Source	DF	Squares	Square	F Value	Pr > F
Model	1	0.74231737	0.74231737	0.25	0.6184
Error	158	470.79505667	2.97971555		
Corrected	Total 159	471.53737404			
	R-Square	C.V.	Root MSE		N12 Mean
	0.001574	7.386843	1.72619		23.3684
Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	0.74231737	0.74231737	0.25	0.6184

## Multivariate Analysis of Variance

## Class Level Information

Class	Levels	Values
SURVEY	2	1 2

Number of observations in data set = 161

NOTE: Observations with missing values will not be included in this analysis. Thus, only 160 observations can be used in this analysis.

First Eigenvalue and Eigenvector of: E Inverse * H, where H = Type IV SS&CP Matrix for SURVEY E = Error SS&CP Matrix

First Eigenvalue: 0.48475268 Percent: 100.00

First Eigenvector V'EV=1:

-0.00492120 0.07054901 0.01707785 -0.02426893 -0.04209579	(Reported Weight) (Biacromial Breadth) (Chest Circ) (Hip Circ Max) (Shoulder Circ)	0.02061864 0.08818974 -0.01722315 0.01062900 0.08126173	<pre>(Acromial Height) (Cervicale Height) (Crotch Height) (Hip Height Max) (Sleeve L: Sp-Wrist) (This Circa)</pre>
0.05101052	(Stature)	0.07500890	(Thigh Circ)

Manova Test Criteria and Exact F Statistics for the Hypothesis of no Overall SURVEY Effect H = Type IV SS&CP Matrix for SURVEY E = Error SS&CP Matrix

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.67351285	5.9382	12	147	0.0001
Pillai's Trace	0.32648715	5.9382	12	147	0.0001

## APPENDIX D NAVY: MANOVA USING ALL VARIABLES

Navy Flight Suit Females Acceptable Fits

General Linear Models Procedure Class Level Information

Class Levels Values SZNUMBER 6 32 34 36 38 40 42 SZLETTER 3 L R S

Number of observations in data set = 80

NOTE: Observations with missing values will not be included in this analysis. Thus, only 79 observations can be used in this analysis.

Multivariate Analysis of Variance

First Eigenvalue and Eigenvector of: E Inverse * H, where H = Type IV SS&CP Matrix for SIZE NUMBER E = Error SS&CP Matrix

First Eigenvalue: 3.78401424

First Eigenvector V'EV=1:

-0.00240796 (Stature) -0.00049010 (Reported Weight) 0.00157107 (Cervicale Ht) 0.00117315 (Acromial Ht) -0.00295596 (Waist Front Ht Nat) 0.00662468 (Waist Back Ht Nat) -0.00574484 (Crotch Ht) 0.00038932 (Biacromial Br) -0.00023994 (Chest Circ) 0.00198583 (Shoulder Circ) 0.00401460 (Hip Circ Max) -0.00145946 (Waist Circ Nat) 0.00411647 (Hip Ht Max) -0.00279233 (Wrist Circ) -0.00063598 (Biceps Circ) -0.00040720 (Sleeve Lth) 0.00212642 (Waist Back Lth Nat) -0.00000610 (Waist Front Lth Nat) 0.00113443 (Crotch Lth Tot Nat) -0.00252924 (Crotch Lth Back Nat) 0.00152941 (Thigh Circ)

Percent: 64.97

Second Eigenvalue: 1.04504501 Percent: 17.94

Second Eigenvector V'EV=1:

0.00312334 (Stature) 0.01270305 (Reported Weight) -0.00828320 (Cervicale Ht) 0.00340687 (Acromial Ht) 0.00393786 (Waist Front Ht Nat) -0.00770759 (Waist Back Ht Nat) 0.00937367 (Crotch Ht) 0.00704188 (Biacromial Br) -0.00115679 (Chest Circ) -0.00254931 (Shoulder Circ) -0.00284226 (Hip Circ Max) 0.00438224 (Waist Circ Nat) 0.00945981 (Wrist Circ) -0.00180029 (Hip Ht Max) -0.00077579 (Biceps Circ) -0.00300711 (Sleeve Lth) 0.00201543 (Waist Back Lth Nat) 0.00127531 (Waist Front Lth Nat) 0.00007817 (Crotch Lth Tot Nat) 0.00186170 (Crotch Lth Back Nat) 0.00127351 (Thigh Circ)

Manova Test Criteria and F Approximations for the Hypothesis of no Overall SIZE NUMBER Effect H = Type IV SS&CP Matrix for SIZE NUMBER E = Error SS&CP Matrix

Statistic	Value	F	Num DF	Den DF	$\Pr > F$
Wilks' Lambda	0.04378845	1.9599	105	229.6434	0.0001
Pillai's Trace	2.03164493	1.6296	105	250	0.0011

First Eigenvalue and Eigenvector of: E Inverse * H, where H = Type IV SS&CP Matrix for SIZE LETTER E = Error SS&CP Matrix

First Eigenvalue: 2.36472986

Percent: 88.30

First Eigenvector V'EV=1:

0.00892682 (Reported Weight)0.00238675 (Stature)-0.00100946 (Cervicale Ht)0.00247179 (Acromial Ht)-0.00475593 (Waist Back Ht Nat)0.00267705 (Waist Front Ht Nat)0.00158882 (Crotch Ht)0.00360483 (Biacromial Br)-0.00218149 (Shoulder Circ)-0.00131353 (Chest Circ)0.00373222 (Waist Circ Nat)-0.00152134 (Hip Circ Max)0.00024479 (Hip Ht Max)0.00391862 (Wrist Circ)-0.0035314 (Sleeve Lth)0.00123561 (Biceps Circ)-0.00326866 (Waist Back Lth Nat)0.00295236 (Waist Front Lth Nat)-0.00074409 (Crotch Lth Tot Nat)-0.00275399 (Crotch Lth Back Nat)0.00101202 (Thigh Circ)-0.00275399 (Crotch Lth Back Nat)

Second Eigenvalue: 0.31329987 Percent: 11.70

Second Eigenvector V'EV=1:

-0.00043412	(Reported Weight)	0.00203440	(Stature)
-0.01024345	(Cervicale Ht)	0.00284648	(Acromial Ht)
0.00053034	(Waist Back Ht Nat)	0.00186681	(Waist Front Ht Nat)
0.00503831	(Crotch Ht)	0.00271602	(Biacromial Br)
-0.00025959	(Shoulder Circ)	0.00048204	(Chest Circ)
0.00025065	(Waist Circ Nat)	0.00043265	(Hip Circ Max)
-0.00058207	(Hip Ht Max)	-0.00539637	(Wrist Circ)
-0.00051179	(Sleeve Lth)	0.00012454	(Biceps Circ)
0.00574995	(Waist Back Lth Nat)	0.00007638	(Waist Front Lth Nat)
0.00170186	(Crotch Lth Tot Nat)	0.00294549	(Crotch Lth Back Nat)
-0.00278218	(Thigh Circ)		

Manova Test Criteria and F Approximations for the Hypothesis of no Overall SIZE LETTER Effect H = Type IV SS&CP Matrix for SIZE LETTER E = Error SS&CP Matrix

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.22630070	2.4142	42	92	0.0002
Pillai's Trace	0.94135860	1.9901	42	94	0.0031

NOTE: F Statistic for Wilks' Lambda is exact.

Characteristic Roots and Vectors of: E Inverse * H, where H = Type IV SS&CP Matrix for SIZE NUMBER*SIZE LETTER E = Error SS&CP Matrix

First Eigenvalue: 1.01481354 Percent: 35.60

First Eigenvector V'EV=1:

0.00689549	(Reported Weight)	-0.00071627	(Stature)
0.00002119	(Cervicale Ht)	0.00257927	(Acromial Ht)
-0.00885338	(Waist Back Ht Nat)	0.00533853	(Waist Front Ht Nat)
0.00290637	(Crotch Ht)	0.00124506	(Biacromial Br)
-0.00176405	(Shoulder Circ)	-0.00126024	(Chest Circ)
0.00233607	(Waist Circ Nat)	-0.00117027	(Hip Circ Max)
-0.00209262	(Hip Ht Max)	0.01449898	(Wrist Circ)
0.00216682	(Sleeve Lth)	0.00256971	(Biceps Circ)
-0.00452351	(Waist Back Lth Nat)	0.00222382	(Waist Front Lth Nat)
-0.00291353	(Crotch Lth Tot Nat)	-0.00171989	(Crotch Lth Back Nat)
-0.00099004	(Thigh Circ)		

## Manova Test Criteria and F Approximations for the Hypothesis of no Overall SIZE NUMBER*SIZE LETTER Effect H = Type IV SS&CP Matrix for SIZE NUMBER*SIZE LETTER E = Error SS&CP Matrix

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.12013849	1.1865	105	229.6434	0.1455
Pillai's Trace	1.63834653	1.1604	105	250	0.1750

## APPENDIX E NAVY: ANTHROPOMETRY AND EIGENVECTOR CORRELATION

## Navy Flight Suit Females Acceptable Fits

## Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0
/ Number of Observations

Eigenvector for:	NUMBER	LETTER
X1 Reported Weight	0.86789 0.0001 79	0.55450 0.0001 79
X5 Stature	0.45611 0.0001 79	0.67497 0.0001 79
X6 Cervicale Ht	0.46925 0.0001 79	0.66765 0.0001 79
X7 Acromial Ht	0.41012 0.0002 79	0.72034 0.0001 79
X8 Waist Back Ht Nat	0.48504 0.0001 79	0.62768 0.0001 79
X9 Waist Front Ht Nat	0.42133 0.0001 79	0.51417 0.0001 79
X10 Crotch Ht	0.23792 0.0347 79	0.55923 0.0001 79
X11 Biacromial Br	0.45557 0.0001 79	0.28027 0.0124 79
X12 Shoulder Circ	0.58321 0.0001 79	0.31384 0.0049 79
X13 Chest Circ	0.56387 0.0001 79	0.39293 0.0003 79
X14 Waist Circ Nat	0.50183 0.0001 79	0.48845 0.0001 79
X15 Hip Circ Max	0.84579 0.0001 79	0.16700 0.1413 79
X16 Hip Ht Max	$0.36316 \\ 0.0010$	0.57371 0.0001
X17 Wrist Circ	0.52963 0.0001 79	0.48074 0.0001 79

X18 Sleeve Lt: Sp-Wrist	0.28633 0.0105 79	0.61250 0.0001 79
X19 Biceps Circ	0.52648 0.0001 79	0.24839 0.0273 79
X20 Waist Back Lth Nat	0.13600 0.2320 79	0.18383 0.1049 79
X21 Waist Front Lth Nat	0.26506 0.0182 79	0.54570 0.0001 79
X22 Crotch Lth Total Nat	0.79624 0.0001 79	0.26385 0.0188 79
X23 Crotch Lth Back Nat	0.64853 0.0001 79	0.15557 0.1710 79
X24 Thigh Circ	0.78740 0.0001 79	0.19533 0.0845 79

## APPENDIX F NAVY: F-TO-REMOVE STATISTICS

## Navy Flight Suit Women Acceptable Fits

## Stepwise Discriminant Analysis For Size Number

79	Observations	21	Variable(s)	in the A	Analysis
6	Class Levels	0	Variable(s)	will be	included

The Method for Selecting Variables will be: BACKWARD

Significance Level to Stay = 0.1500

## Class Level Information

Proportion	Weight	Frequency	SZNUMBER
0.037975	3.0000	3	32
0.177215	14.0000	14	34
0.278481	22.0000	22	36
0.316456	25.0000	25	38
0.177215	14.0000	14	40

Backward Elimination: Step 0

All variables have been entered

#### Multivariate Statistics

Wilks' Lambda	=	0.03538390	F( 105, 264) =	2.464
Pillai's Trace	=	2.053553	Prob > F = 0.0001 F(105,285) =	1.892

Average Squared Canonical Correlation = 0.41071057

Backward Elimination: Step 1

## Statistics for Removal, DF = 5, 53

	Partial			
Variable	R**2	F	Prob > F	Label
X1	0.1030	1.217	0.3141	Reported Weight
X5	0.0886	1.030	0.4097	Stature
X6	0.1080	1.283	0.2851	Cervicale Ht
X7	0.0783	0.901	0.4876	Acromial Ht
X8	0.0920	1.074	0.3853	Waist Back Ht Nat
X9	0.0132	0.142	0.9815	Waist Front Ht Nat
X10	0.1812	2.345	0.0537	Crotch Ht
X11	0.1589	2.003	0.0932	Biacromial Br
X12	0.0921	1.075	0.3848	Shoulder Circ
X13	0.0903	1.052	0.3975	Chest Circ
X14	0.1910	2.502	0.0416	Waist Circ Nat
X15	0.3104	4.772	0.0011	Hip Circ Max
X16	0.1004	1.183	0.3297	Hip Ht Max
X17	0.1195	1.439	0.2256	Wrist Circ
X18	0.1463	1.816	0.1255	Sleeve Lt: Sp-Wrist
X19	0.0235	0.255	0.9353	Biceps Circ
X20	0.0744	0.852	0.5193	Waist Back Lth Nat
X21	0.0468	0.520	0.7600	Waist Front Lth Nat
X22	0.0713	0.814	0.5453	Crotch Lth Total Nat
X23	0.0989	1.163	0.3394	Crotch Lth Back Nat
X24	0.0333	0.365	0.8703	Thigh Circ

Variable X9 will be removed

## The following variable(s) have been removed: X9

## Multivariate Statistics

Wilks' Lambda	=	0.03585886	F(100, 268) =	2.623
Pillai's Trace	=	2.046541	F(100, 290) = Prob > F = 0.0001	2.009

Average Squared Canonical Correlation = 0.40930822

Stepwise Discriminant Analysis For Size Letter

79	Observations	20	Variable(s)	in the	Analysis
3	Class Levels	0	Variable(s)	will b	e included

The Method for Selecting Variables will be: BACKWARD

Significance Level to Stay = 0.1500

## Class Level Information

SZLETTER	Frequency	Weight	Proportion
L R	8 42	8.0000 42.0000	0.101266 0.531646
S	29	29.0000	0.367089

Backward Elimination: Step 0

All variables have been entered

#### Multivariate Statistics

Wilks' Lambda	=	0.19371694	F (	40,	114) =	=	3.625	Prob	>	F	=	0.0001
Pillai's Trace	=	1.057142	F (	40,	116) =	-	3.252	Prob	>	F	=	0.0001

Average Squared Canonical Correlation = 0.52857086

Backward Elimination: Step 1

Statistics for Removal, DF = 2, 57

	Partial			
Variable	R**2	F	Prob > F	Label
X5	0.0505	1.515	0.2286	Stature
X6	0.0117	0.337	0.7156	Cervicale Ht
X7	0.0206	0.599	0.5529	Acromial Ht
X8	0.0314	0.925	0.4023	Waist Back Ht Nat
X9	0.0003	0.010	0.9905	Waist Front Ht Nat
X10	0.0153	0.444	0.6435	Crotch Ht
X11	0.0692	2.119	,0.1295	Biacromial Br
X12	0.0828	2.572	0.0852	Shoulder Circ
X13	0.0190	0.551	0.5795	Chest Circ
X14	0.2536	9.683	0.0002	Waist Circ Nat
X15	0.0699	2.141	0.1269	Hip Circ Max
X16	0.0508	1.526	0.2262	Hip Ht Max
X17	0.0020	0.058	0.9436	Wrist Circ
X18	0.0404	1.200	0.3087	Sleeve Lt: Sp-Wrist
X19	0.0140	0.405	0.6686	Biceps Circ
X20	0.0623	1.894	0.1598	Waist Back Lth Nat
X21	0.0074	0.211	0.8103	Waist Front Lth Nat
X22	0.0112	0.322	0.7260	Crotch Lth Total Nat
X23	0.0198	0.575	0.5661	Crotch Lth Back Nat
X24	0.0845	2.632	0.0807	Thigh Circ

## Variable X9 will be removed

The following variable(s) have been removed:

## Multivariate Statistics

Wilks' Lambda	=	0.19378169	F (	38,	116)	=	3.882	Prob	>	F	=	0.0001
Pillai's Trace	=	1.057034	F (	38,	118)	=	3.481	Prob	>	F	=	0.0001

## APPENDIX G NAVY FACTOR ANALYSIS

## Navy Flight Suit Females Acceptable Fits

## Initial Factor Method: Principal Components

## Prior Communality Estimates: ONE

Eigenvalues	of the Corr	elation Matri	ix: Total =	21 Average	= 1
Eigenvalue Difference Proportion Cumulative	1 8.4781 2.7723 0.4037 0.4037	2 5.7058 4.2100 0.2717 0.6754	3 1.4958 0.2981 0.0712 0.7467	4 1.1977 0.2358 0.0570 0.8037	5 0.9620 0.2641 0.0458 0.8495
Eigenvalue Difference Proportion Cumulative	6 0.6979 0.1316 0.0332 0.8827	7 0.5663 0.1782 0.0270 0.9097	8 0.3881 0.0294 0.0185 0.9282	9 0.3587 0.0653 0.0171 0.9453	$\begin{array}{c} 10 \\ 0.2934 \\ 0.0673 \\ 0.0140 \\ 0.9592 \end{array}$
Eigenvalue Difference Proportion Cumulative	11 0.2261 0.0865 0.0108 0.9700	12 0.1396 0.0149 0.0066 0.9766	13 0.1248 0.0152 0.0059 0.9826	14 0.1095 0.0191 0.0052 0.9878	$15 \\ 0.0904 \\ 0.0427 \\ 0.0043 \\ 0.9921$
Eigenvalue Difference Proportion Cumulative	16 0.0478 0.0037 0.0023 0.9944	17 0.0440 0.0145 0.0021 0.9965	18 0.0296 0.0057 0.0014 0.9979	19 0.0239 0.0096 0.0011 0.9990	20 0.0143 0.0082 0.0007 0.9997
Eigenvalue Difference Proportion Cumulative	21 0.0061 0.0003 1.0000				

4 factors will be retained by the MINEIGEN criterion.

Initial Factor Method: Principal Components

## Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	
X1	0.76945	0.55725	-0.06562	0.13452	Reported Weight
X5	0.85691	-0.45921	0.04166	0.13415	Stature
X6	0.85889	-0.47474	0.02560	0.14644	Cervicale Ht
X7	0.81541	-0.46731	0.04456	0.11482	Acromial Ht
X8	0.87289	-0.40832	-0.09634	-0.14050	Waist Back Ht Nat
X9	0.81524	-0.48238	-0.22905	-0.04022	Waist Front Ht Nat
X10	0.70931	-0.64186	-0.02636	-0.01428	Crotch Ht
X11	0.53356	0.13418	0.24547	-0.33754	Biacromial Br
X12	0.51627	0.58372	0.35633	-0.19720	Shoulder Circ
X13	0.44415	0.70080	0.23784	-0.08274	Chest Circ
X14	0.36680	0.74805	0.20563	-0.09055	Waist Circ Nat
X15	0.47938	0.65345	-0.30427	0.33756	Hip Circ Max
X16	0.71769	-0.48223	-0.03292	-0.14872	Hip Ht Max
X17	0.64059	0.28927	0.17963	-0.07391	Wrist Circ
X18	0.74553	-0.37369	0.23357	-0.27148	Sleeve Lt: Sp-Wrist
X19	0.36446	0.70563	0.07309	-0.08754	Biceps Circ
X20	0.23531	-0.30907	0.22284	0.74421	Waist Back Lth Nat
X21	0.26275	0.22468	0.69788	0.28815	Waist Front Lth Nat
X22	0.67467	0.47164	-0.42265	-0.00054	Crotch Lth Total Nat

X23	0.58315	0.41669	-0.42489	-0.09230	Crotch Lth Back Nat
X24	0.41588	0.77263	-0.23861	0.26324	Thigh Circ

## Variance explained by each factor

#### FACTOR1 FACTOR2 FACTOR3 FACTOR4 8.478130 5.705796 1.495836 1.197744

Final Communality Estimates: Total = 16.877507

X1	X5	X6	X7	X8	X9	X10
0.924991	0.964906	0.985169	0.898444	0.957672	0.951384	0.916000
X11	X12	X13	X14	X15	X16	X17
0.476883	0.773119	0.751808	0.744607	0.863329	0.770820	0.531767
X18	X19	X20	X21	X22	X23	X24
0.823713	0.643752	0.754407	0.689592	0.856259	0.702749	0.896136

## Rotation Method: Varimax

#### Orthogonal Transformation Matrix

	1	2	3	4
1	0.80380	0.45894	0.37124	0.07387
2	-0.58498	0.62712	0.50769	-0.08230
3	-0.04448	-0.56568	0.71399	0.41017
4	-0.09861	0.27587	-0.30764	0.90528

#### Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	
X1 X5 X6	0.28216 0.94233 0.95251	0.77683 0.11873 0.12237	0.48033 0.07347 0.05107	0.10584 0.23962 0.24558	Reported Weight Stature Cervicale Ht
X7	0.91549	0.08763	0.06196	0.22092	Acromial Ht Waist Back Ht Nat
X8 X9	0.95162	0.19011	-0.09341	-0.03044	Waist Front Ht Nat
X10	0.94820	-0.06602	-0.07697	0.08148	Crotch Ht
X11	0.37276	0.09704	0.54531	-0.17651	Biacromial Br
X12	0.07711	0.34703	0.80309	-0.04227	Shoulder Circ
X13	-0.05536	0.48596	0.71594	-0.00221	Chest Circ
X14	-0.14297	0.49615	0.69063	-0.03210	Waist Circ Nat
X15	-0.01668	0.89504	0.18862	0.16241	Hip Circ Max
X16	0.87510	0.00455	0.04387	-0.05544	Hip Ht Max
X17	0.34499	0.35340	0.53567	0.03028	Wrist Circ
X18	0.83424	-0.09922	0.33734	-0.06414	Sleeve Lt: Sp-Wrist
X19	-0.11444	0.54428	0.57266	-0.08042	Biceps Circ
X20	0.28664	-0.00658	-0.13940	0.80794	Waist Back Lth Nat
X21	0.02030	-0.05380	0.62125	0.54803	Waist Front Lth Nat
X22	0.28526	0.84434	0.18830	-0.16283	Crotch Lth Total Nat
X23	0.25299	0.74383	0.15306	-0.24906	Crotch Lth Back Nat
X24	-0.13303	0.88299	0.29530	0.10757	Thigh Circ

#### Variance explained by each factor

## FACTOR1FACTOR2FACTOR3FACTOR47.4448304.5994813.5150411.318155

Final Communality Estimates: Total = 16.877507

X1	X5	X6	X7	X8	X9	X10
0.924991	0.964906	0.985169	0.898444	0.957672	0.951384	0.916000

X11	X12	X13	X14	X15	X16	X17
0.476883	0.773119	0.751808	0.744607	0.863329	0.770820	0.531767
X18	X19	X20	X21	X22	X23	X24
0.823713	0.643752	0.754407	0.689592	0.856259	0.702749	0.896136

## APPENDIX H NAVY: MANOVA AGAINST COMMON VARIABLES

#### Navy Flight Suit Females Acceptable Fits

#### General Linear Models Procedure Class Level Information

Class	Levels	Values
SZNUMBER	6	32 34 36 38 40 42
SZLETTER	3	LRS

Number of observations in data set = 80

Multivariate Analysis of Variance

First Eigenvalue and Eigenvector of: E Inverse * H, where H = Type IV SS&CP Matrix for SZNUMBER E = Error SS&CP Matrix

First Eigenvalue: 3.17119920 Percent: 77.61

First Eigenvector V'EV=1:

0.00227422	(Reported Weight)	0.04024976	(Acromial Height)
0.06344858	(Biacromial Breadth)	0.07294894	(Cervicale Height)
-0.00776057	(Chest Circ)	-0.06725586	(Crotch Height)
0.07774618	(Hip Circ Max)	0.06648756	(Hip Height Max)
0.01808090	(Shoulder Circ)	-0.02290117	(Sleeve L: Sp-Wrist)
-0.05237498	(Stature)	0.03932973	(Thigh Circ)

Manova Test Criteria and F Approximations for the Hypothesis of no Overall SZNUMBER Effect H = Type IV SS&CP Matrix for SZNUMBER E = Error SS&CP Matrix

S=5	M=3	N=27	
Value		P	Num DE

SLALISLIC	Value	Ľ	Num Dr	Dell Dr	
Wilks' Lambda	0.10770373	2.7019	60	266.0044	0.0001
Pillai's Trace	1.46648947	2.0751	60	300	0.0001

First Eigenvalue and Eigenvector of: E Inverse * H, where H = Type IV SS&CP Matrix for SZLETTER E = Error SS&CP Matrix

First Eigenvalue: 0.96755118 Percent: 90.26

First Eigenvector V'EV=1:

0.01094588	(Reported Weight)	0.08589151	(Acromial Height)
0.04289182	(Biacromial Breadt	h)-0.06580052	(Cervicale Height)
0.02184077	(Chest Circ)	-0.03113111	(Crotch Height)
-0.01774687	(Hip Circ Max)	0.01241213	(Hip Height Max)
-0.04004196	(Shoulder Circ)	0.04873405	(Sleeve L: Sp-Wrist)
0.02709935	(Stature)	-0.01248359	(Thigh Circ)

Manova Test Criteria and F Approximations for the Hypothesis of no Overall SZLETTER Effect

H = Type IV SS&CP Matrix for SZLETTER E = Error SS&CP Matrix

#### S=2 M=4.5 N=27

Value

Statistic

a. . . . . . . . .

F Num DF

Don DE Dr > E

Den DF Pr > F

Pillai's Trace 0.58626154 1.9698	8 24	114	0.0095
----------------------------------	------	-----	--------

NOTE: F Statistic for Wilks' Lambda is exact.

First Eigenvalue and Eighenvector of: E Inverse * H, where H = Type IV SS&CP Matrix for SZNUMBER*SZLETTER E = Error SS&CP Matrix

First Eigenvalue: 0.45201546 Percent: 44.08 First Eigenvector V'EV=1: -0.01242903 (Reported Weight) -0.04467761 (Acromial Height) -0.05006036 (Biacromial Breadth) 0.26304665 (Cervicale Height) 0.00221064 (Chest Circ) -0.09487646 (Crotch Height) -0.01572769 (Hip Circ Max) 0.10148862 (Hip Height Max) 0.05574749 (Shoulder Circ) -0.02400013 (Sleeve L: Sp-Wrist)

0.05574749 (Shoulder Circ) -0.02400013 (Sleeve L: Sp-Wrist) -0.11889356 (Stature) 0.12648888 (Thigh Circ)

Manova Test Criteria and F Approximations for the Hypothesis of no Overall SZNUMBER*SZLETTER Effect H = Type IV SS&CP Matrix for SZNUMBER*SZLETTER E = Error SS&CP Matrix

	S=5 M=3	N=27			
Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda Pillai's Trace	0.40679809 0.79639314	0.9389 0.9473	60 60	266.0044 300	0.6052 0.5887

## APPENDIX I AIR FORCE: ANTHROPOMETRY AND EIGENVECTOR CORRELATION

## Air Force Flight Suit Females

 $\label{eq:Correlation Analysis} Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 72$ 

	LDFNUM	LDFLET
X1	0.96816	0.88819
WEIGHT	0.0001	0.0001
X4	0.91538	0.73287
HIP CIRC MAX	0.0001	0.0001
X5	0.60061	0.79548
HIP HT	0.0001	0.0001
X6	0.60969	0.53453
NECK CIRC	0.0001	0.0001
X7	0.78690	0.68293
SHOULDER CIRC	0.0001	0.0001
X8	0.79682	0.62235
CHEST CIRC	0.0001	0.0001
X10	0.83979	0.70600
WAIST CIRC PREFER	0.0001	0.0001
X13	0.84715	0.79357
VTC	0.0001	0.0001
X14	0.54725	0.69618
SLEEVE LTH TOTAL	0.0001	0.0001
X15	0.47973	0.63574
SLEEVE OUTSEAM	0.0001	0.0001
X16	0.34819	0.56380
SLEEVE INSEAM	0.0027	0.0001
X17	0.61527	0.79540
STATURE	0.0001	0.0001
X20 NECK HT	0.60398 0.0001	0.78112
X22	0.48179	0.68983
WAIST HT PREFER	0.0001	0.0001
X23	0.50449	0.67091
CROTCH HT	0.0001	0.0001
X24	0.58319	0.64415
BIACROMIAL BR	0.0001	0.0001

## APPENDIX J AIR FORCE: F-TO-REMOVE STATISTICS

#### Air Force Flight Suit Females Stepwise Discriminant Analysis

71 Observations	16	Variable(s)	in the Analysis
7 Class Levels	0	Variable(s)	will be included
	-		

The Method for Selecting Variables will be: BACKWARD

Significance Level to Stay = 0.1500

C3	Class Level Frequency	Information Weight	Proportion
32	9	9.0000	0.126761
34	18	18.0000	0.253521
36	19	19.0000	0.267606
38	13	13.0000	0.183099
40	10	10.0000	0.140845
42	1	1.0000	0.014085
44	1	1.0000	0.014085

Backward Elimination: Step 0

All variables have been entered

#### Multivariate Statistics

Wilks' Lambda= 0.03059292F(96, 284)= 2.520Prob > F = 0.0001Pillai's Trace= 1.909869F(96, 324)= 1.576Prob > F = 0.0019

Average Squared Canonical Correlation = 0.31831147

Backward Elimination: Step 1

## Statistics for Removal, DF = 6, 49

	Partial			
Variable	R**2	F	Prob > F	Label
X1	0.1050	0.958	0.4634	WEIGHT
X4	0.2559	2.809	0.0198	HIP CIRC MAX
x5	0.1288	1.208	0.3183	HIP HT
X6	0.1961	1.992	0.0848	NECK CIRC
x7	0.1611	1.568	0.1765	SHOULDER CIRC
X8	0.0163	0.135	0.9911	CHEST CIRC
x10	0.0477	0.409	0.8696	WAIST CIRC PREFER
X13	0.2029	2.079	0.0727	VTC
x14	0.0436	0.372	0.8933	SLEEVE LTH TOTAL
x15	0.0424	0.362	0.8994	SLEEVE OUTSEAM
X16	0.0970	0.877	0.5184	SLEEVE INSEAM
x17	0.1668	1.635	0.1576	STATURE
x20	0.1723	1.699	0.1411	NECK HT
x22	0.1185	1.098	0.3769	WAIST HT PREFER
x23	0.2218	2.328	0.0468	CROTCH HT
x24	0.1039	0.947	0.4707	BIACROMIAL BR

#### Variable X8 will be removed

The following variable(s) have been removed:

Multivariate Statistics													
Wilks' La	mbda :	=	0.03109911	F (	90,	288)	=	2.730	Prob	>	F	Ħ	0.0001
Pillai's '	Trace :	=	1.905458	F (	90,	330)	=	1.706	Prob	>	F	=	0.0004

Average Squared Canonical Correlation = 0.31757640

## APPENDIX K AIR FORCE: FACTOR ANALYSIS

#### Air Force Flight Suit Females

## Initial Factor Method: Principal Components

#### Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 30 Average = 1 3 4 1.4751 17.7127 5.4467 1.6050 0.7538 Eigenvalue Difference 12.2661 3.8417 0.1298 0.7214 0.2117 0.1816 Proportion 0.0535 0.0492 0.0251 0.5904 0.8747 Cumulative 0.5904 0.7720 0.8255 0.8998 9 6 7 8 10 0.2200 0.5420 0.5313 0.4066 0.3002 Eigenvalue 0.1063 0.0803 0.0371 Difference 0.0107 0.1248 Proportion 0.0181 0.0177 0.0136 0.0100 0.0073 0.9591 0.9664 0.9178 0.9356 0.9491 Cumulative 13 14 15 12 11 0.0988 0.0895 0.1290 0.1056 Eigenvalue 0.1828 0.0539 0.0234 0.0068 0.0093 0.0165 Difference 0.0035 0.0033 0.0030 Proportion 0.0061 0.0043 0.9725 0.9768 0.9804 0.9837 0.9866 Cumulative 17 18 19 20 16 0.0731 0.0595 0.0551 0.0532 0.0391 Eigenvalue 0.0074 0.0043 0.0020 0.0141 Difference 0.0136 0.0020 0.0018 0.0018 0.0013 Proportion 0.0024 0.9960 0.9891 0.9911 0.9929 0.9947 Cumulative 25 22 23 2.4 21 Eigenvalue 0.0176 0.0119 0.0105 0.0316 0.0226 0.0057 0.0025 Difference 0.0090 0.0050 0.0013 0.0006 0.0004 0.0004 Proportion 0.0011 0.0008 0.9970 0.9978 0.9984 0.9988 0.9991 Cumulative 29 30 26 27 28 0.0080 0.0071 0.0047 0.0038 0.0030 Eigenvalue Difference 0.0009 0.0024 0.0009 0.0008 0.0002 0.0002 0.0001 0.0001 Proportion 0.0003 1.0000 Cumulative 0.9994 0.9996 0.9998 0.9999

4 factors will be retained by the MINEIGEN criterion.

Initial Factor Method: Principal Components

#### Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	
X1	0.82905	0.49828	-0.00763	-0.10217	WEIGHT
X2	0.58220	0.65774	-0.13418	-0.25261	UPPER THIGH CIRC
X3	0.69026	0.58686	-0.23808	-0.21798	BUTTOCK CIRC
X4	0.67584	0.59525	-0.24056	-0.21671	HIP CIRC MAX
X5	0.82736	-0.35770	0.20693	-0.13755	HIP HT
X6	0.49634	0.41787	0.31467	0.25769	NECK CIRC
X7	0.66539	0.55741	0.22848	0.14736	SHOULDER CIRC
X8	0.61839	0.64239	0.14414	0.16650	CHEST CIRC
X9	0.63172	0.53102	0.20533	-0.18162	WAIST CIRC OMPH
X10	0.66589	0.60517	0.22684	0.04239	WAIST CIRC PREFER
X11	0.68701	-0.01335	-0.14663	0.57228	WAIST BACK
X12	0.55751	0.22533	-0.40797	-0.48697	CROTCH LTH
X13	0.85266	0.30075	-0.28143	0.11985	VTC

X14 X15 X16 X17	0.86117 0.80442 0.71957 0.91531	-0.24362 -0.43681 -0.51335 -0.34407	0.20901 0.19146 0.13007 -0.12917	0.16446 -0.00445 0.06086 0.05880	SLEEVE LTH TOTAL SLEEVE OUTSEAM SLEEVE INSEAM STATURE
X18	0.92074	-0.34935	-0.06377	0.06788	CERVICALE HT
X19	0.91530	-0.33362	-0.03405	-0.00119	ACROMION HT
X20	0.91050	-0.37439	-0.09998	0.03403	NECK HT
X21	0.81216	-0.51476	0.00453	-0.07694	WAIST HT OMPH
X22	0.76502	-0.50196	-0.04895	-0.28027	WAIST HT PREFER
X23	0.77910	-0.49338	0.21589	-0.13111	CROTCH HT
X24	0.71322	0.21617	0.11455	0.33211	BIACROMIAL BR
X25	0.77021	-0.11164	-0.51791	0.27811	SITTING HT
X26	0.75809	-0.10340	-0.54869	0.26915	EYE HT SIT
X27	0.84910	-0.37879	0.16441	-0.14427	KNEE HT SIT
X28	0.90268	-0.02717	0.15487	-0.22760	BUTT-KNEE LTH (ANSUR)
X29	0.89972	-0.01217	0.16578	-0.23960	BUTT-KNEE LTH (AF)
X30	0.71577	0.52087	0.24021	0.16154	BIDELTOID BR

Variance explained by each factor

FACTOR1 FACTOR2 FACTOR3 FACTOR4 17.712749 5.446692 1.604990 1.475142

Final Communality Estimates: Total = 26.239574

X1	X2	X3	X4	X5	X6
0.946103	0.853390	0.925067	0.915918	0.874215	0.586388
X7	X8	X9	X10	X11	X12
0.827373	0.843572	0.756198	0.862884	0.821170	0.765171
x13	X14	X15	X16	X17	X18
0.911057	0.871704	0.874573	0.801934	0.976311	0.978479
X19	X20	X21	X22	X23	X24
0.950238	0.980331	0.930521	0.918155	0.914226	0.678837
X25	X26	X27	X28	X29	X30
0.951269	0.958891	0.912295	0.891353	0.894529	0.867420

Rotation Method: Varimax

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Orthogonal Transformation Matrix

	1	2	3	4
1 2 3 <b>1</b>	0.73040 -0.61994 0.23154 -0.16906	0.52758 0.71830 0.40622 0.20173	0.32708 -0.04636 -0.67198 0.66281	0.28493 0.31238 -0.57431 -0.70100

## Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	
X1	0.31214	0.77160	0.18547	0.46788	WEIGHT
X2	0.02912	0.67414	0.08267	0.62549	UPPER THIGH CIRC
Х3	0.12208	0.64503	0.21406	0.66954	BUTTOCK CIRC
X4	0.10555	0.64270	0.21147	0.66858	HIP CIRC MAX
X5	0.89722	0.23588	0.05698	0.10159	HIP HT
X6	0.13277	0.74182	0.10232	-0.08940	NECK CIRC
X7	0.16843	0.87398	0.13593	0.12920	SHOULDER CIRC
X8	0.05865	0.87982	0.18598	0.17737	CHEST CIRC
X9	0.21046	0.76148	-0.07635	0.35528	WAIST CIRC OMPH
X10	0.15656	0.88670	0.06541	0.21879	WAIST CIRC PREFER
X11	0.37937	0.40875	0.70318	-0.12538	WAIST BACK
X12	0.25538	0.19203	0.12328	0.80491	CROTCH LTH
X13	0.35092	0.57573	0.53350	0.41451	VTC
X14	0.80062	0.39743	0.26153	-0.06605	SLEEVE LTH TOTAL

0.90343	0.18752	0.15176	-0.01408	SLEEVE OUTSEAM
0.86365	0.07601	0.21209	-0.07269	SLEEVE INSEAM
0.84199	0.19515	0.44110	0.18629	STATURE
0.86284	0.22262	0.40519	0.14227	CERVICALE HT
0.86768	0.22919	0.33693	0.17698	ACROMION HT
0.86823	0.17769	0.40490	0.17605	NECK HT
0.92638	0.04505	0.23546	0.12195	WAIST HT OMPH
0.90600	-0.03336	0.12062	0.28576	WAIST HT PREFER
0.94708	0.11790	0.04573	0.03579	CROTCH HT
0.35730	0.64509	0.36641	-0.02784	BIACROMIAL BR
0.46484	0.17187	0.78946	0.28707	SITTING HT
0.44527	0.15709	0.79985	0.31014	EYE HT SIT
0.91747	0.21357	0.08919	0.13033	KNEE HT SIT
0.75050	0.47372	0.04158	0.31933	BUTT-KNEE LTH (ANSUR)
0.74359	0.48495	0.02463	0.32531	BUTT-KNEE LTH (AF)
0.22820	0.88193	0.15562	0.11546	BIDELTOID BR
	0.90343 0.86365 0.84199 0.86284 0.86768 0.92638 0.92638 0.90600 0.94708 0.35730 0.46484 0.44527 0.91747 0.75050 0.74359 0.22820	$\begin{array}{cccccc} 0.90343 & 0.18752 \\ 0.86365 & 0.07601 \\ 0.84199 & 0.19515 \\ 0.86284 & 0.22262 \\ 0.86768 & 0.22919 \\ 0.86823 & 0.17769 \\ 0.92638 & 0.04505 \\ 0.90600 & -0.03336 \\ 0.94708 & 0.11790 \\ 0.35730 & 0.64509 \\ 0.46484 & 0.17187 \\ 0.44527 & 0.15709 \\ 0.91747 & 0.21357 \\ 0.75050 & 0.47372 \\ 0.74359 & 0.48495 \\ 0.22820 & 0.88193 \\ \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

Variance explained by each factor

FACTOR1 FACTOR2 FACTOR3 FACTOR4 11.671031 8.065318 3.279427 3.223798

Final Communality Estimates: Total = 26.239574

X1	X2	X3	X4	X5	X6
0.946103	0.853390	0.925067	0.915918	0.874215	0.586388
X7	X8	X9	X10	X11	X12
0.827373	0.843572	0.756198	0.862884	0.821170	0.765171
X13	X14	X15	X16	X17	X18
0.911057	0.871704	0.874573	0.801934	0.976311	0.978479
X19	X20	X21	X22	X23	X24
0.950238	0.980331	0.930521	0.918155	0.914226	0.678837
X25	X26	X27	X28	X29	X30
0.951269	0.958891	0.912295	0.891353	0.894529	0.867420

## APPENDIX L AIR FORCE: MANOVA AGAINST COMMON VARIABLES

Air Force Flight Suit Females

#### General Linear Models Procedure Class Level Information

Class	Levels	Values
C3	7	32 34 36 38 40 42 44
C4	3	LRS

Number of observations in data set = 72

NOTE: Observations with missing values will not be included in this analysis. Thus, only 71 observations can be used in this analysis.

## Multivariate Analysis of Variance

First Eigenvalue and Eigenvector of: E Inverse * H, where H = Type IV SS&CP Matrix for BFNUM E = Error SS&CP Matrix

First Eigenvalue: 4.18471355 Percent: 74.39

0.00952276	(Reported Weight)	0.00028957	(Acromial Height)
-0.00062366	(Biacromial Breadth)	-0.00124671	(Cervicale Height)
0.00045457	(Chest Circ)	0.00251243	(Crotch Height)
0.00357014	(Hip Circ Max)	0.00114335	(Hip Height Max)
0.00086555	(Shoulder Circ)	-0.00130059	(Sleeve L: Total)
-0.00035955	(Stature)	-0.00126202	(Thigh Circ)

Manova Test Criteria and F Approximations for the Hypothesis of no Overall C3 Effect H = Type IV SS&CP Matrix for C3 E = Error SS&CP Matrix

#### S=6 M=2.5 N=22

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.05743624	2.4565	72	256.0715	0.0001
Pillai's Trace	1.83921801	1.8787	72	306	0.0001

Characteristic Roots and Vectors of: E Inverse * H, where H = Type IV SS&CP Matrix for BFLET E = Error SS&CP Matrix

First Eigenvalue: 1.30879118 Percent: 74.99

First Eigenvector V'EV=1:

0.01451158	(Reported Weight)	0.00003631	(Acromial Height)
0.00474079	(Biacromial Breadth	h)-0.00587677	(Cervicale Height)
-0.00065218	(Chest Circ)	-0.00060890	(Crotch Height)
-0.00121524	(Hip Circ Max)	0.00466913	(Hip Height Max)
-0.00082467	(Shoulder Circ)	-0.00106992	(Sleeve L: Total)
0.00441606	(Stature)	0.00117548	(Thigh Circ)

Manova Test Criteria and F Approximations for the Hypothesis of no Overall C4 Effect H = Type IV SS&CP Matrix for BFLET E = Error SS&CP Matrix

#### S=2 M=4.5 N=22

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.30153665	3.1475	24	92	0.0001
Pillai's Trace	0.87068774	3.0197	24	94	0.0001
Hotelling-Lawley Trace	1.74519064	3.2722	24	90	0.0001
Roy's Greatest Root	1.30879118	5.1261	12	47	0.0001

NOTE: F Statistic for Wilks' Lambda is exact.

First Eigenvalue and Eigenvector of: E Inverse * H, where H = Type IV SS&CP Matrix for BFNUM*BFLET E = Error SS&CP Matrix

First Eigenvalue: 0.57874900 Percent: 42.74

First Eigenvector V'EV=1:

-0.00626444	(Reported Weight)	0.00117188	(Acromial Height)
-0.00049695	(Biacromial Breadth)	0.00212542	(Cervicale Height)
0.00094323	(Chest Circ)	0.00233185	(Crotch Height)
0.00736501	(Hip Circ Max)	-0.00009296	(Hip Height Max)
0.00041219	(Shoulder Circ)	-0.00154880	(Sleeve L: Total)
-0.00261475	(Stature)	-0.00545837	(Thigh Circ)

Manova Test Criteria and F Approximations for the Hypothesis of no Overall BFNUM*BFLET Effect H = Type IV SS&CP Matrix for BFNUM*BFLET E = Error SS&CP Matrix

#### S=5 M=3 N=22

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.32000567	1.0064	60	219.1783	0.4721
Pillai's Trace	0.97308226	1.0069	60	250	0.4701
APPENDIX M PATTERN MEASUREMENTS

# MEASURMENTS FOR SIZES WITH LENGTH S

<b>MEAFFS Pattern</b>					SIZES				
Measurements (in)	32S	34S	36S	38S	40S	42S	44S	46S	
Torso Neckline	5 1/8	5 3/8	5 3/8	5 6/8	not				
(Front)					available				
Torso Neckline	6 5/8	7	7 2/8	7 4/8	not				
(Back)					available				
Shoulder (Front)	10 5/8	11	11 1/8	11 4/8	not				
					available				
Shoulder (Back)	27	27 5/8	28 1/8	28 4/8	not	29 5/8	30 1/8		
					available				
Chest (Front)	8 5/8	9 2/8	9 6/8	10 4/8	not				
					available				
Chest (Back)	25 1/8	26 2/8	27 3/8	28 1/8	not				
					available				
Waist (Front)	9 1/8	9 6/8	10 1/8	10 6/8	not				
	•				available				
Waist (Back) 2	24 1/8	25 2/8	26 2/8	27	not				
					available				
Waist (Back) 1	24	25 1/8	26 2/8	27	not	29 2/8	30 3/8		
					available				
Hip (Front)	10 2/8	10 6/8	11 2/8	11 6/8	not				
					available				
Hip (Back)	12 1/8	12 5/8	12 7/8	12 3/8	not				
					available				
Thigh (Front)	12 4/8	12 7/8	12 4/8	14	not				
					available				
Thigh (Back)	17 1/8	17 4/8	17 7/8	18 2/8	not				
					available				

MEAFFS Pattern					SIZES				
 Measurements (in)	32S	34S	36S	38S	40S	42S	44S	46S	
Calf (Front)	10 2/8	10 4/8	10 7/8	11 1/8	not available				
Calf (Back)	11 5/8	12	12 1/8	12 3/8	not available				
Hem (Front)	10 3/8	10 6/8	10 7/8	11	not available				
Hem (Back)	10 4/8	10 7/8	11 1/8	11 1/8	not available				
Crotch Lth (Front)	12 1/8	12 3/8	12 6/8	12 3/8	not available				
Crotch Lth (Back)	17	17 1/8	17 3/8	17 3/8	not available				
Leg Inseam	31	31	31	31	not available				
 Leg Outseam	42 4/8	42 5/8	43	43	not available			· · · · · · · · · · · · · · · · · · ·	
Upper Torso (Front)	15 2/8	15 3/8	15 5/8	16 3/8	not available				
 Upper Torso (Back) 2	18 6/8	19	19 2/8	20	not available			2.	
Upper Torso (Back) 1	18 6/8	19	19 2/8	19 7/8	not available	20 2/8	20 1/8		
Torso (Full Length)	26 6/8	27 2/8	27 7/8	28 2/8	not available	29 1/8	30	30 3/8	
Sleeve Head (Top)	14 1/8	14 5/8	15 1/8	15 6/8	16 2/8	16 7/8	17 4/8	18	
Sleeve Head (Bottom)	7 4/8	7 6/8	œ	8 3/8	8 5/8*	8 7/8*	9 1/8	*6	
Sleeve Cuff (Top)	6	6	9 2/8	9 2/8	9 2/8	9 5/8	9 4/8	9 6/8	
Sleeve Cuff (Bottom)	6 1/8	6 1/8	6 2/8	6 3/8	6 3/8	6 4/8	6 5/8	6 5/8	
				65					

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<b>MEAFFS</b> Pattern					SIZES				
Measurements (in)	32S	34S	36S	38S	40S	42S	44S	46S	
Sleeve Inseam (Top)	23 3/8	23 5/8	23 7/8	24	24 2/8	24 5/8	24 6/8	25	
Sleeve Inseam (Bottom)	23 3/8	23 5/8	23 7/8	24 1/8	24 2/8*	24 5/8*	24 6/8	25 1/8*	
Sleeve Back Seam (Top)	22 2/8	22 3/8	22 4/8	22 4/8	22 4/8	22 5/8	22 6/8	22 7/8	
Sleeve Back Seam (Bottom)	22 5/8	22 6/8	22 6/8	22 7/8	22 6/8	23	23	23 1/8	

* Measured the longest point on the pattern.

Some measurements were originally measured in centimeters. They are: Shoulders, Waist Ht, Upper Torso (Back), Torso (Full Length), and all sleeve measurements. These measurements were then coverted to inches. The deltas were therefore also computed in cm and converted to in. Any discrepancy between the delta in inches and the actual measurement values in inches is due to conversion error.

CHANGE BETWEEN SIZES OF LENGTH S

	MEAFFS Pattern					
	Measurements (in)	34S - 32S	36S - 34S	38S - 36S	40S - 38S	42S - 40S
•	Torso Neckline	2/8	0	2/8	not available	not available
	Torso Neckline (Back)	3/8	2/8	2/8	not available	not available
	Shoulder (Front)	3/8	1/8	3/8	not available	
	Shoulder (Back)	5/8	4/8	3/8	not available	not available
	Chest (Front)	5/8	4/8	6/8	not available	not available
	Chest (Back)	1 1/8	1 1/8	6/8	not available	not available
1	Waist (Front)	5/8	3/8	5/8	not available	not available
	Waist (Back) 2	1 1/8	1	6/8	not available	not available
	Waist (Back) 1	1 1/8	1 1/8	6/8	not available	not available
	Hip (Front)	4/8	4/8	4/8	not available	
	Hip (Back)	4/8	2/8	4/8	not available	
	Thigh (Front)	3/8	5/8	4/8	not available	
	Thigh (Back)	3/8	3/8	3/8	not available	
	Calf (Front)	2/8	3/8	2/8	not available	

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MEAFFS Pattern					
Measurements (in)	34S - 32S	36S - 34S	38S - 36S	40S - 38S	42S - 40S
Calf (Back)	3/8	1/8	2/8	not available	
Hem (Front)	3/8	1/8	1/8	not ayailable	
Hem (Back)	3/8	2/8	0	not available	
Crotch Lth (Front)	2/8	3/8	-3/8	not available	
Crotch Lth (Back)	1/8	2/8	0	not available	
Leg Inseam	0	0	0	not available	
Leg Outseam	1/8	3/8	0	not available	
Upper Torso (Front)	1/8	2/8	6/8	not available	not available
Upper Torso (Back) 2	2/8	2/8	6/8	not available	
Upper Torso (Back) 1	2/8	2/8	6/8	not available	not available
Torso (Full Length)	4/8	5/8	3/8	not available	not available
Sleeve Head (Top)	4/8	4/8	5/8	4/8	4/8
Sleeve Head (Bottom)	2/8	2/8	3/8	2/8	2/8
Sleeve Cuff (Top)	0	1/8	0	0	3/8
Sleeve Cuff (Bottom)	1/8	1/8	1/8	0	1/8
Sleeve Inseam (Top)	2/8	2/8	2/8	1/8	3/8

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$-325$ $365 \cdot 345$ $385 \cdot 365$ $405 \cdot 385$ $425 \cdot 405$ $1/8$ $1/8$ $1/8$ $1/8$ $3/8$ $1/8$ $1/8$ $0$ $0$ $0$ $1/8$ $1/8$ $2/8$	42S - 40S 3/8 0 2/8	1
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	42S - 40 3/8 0 2/8	
365 - 34S     38S - 36S     40S - 38S       1/8     3/8     1/8     1/8       1/8     1/8     0       0     1/8     -1/8	-325     365 - 345     385 - 365     405 - 385       1/8     1/8     1/8     0       0     1/8     1/8		
365 - 34S     38S - 36S     40S       1/8     3/8     1/8     1/8       1/8     1/8     0       0     1/8     -1/8	- 32S     36S - 34S     38S - 36S     40S       1/8     1/8     3/8     1/8     0       0     1/8     1/8     0	- 38S	·
36S - 34S     38S - 36S       1/8     3/8       1/8     1/8       0     1/8	-32S     36S - 34S     38S - 36S       1/8     3/8       1/8     1/8       0     1/8	40S 1/8 0 -1/8	
365 - 345 1/8 0	- 32S 36S - 34S 1/8 0 0	<u>38S - 36S</u> 3/8 1/8 1/8	
36S - 34 1/8 0	- 32S 36S - 34 1/8 0	S2	
	- 325	36S - 34 1/8 1/8 0	. :

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# MEASUREMENTS FOR SIZES OF LENGTH R

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	48R				31 2/8					32 1/8					
	46R				30 6/8					31 2/8					
	44R				30					30 2/8					
	42R				29 5/8					29					
SIZES	40R	5 6/8	7 7/8	11 5/8	29 1/8	11 1/8 **	29 2/8 **	11 3/8	not available	28 2/8	12 2/8	13 5/8	14 4/8	18 6/8	11 2/8 **
	38R	5 6/8	7 6/8	11 4/8	28 4/8	10 5/8 **	28 3/8 **	10 7/8	27 3/8	27 2/8	11 7/8	13 3/8	14 1/8	18 3/8	** 11
	36R	5 5/8	7 3/8	11 3/8	28	10 **	27 4/8 **	10 3/8	26 3/8	26 2/8	11 2/8	12 7/8	13 5/8	17 6/8	10 6/8 **
	34R	5 2/8	6 5/8	10 7/8	27 4/8	9 2/8 **	26 2/8 **	9 6/8	25 1/8	25	10 7/8	12 5/8	13 1/8	17 4/8	10 5/8 **
	32R	5 2/8	6 5/8	10 6/8	27	8 7/8 **	25 2/8 **	9 3/8	24 1/8	24	10 4/8	12 1/8	12 5/8	17	10 3/8 **
<b>MEAFFS</b> Pattern	Measurements (in)	Torso Neckline (Front)	Torso Neckline (Back)	Shoulder (Front)	Shoulder (Back)	Chest (Front)	Chest (Back)	Waist (Front)	Waist (Back) 2	Waist (Back) 1	Hip (Front)	Hip (Back)	Thigh (Front)	Thigh (Back)	Calf (Front)

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	48R								-	1.	21 2/8	31 6/8	18 4/8	9 2/8*	<i>6 1/8</i>	6 6/8	26 2/8	
	46R										21	31 2/8	17 7/8	not available	9 5/8	not available	25 7/8	
	44R										20 7/8	30 7/8	17 2/8	6	9 2/8	6 5/8	25 4/8	
	42R										20 6/8	30 1/8	not available	8 6/8	not available	6 3/8	not available	
SILES	40R	12 3/8 **	11	11 1/8	13 5/8 **	18 **	33 **	45 6/8	17	not available	20 7/8	29 4/8	not available	not available	not available	not available	not available	
	38R	12 2/8 **	11	11	12 3/8 **	17 6/8 **	33 **	45 4/8	17	20_3/8	20 2/8	29 1/8	15 5/8	8 2/8	9 2/8	6 2/8	25 1/8	
	36R	12 **	11	11 1/8	12 6/8 **	17 4/8 **	33 1/8 **	45 3/8	16 3/8	20	20	28 7/8	15 1/8	8	6	6 2/8	24 6/8	
	34R	11 7/8 **	10 6/8	10 5/8	12 5/8 **	17 2/8 **	33 1/8 **	45 1/8	16 1/8	19 6/8	19 6/8	28 1/8	14 6/8	7 6/8	9 1/8	6 1/8	24 5/8	-
	32R	11 4/8 **	10 1/8	10 5/8	12 3/8 **	16 7/8 **	33 1/8 **	45	15 7/8	19 4/8	19 4/8	27 6/8	14 1/8	7 4/8	6	6 1/8	24 3/8	
MEAFFS Pattern	Measurements (in)	Calf (Back)	Hem (Front)	Hem (Back)	Crotch Lth (Front)	Crotch Lth (Back)	Leg Inseam	Leg Outseam	Upper Torso (Front)	Upper Torso (Back) 2	Upper Torso (Back) 1	Torso (Full Length)	Sleeve Head (Top)	Sleeve Head (Bottom)	Sleeve Cuff (Top)	Sleeve Cuff (Bottom)	Sleeve Inseam (Top)	

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MEAFFS Pattern					SIZES				
Measurements (in)	32R	34R	36R	38R	40R	42R	44R	46R	48R
Sleeve Inseam	24 4/8	24 6/8	24 7/8	25 1/8	not	25 3/8	25 6/8	not	26 2/8*
(Bottom)					available			available	
Sleeve Back Seam	23 2/8	23 2/8	23 4/8	23 5/8	not	not	23 6/8	23 5/8	23 6/8
(Top)					available	available			
Sleeve Back Seam	23 6/8	23 7/8	23 7/8	24	not	23 7/8	23 7/8	not	24 2/8
(Bottom)					available			available	

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* Measured the longest point on the pattern ** Measurements taken from a sheet containing multiple patterns; measurements may not be accurate.

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CHANGE BETWEEN SIZES OF LENGTH R

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Measurements (in)	34R - 37R	36R - 34R	38R - 36R	40R - 38R	42R - 40R
Torso Neckline (Front)	0	3/8	1/8	0	
Torso Neckline (Back)	0	6/8	3/8	1/8	
Shoulder (Front)	1/8	4/8	1/8	1/8	
Shoulder (Back)	4/8	4/8	4/8	4/8	5/8
Chest (Front)	3/8	6/8	5/8	4/8	
Chest (Back)		1 2/8	7/8	7/8	•
Waist (Front)	3/8	5/8	5/8	4/8	
Waist (Back) 2	1	1 2/8	1	not available	
Waist (Back) 1	1 1/8	1 2/8	1	1	6/8
Hip (Front)	3/8	5/8	5/8	3/8	
Hip (Back)	4/8	2/8	4/8	2/8	
Thigh (Front)	4/8	4/8	4/8	3/8	
Thigh (Back)	4/8	2/8	5/8	3/8	
Calf (Front)	2/8	1/8	2/8	2/8	

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MEAFFS Pattern					
Measurements (in)	34R - 32R	36R - 34R	38R - 36R	40R - 38R	42R - 40R
Calf (Back)	3/8	1/8	2/8	-1/8	
Hem (Front)	5/8	2/8	0	0	
Hem (Back)	0	4/8	-1/8	1/8	
Crotch Lth (Front)	2/8	1/8	-3/8	1 2/8	
Crotch Lth (Back)	3/8	2/8	2/8	2/8	
Leg Inseam	0	0	-1/8	0	
Leg Outseam	1/8	2/8	1/8	2/8	
Upper Torso (Front)	2/8	2/8	5/8	0	
Upper Torso (Back) 2	2/8	2/8	3/8	not available	
Upper Torso (Back) 1	2/8	2/8	3/8	4/8	-1/8
Torso (Full Length)	3/8	5/8	3/8	3/8	5/8
Sleeve Head (Top)	5/8	3/8	4/8	not available	not available
Sleeve Head (Bottom)	2/8	2/8	2/8	not available	not available
Sleeve Cuff (Top)	0	0	2/8	not available	not available
Sleeve Cuff (Bottom)	1/8	1/8	0	not available	not available
Sleeve Inseam (Top)	1/8	2/8	3/8	not available	not available

<b>MEAFFS</b> Pattern					
Measurements (in)	34R - 32R	36R - 34R	38R - 36R	40R - 38R	42R - 40R
Sleeve Inseam	2/8	1/8	2/8	not available	not available
(Bottom)				-	
Sleeve Back Seam	1/8	2/8	1/8	not available	not available
(Top)					
Sleeve Back Seam	1/8	0	1/8	not available	not available
(Bottom)					

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MEASUREMENTS FOR SIZES OF LENGTH L

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	48L				31 3/8	-				32 2/8					
	46L				30 6/8					31 4/8					
•	44L		-		29 7/8					30					
	42L				29 5/8					29 2/8					
SIZES	40L	5 7/8	not availahle	11 4/8	not available	11 1/8	not available	11 4/8	not available	not available	12 2/8	13 4/8	14 4/8	18 6/8	11 1/8
	38L	5 6/8	7 5/8	11 3/8	28 5/8	10 4/8	28 2/8	10 7/8	27 2/8	27 2/8	11 6/8	13 1/8	14 1/8	18 2/8	11
	36L	5 3/8	7 3/8	11	28 1/8	9 6/8	27 3/8	10 2/8	26 2/8	26 2/8	11 2/8	12 6/8	13 5/8	18	10 7/8
MEAFFS Pattern	Measurements (in)	Torso Neckline · (Front)	Torso Neckline (Back)	Shoulder (Front)	Shoulder (Back)	Chest (Front)	Chest (Back)	Waist (Front)	Waist (Back) 2	Waist (Back) 1	Hip (Front)	Hip (Back)	Thigh (Front)	Thigh (Back)	Calf (Front)

MEAFFS Pattern			SIZES				
Measurements (in)	36L	38L	40L	42L	44L	46L	48L
Calf (Back)	11 7/8	12 1/8	12 2/8				
Hem (Front)	10 7/8	10 6/8	11				
Hem (Back)	11 2/8	11	11 1/8				
Crotch Lth (Front)	13 3/8	13 7/8	14 2/8				
Crotch Lth (Back)	18 2/8	18 3/8	18 5/8				
Leg Inseam	35	35 2/8	35				
Leg Outseam	47 5/8	48 2/8	48 3/8				
Upper Torso (Front)	16 6/8	17	17				
Upper Torso (Back) 2	20 5/8	20 4/8	not available			•	
Upper Torso (Back) 1	20 5/8	20 4/8	not available	21 2/8	21 6/8	21 5/8	21 6/8
Torso (Full Length)	29 5/8	30 2/8	30 4/8	31 1/8	31 6/8	32 2/8	32 5/8
Sleeve Head (Top)	15 2/8	15 5/8	16 1/8	16 6/8	17 4/8	18 1/8	18 4/8
Sleeve Head (Bottom)	œ	8 2/8	8 5/8	8 6/8	9 1/8	9 3/8	9 3/8*
Sleeve Cuff (Top)	9 1/8	9 2/8	9 2/8	9 4/8	9 4/8	9 5/8	8/L 6
Sleeve Cuff (Bottom)	6 3/8	6 2/8	6 4/8	6 4/8	6 4/8	6 5/8	6 6/8
Siceve Inseam (Top)	25 7/8	26 1/8	26 2/8	26 3/8	26 5/8	26 7/8	27 3/8

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<b>MEAFFS Pattern</b>			SIZES				
Measurements (in)	36L	38L	40L	42L	44L	46L	48L
Sleeve Inseam	25 7/8	26 1/8	26 2/8	26 3/8	26 5/8	26 6/8	27 3/8*
(Bottom)							
Sleeve Back Seam	24 4/8	24 5/8	24 5/8	24 5/8	24 6/8	25 1/8	24 6/8
(Top)							
Sleeve Back Seam	24 7/8	25	25	25	25	24 6/8	25 1/8
(Bottom)		-					

* Measured the longest point on the pattern

CHANGE BETWEEN SIZES OF LENGTH L

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Measurements (in)	38L - 36L	40L - 38L	42L - 40L	44L - 42L	46L - 44L	48L - 46L
Torso Neckline (Front)	3/8	1/8				
Torso Neckline (Back)	2/8	not available				
Shoulder (Front)	3/8	1/8				
Shoulder (Back)	4/8	not available	not available	2/8	2/8	5/8
Chest (Front)	6/8	5/8				
Chest (Back)	7/8	not available				
Waist (Front)	5/8	5/8				
Waist (Back) 2	1	not available				
Waist (Back) 1	1	not available	not available	6/8	1 4/8	7/8
Hip (Front)	4/8	4/8				
Hip (Back)	3/8	3/8				
Thigh (Front)	4/8	3/8				
Thigh (Back)	2/8	4/8				
Calf (Front)	1/8	1/8				

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MEAFFS Pattern						
Measurements (in)	38L - 36L	40L - 38L	42L - 40L	44L - 42L	46L - 44L	48L - 46L
Calf (Back)	2/8	1/8				
Hem (Front)	-1/8	4/8				
Hem (Back)	-2/8	1/8				
Crotch Lth (Front)	4/8	3/8				
Crotch Lth (Back)	1/8	2/8				
Leg Inseam	2/8	-2/8				
Leg Outseam	5/8	1/8				
Upper Torso (Front)	2/8	not available				
Upper Torso (Back) 2	-1/8	not available				
Upper Torso (Back) 1	-1/8	not available	not available	3/8	0	1/8
Torso (Full Length)	5/8	2/8	5/8	5/8	4/8	3/8
Sleeve Head (Top)	4/8	4/8	5/8	5/8 .	5/8	3/8
Sleeve Head (Bottom)	2/8	3/8	1/8	3/8	2/8	0
Sleeve Cuff (Top)	1/8.	0	2/8	-1/8	2/8	2/8
Sleeve Cuff (Bottom)	0	1/8	0	0	1/8	1/8
Sleeve Inseam (Top)	2/8	1/8	2/8	2/8	2/8	4/8

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MEAFFS Pattern						
Measurements (in)	38L - 36L	40L - 38L	42L - 40L	44L - 42L	46L, - 44L	48L - 46L
Sleeve Inseam (Bottom)	2/8	0	2/8	2/8	1/8	4/8
Sleeve Back Seam (Top)	1/8	1/8	0	1/8	0	-4/8
Sleeve Back Seam (Bottom)	1/8	0	0	0	-3/8	4/8

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# CHANGE BETWEEN LENGTHS FOR EACH SIZE

MEAFFS Pattern				SIZI	ES			
Measurements (in)	32 R-S	34 R-S	36 R-S	38 R-S	40 R-S	36 L-R	38 L-R	40 L-R
Torso Neckline (Front)	1/8	-1/8	2/8	0	not available	-2/8	0	1/8
Torso Neckline (Back)	0	-3/8	1/8	2/8	not available	0	-1/8	not available
Shoulder (Front)	1/8	-1/8	2/8	0	not available	-3/8	-1/8	-1/8
Shoulder (Back)	0	-1/8	-1/8	0	not available	1/8	1/8	not available
Chest (Front)	2/8	0	2/8	1/8	not available	-2/8	-1/8	0
Chest (Back)	1/8	0	1/8	2/8	not available	-1/8	-1/8	not available
Waist (Front)	2/8	0	2/8	1/8	not available	-1/8	. 0	1/8
Waist (Back) 2	0	-1/8	1/8	3/8	not available	-1/8	-1/8	not available
Waist (Back) 1	0	-1/8	0	2/8	not available	0	0	not available
Hip (Front)	2/8	1/8	0	1/8	not available	0	-1/8	0
Hip (Back)	0	0	0	0	not available	-1/8	-2/8	-1/8
Thigh (Front)	1/8	2/8	1/8	1/8	not available	0	0	0
Thigh (Back)	-1/8	0	-1/8	1/8	not available	2/8	-1/8	0
Calf (Front)	1/8	1/8	-1/8	-1/8	not available	1/8	0	-1/8

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MEAFFS Pattern				SIZ	ES	、		
Measurements (in)	32 R-S	34 R-S	36 R-S	38 R-S	40 R-S	36 L-R	38 L-R	40 L-R
Calf (Back)	-1/8	-1/8	-1/8	-1/8	not available	-1/8	-1/8	-1/8
Hem (Front)	-2/8	0	1/8	0	not available	-1/8	-2/8	0
Hem (Back)	1/8	-2/8	0	-1/8	not available	1/8	0	0
Crotch Lth (Front)	2/8	2/8	0	0	not available	5/8	1 4/8	5/8
Crotch Lth (Back)	1/8	1/8	1/8	3/8	not available	6/8	5/8	5/8
Leg Inseam	2 1/8	2 1/8	2 1/8	2	not available	1 7/8	2 2/8	2
Leg Outseam	2 4/8	2 4/8	2 3/8	2 4/8	not available	2 2/8	2 6/8	2 5/8
Upper Torso (Front)	5/8	6/8	6/8	5/8	not available	3/8	0	0
Upper Torso (Back) 2	6/8	6/8	6/8	3/8	not available	5/8	1/8	not available
Upper Torso (Back) 1	6/8	6/8	6/8	3/8	not available	5/8	2/8	not available
Torso (Full Length)	0	-1/8	0	-1/8	not available	6/8	1 1/8	not available
Sleeve Head (Top)	0	1/8	0	0	not available	1/8	0	not available
Sleeve Head (Bottom)	0	0	0	1/8	not available	0	0	not available
Sleeve Cuff (Top)	0	1/8	-2/8	0	not available	1/8	0	not available
Sleeve Cuff (Bottom)	0	0	0	-1/8	not available	1/8	0	not available
Sleeve Inseam (Top)	1	1	7/8	1 1/8	not available	1 1/8	1	not available

MEAFFS Pattern				SIZ	ES			
Measurements (in)	32 R-S	34 R-S	36 R-S	38 R-S	40 R-S	36 L-R	38 L-R	40 L-R
Sleeve Inseam	1 1/8	1 1/8	6/8	1	not available	1	1	not available
(Bottom)								
Sleeve Back Seam	1	7/8	1	1 1/8	not available	1	1	not available
(Top)								
Sleeve Back Seam	1 1/8	1 1/8	1 1/8	1 1/8	not available	1	1	not available
(Bottom)								

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### APPENDIX N PATTERN MEASUREMENT DESCRIPTIONS AND DIAGRAMS

Below are textual descriptions of how each measurement was taken on the patterns. They are listed in alphabetical order. Since seam allowances can vary around a pattern, they have not been subtracted from the measurement unless otherwise indicated. An experienced pattern designer can subtract the appropriate seam allowance as desired. Following the textual descriptions are diagrams showing each measurement.

**Calf (front):** On the full-length front pattern, measure across the leg from one mid-calf point to the other. To find the mid-calf point, lay a same-size back pant pattern upside-down on top of the front pattern. Match the bottom leg hems together and press down on the patterns to hold them in position. Match the right side of the back pant pattern (the right is the side without the pointed crotch structure) to the right side of the front pattern. Allow for some curve in the pattern by lifting or twisting it slightly. Mark the front pattern where it matches the mid-calf point on the back pattern. Repeat these steps for the left side (you may need to realign the bottom leg hems). Put the back pattern aside. Measure straight across from one side to the other. This measurement makes up one half the total calf circumference for one leg.

**Calf (back):** On the back pant pattern, find the mid-point of the seam line on the lower part of the leg. Sight a line across the sides of the pattern perpendicular to the grain line (usually signified by an arrow). Mark measuring points on both sides of the leg. Measure straight across from one side to the other. This measurement makes up one half the total calf circumference for one leg.

Chest (front): On the right side of the full-length pattern, mark a preliminary point 5/8" down and in from the pointed area formed by the armpit structure. Mark a measuring point 1" down from the preliminary point. Use a square to sight a line from the measuring point across to the left side of the pattern. The sighting line should be perpendicular to the grain line (usually signified by an arrow) marked on the pattern. Mark a preliminary point where the sighting line meets the pattern line. Mark a measuring point 5/8" in from the preliminary point. Measure straight across from the right measuring point to the left measuring point. Note that 5/8" seam allowance was subtracted from each side of the pattern. This measurement makes up one quarter of the total chest circumference.

**Chest (back):** On the right side of the upper back pattern, mark a preliminary point 5/8" down and in from the pointed area formed by the armpit structure. Mark a measuring point 1" down from the preliminary point. Do the same on the left side of the pattern. Measure straight across from the right

measuring point to the left measuring point. Note that this measurement makes up one half the total chest measurement.

**Crotch height:** On the back pant pattern, use a flexible tape to measure from the tip of the pointed crotch structure down to the bottom of the leg hem, following the curve of the pattern line.

Crotch length (front): The full-length front pattern is one long piece from the shoulder to the leg hem, and the pattern does not indicate the waist point needed for the crotch length measurement. To find the waist point, lay a same-size back pant pattern upside-down on top of the front pattern. Match the bottom leg hems together and press down on the patterns to hold them in position. Match the top right side of the back pant pattern (the right is the side without the pointed crotch structure) to the right side of the front pattern. Allow for some curve in the pattern by lifting or twisting it slightly. Mark the front pattern where it matches the waist point on the back pattern. Put the back pattern aside. Use a square to sight a line from the waist mark across to the left side of the pattern. The sighting line should be perpendicular to the grain line (usually signified by an arrow) marked on the pattern. Mark a measuring point where the sighting line meets the pattern line. Use a flexible tape to measure this point to the tip of the pointed crotch structure, following the curve of the pattern line.

**Crotch length (back):** On the back pant pattern, use a flexible tape to measure from the top on the right side of the pattern (the right is the side with the pointed crotch structure) to the tip of the pointed crotch structure, following the curve of the pattern line.

Hem (front): On the full-length pattern, measure across the bottom hem line of the pattern. This measurement makes up one half the total hem circumference for one leg.

**Hem (back):** On the back pant pattern, measure across the bottom hem line of the pattern. This measurement makes up one half the total hem circumference for one leg.

Hip (front): On the full-length pattern, mark a measuring point 7 5/8" down from the waist point on the right side of the pattern (the right is the side without the pointed crotch structure). Use a square to sight a line from the hip mark across to the left side of the pattern. The sighting line should be perpendicular to the grain line (usually signified by an arrow) marked on the pattern. Mark a measuring point where the sighting line meets the pattern line. Measure straight across from one hip point to the other. *Note:* There is no waist mark on the full-length pattern. See Crotch length (front) for instructions on finding and marking the waist point. This measurement makes up one quarter of the total hip circumference.

**Hip** (back): On the back pant pattern, mark the hip point 7 5/8" inches down from the top of the left-side pattern line (the left is the side without the pointed crotch structure). Use a square to sight a line from the hip mark across to the right side of the pattern. The sighting line should be perpendicular to the grain line (usually signified by an arrow) marked on the pattern. Mark a measuring point where the sighting line meets the pattern line. Measure straight across from one hip point to the other. This measurement makes up one quarter of the total hip circumference.

Leg outseam: On the back pant pattern, use a flexible tape to measure from the top of the left-side pattern line (the left is the side without the pointed crotch structure) to the bottom of the leg hem, following the curve of the pattern line.

Shoulder (front): On the full-length pattern, use a square to sight a line from the top of the shoulder on the right side of the pattern across to the left side of the pattern. The sighting line should be perpendicular to the grain line (usually signified by an arrow) marked on the pattern. Use a straight edge to extend the left-side pattern line straight to the top of the sheet. Mark a measuring point where the sighting line meets the extended pattern line. Measure straight across from the top of the shoulder to the measuring point on the other side of the pattern.

Shoulder (back): On the upper back pattern, measure from point to point of the sleeve inset meeting the top of the shoulder (where the seam on top would be).

Sleeve elbow seam: On either the over sleeve or under sleeve pattern (as appropriate), measure from the point of the cuff end to the point of the part which is sewn into the upper back piece.¹

Sleeve inseam: On either the top sleeve or bottom sleeve pattern (as appropriate), measure from the point of the cuff end to the point of the part which is sewn into the upper back piece.¹

**Sleeve head:** On either the top sleeve or bottom sleeve pattern (as appropriate), measure from the top point to the bottom point on the end which is to be sewn into the upper back piece.¹ These measurements summed together make up the total sleeve hole circumference.

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Sleeve cuff: On either the top sleeve or under sleeve pattern (as appropriate), measure from the top point to the bottom point on the cuff end.¹ These measurements summed together make up the total sleeve cuff circumference.

Thigh (front): On the full-length pattern, use a square to sight a line from the tip of the pointed crotch structure across to the left side of the pattern. The sighting line should be perpendicular to the grain line (usually signified by an arrow) marked on the pattern. Mark a measuring point where the sighting line meets the pattern line. Measure straight across from the tip of the crotch structure to the measuring point on the other side of the pattern. This measurement makes up one half the total thigh circumference for one leg.

Thigh (back): On the back pant pattern, use a square to sight a line from the tip of the pointed crotch structure across to the left side of the pattern. The sighting line should be perpendicular to the grain line (usually signified by an arrow) marked on the pattern. Mark a measuring point where the sighting line meets the pattern line. Measure straight across from the tip of the crotch structure to the measuring point on the other side of the pattern. This measurement makes up one half the total thigh circumference for one leg.

**Torso neckline (front):** On the full-length pattern, use a flexible tape to measure the collar, following the curve of the pattern line. This measurement makes up one quarter of the total neckline circumference.

**Torso neckline (back):** On the upper back pattern, use a flexible tape to measure the collar, following the curve of the pattern line. This measurement makes up one half the total neckline circumference.

Torso (Full Length): On the full-length pattern, measure along the body-center edge of the pattern from the point where the neck cut-out is to the point of the crotch.

Upper torso (front): On the full-length pattern, measure from the waist mark on the left side of the pattern (the left side is the side with the pointed crotch structure) to the bottom of the collar, also on the left side of the pattern. Do not use seam allowances. *Note:* There is no waist mark on the full-length pattern. See Crotch length (front) for instructions on finding and marking the waist point.

¹ There were no "points" on a few of the sleeve patterns. When that occurred the measurements were taken to the longest part of the sleeve length near that edge.

**Upper torso (back):** On the upper back pattern, measure from the midpoint mark at the bottom of the pattern to the midpoint mark on the collar. Do not use seam allowances.

Waist (front): On the full-length pattern, measure from the waist mark on the left side of the pattern to the waist mark on the right side of the pattern. *Note:* There is no waist mark on the full-length pattern. See Crotch length (front) for instructions on finding and marking the waist point. This measurement makes up one quarter of the total waist circumference.

Waist (back): On the upper back pattern, measure across the bottom of the pattern. This measurement makes up one half the total waist circumference.

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# FULL FRONT PATTERN





## TOP SLEEVE PATTERN



# BOTTOM SLEEVE PATTERN



### APPENDIX O TOTAL CHANGE BETWEEN SIZES

The following tables show the estimated grade and pattern measurements (in inches) for current patterns. These values are estimated based on actual pattern measurements which were not evenly graded. The estimated grade was established by examining the actual pattern measurements and the differences between sizes for these measurements. Best estimates are provided for the true grade and pattern measurements given an even grade. Also, separate pattern pieces were added together to get a total dimension for an area. For example, the neckline of the torso was measured for half the front and the full back pattern pieces for all sizes. True measurements for the two pieces were estimated and assigned to the base size (36). The true grade was estimated for both pattern pieces. The average measurements for the back and twice the front were added together to get a total neckline measurement. The true grade between sizes for separate pattern pieces was added together to get a total grade. The same was done for the length sizes.

TOTA	AL GROW	TH BETWE	EEN SIZES F	OR CURREN	<b>FPATTERN</b>	IS
	Grade	32	34	36R (base size)	38	40
Neckline (Torso)	3/4	16 5/8	17 3/8	18 1/8	18 7/8	19 5/8
Shoulder (Front)	1/2	21 1/4	21 3/4	22 1/4	22 3/4	23 1/4
Shoulder (Back)	1/2	27 1/8	27 5/8	28 1/8	28 3/8	29 1/8
Chest ²	2 1/4	46 1/8	48 3/8	50 5/8	52 7/8	55 1/8
Waist	2 1/4	42 1/4	44 1/2	46 3/4	49	51 1/4
Hip	1 3/4	44 3/4	46 1/2	48 1/4	50	51 3/4
Thigh	1	29 1/2	30 1/2	31 1/2	32 1/2	33 1/2
Calf	1/2	21 7/8	22 3/8	22 7/8	23 3/8	23 7/8
Hem	1/2	21	21 1/2	22	22 1/2	23
Upper Torso (Front)	1/4	15 7/8	16 1/8	16 3/8	16 5/8	17 7/8
Upper Torso (Back)	1/4	19 1/2	19 3/4	20	20 1/4	201/2
Rise ³	1/4	11 3/4	12	12 1/4	12 1/2	12 3/4
Leg Inseam	0	33 1/8	33 1/8	33 1/8	33 1/8	33 1/8

² Since seam allowances were not measured, a total of 3 3/4" (5/8" x 6) has been added to approximate entire pattern dimension.

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³ Rise is computed by subtracting Leg Inseam from Leg Outseam.

ТОТА	L GROV	VTH BETWI	EEN SIZES F	OR CURREN	TT PATTERN	IS
Leg Outseam	1/4	44 7/8	45 1/8	45 3/8	45 5/8	45 7/8
Sleeve Hole	3/4	21 5/8	22 3/8	23 1/8	23 7/8	24 5/8
Sleeve Cuff	1/4	14 7/8	15 1/8	15 3/8	15 5/8	15 7/8
Sleeve Inseam	1/4	24 3/8	24 5/8	24 7/8	25 1/8	25 3/8
Sleeve Back Seam (Top)	1/8	23 1/4	23 3/8	23 1/2	23 5/8	23 3/4
Sleeve Back Seam (Bot) ⁴	1/8	23 5/8	23 3/4	23 7/8	24	24 1/8

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⁴ The difference in top and bottom measurements is not understood.

TOTAL (	GROWTH	BETWEEN L	ENGTHS FOR	CURRENT
		PATTER	NS	
	Grade	S	36R	L
Neckline (Torso)	0	18 1/8	18 1/8	18 1/8
Shoulder (Front)	0	22 1/4	. 22 1/4	22 1/4
Shoulder (Back)	0	28 1/8	28 1/8	28 1/8
Chest ²	0	50 5/8	50 5/8	50 5/8
Waist	0	46 3/4	46 3/4	46 3/4
Hip	0	48 1/4	48 1/4	48 1/4
Thigh	0	31 1/2	31 1/2	31 1/2
Calf	0	22 7/8	22 7/8	22 7/8
Hem	0	22	22	22
Upper Torso (Front)	5/8	15 3/4	16 3/8	17
Upper Torso (Back)	5/8	19 3/8	20	20 5/8
Rise ³	3/8	11 7/8	12 1/4	12 5/8
Leg Inseam	2 1/8	31	33 1/8	35 1/4
Leg Outseam	2 1/2	42 7/8	45 3/8	47 7/8
Sleeve Hole	0	23 1/8	23 1/8	23 1/8
• Sleeve Cuff	0	15 3/8	15 3/8	15 3/8
Sleeve Inseam	1	23 7/8	24 7/8	25 7/8
Sleeve Back Seam	1	22 1/2	23 1/2	24 1/2
Sleeve Back	1	22 7/8	23 7/8	24 7/8

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TOTAL GROWTH BETWEEN LENGTHS FOR CURRENT PATTERNS							
Seam (Bot) ⁴							

### APPENDIX P SUMMARY STATISTICS FOR SAMPLE ACCOMMODATED BY CURRENT SIZES

## SUMMARY STATISTICS FOR AIR FORCE MALES WITH ACCEPTABLE FITS

	P	oct Fit	Cizo Num	bar - 34 -			
	De	ser tir	SIZE NUM	Der=24 -		•	
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
VAR Weight Upper Thigh Circ Buttock Circ Hip Circ Max Hip Ht Neck Circ Shoulder Circ Chest Circ Omph Waist Circ Pref Waist Back Crotch Lth VTC Sleeve Lth Tot Sleeve Lth Tot Sleeve Inseam Sleeve Inseam Stature Cervicale Ht Acromion Ht Neck Ht Waist Ht Omph	$\begin{array}{c} N\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.00\\ 0.$	MIN 20.67 18.50 33.23 32.87 31.89 14.49 38.98 32.13 28.54 28.50 17.24 28.62 31.34 21.34 21.34 21.34 25.51 56.22 53.11 53.46 38.98 31	MAX 23.62 19.92 34.72 34.84 35.71 15.20 41.26 34.84 29.45 29.96 19.09 24.84 65.16 33.78 23.46 19.25 69.72 59.96 58.27 58.31 43.07 40.59	MEDIAN 21.56 18.96 34.00 34.04 34.41 15.18 40.35 34.31 28.76 29.13 17.68 23.43 60.41 33.27 22.58 18.25 66.77 56.97 54.37 54.74 40.31 39.29	MODE 20.67 18.50 33.23 32.87 31.89 15.20 38.98 32.13 28.54 28.50 17.24 28.50 17.24 28.50 17.24 28.62 31.34 21.81 16.42 65.51 56.22 53.11 53.46 38.98 38.31	MEAN 21.85 19.08 33.99 33.95 34.10 15.01 40.24 33.90 28.88 29.18 17.92 23.58 61.15 32.91 22.61 18.04 67.19 57.53 55.03 55.31 40.67 39.37	STD 1.45 0.60 0.83 1.02 1.65 0.35 1.11 1.27 0.42 0.68 0.81 1.02 2.81 1.14 0.76 1.19 1.79 1.70 2.24 2.10 1.73 1.00
Crotch Ht Biacromial Br	4.00 4.00 4.00	30.20	40.39 33.66 15.20	31.91 14.90	30.20	31.92 14.91	1.41 0.23
Sitting Ht Eye Ht Sitting Knee Ht Sitting Butt-Knee L (ANSU	4.00 4.00 4.00 4.00	34.96 30.20 19.96 22.28	36.14 31.18 21.61 23.54	35.53 30.87 20.30 22 91	34.96 30.87 19.96 22 28	35.54 30.78 20.54 22 91	0.49 0.41 0.73 0.64
Butt-Knee L (AF) Bideltoid Br Reported Weight	4.00 4.00 4.00	22.17 16.81 120.00	23.58 23.58 17.17 135.00	22.87 16.97 127.50	22.17 16.81 120.00	22.87 16.98 127.50	0.71 0.16 6.45
	Be	est Fit	Size Num	ber=36 -			
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight Upper Thigh Circ Buttock Circ Hip Circ Max Hip Ht Neck Circ Shoulder Circ Chest Circ Waist Circ Omph Waist Circ Pref Waist Back Crotch Lth	39.00 39.00 39.00 39.00 39.00 39.00 39.00 39.00 39.00 39.00	22.05 18.90 33.15 33.39 31.18 14.65 39.96 32.80 27.83 28.82 16.50 21.06	29.72 23.98 39.17 39.53 37.36 17.36 46.26 38.39 34.53 34.53 34.72 20.94 26.73	25.79 21.26 36.38 33.66 15.51 43.66 36.46 30.71 30.51 18.27 24.21	25.98 20.51 37.99 35.63 32.68 15.79 44.53 34.84 29.96 30.35 17.01 23.62	25.77 21.12 36.48 36.54 33.89 15.58 43.63 36.26 31.09 30.98 18.26 24.27	1.85 1.06 1.38 1.37 1.60 0.58 1.26 1.41 1.72 1.49 1.04 1.32
VTC	39.00	58.66	68.62	62.52	62.52	62.55	2.09

35.63

24.96

20.39

72.64

62.48

60.16

60.43

44.65 43.54

Sleeve Lth Tot

Sleeve Outseam

Sleeve Inseam

Cervicale Ht

Waist Ht Omph Waist Ht Pref

Acromion Ht

Stature

Neck Ht

39.00

39.00

39.00

39.00

39.00

39.00

39.00

39.00

39.00

31.89

20.63

16.73

63.27

54.29

50.83

51.69 37.72

36.02

33.90

22.87

18.23

67.83 58.31

55.12

55.75

40.59

39.37

31.89

21.61

16.73

65.63 57.24

55.67

55.51 40.59

40.79

33.78

22.81

18.19

67.88

58.29

55.35

55.94

40.94

39.47

1.06

0.93

0.83

2.40

2.12

2.10

2.17

1.75

1.90

Crotch Ht Biacromial Br Sitting Ht Eye Ht Sitting Knee Ht Sitting Butt-Knee L (ANSU Butt-Knee L (AF) Bideltoid Br Reported Weight	39.00 39.00 23.00 23.00 23.00 23.00 23.00 23.00 39.00	28.82 14.17 33.23 28.90 19.72 22.05 22.13 17.28 125.00	35.67 16.54 37.95 32.87 25.71 25.51 19.25 170.00	31.77 15.59 35.63 31.06 21.18 23.43 23.43 18.35 145.00	32.44 15.87 33.23 31.06 21.38 23.39 23.58 17.76 145.00	31.91 15.52 35.54 30.86 21.19 23.46 23.39 18.34 147.08	1.490.571.311.240.720.820.790.4810.00	
	B	est Fit	Size Num	ber=38 -				
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Weight Upper Thigh Circ Buttock Circ Hip Circ Max Hip Ht Neck Circ Shoulder Circ Chest Circ Omph Waist Circ Pref Waist Back Crotch Lth VTC Sleeve Lth Tot Sleeve Lth Tot Sleeve Outseam Stature Cervicale Ht Acromion Ht Neck Ht Waist Ht Omph Waist Ht Pref Crotch Ht Biacromial Br Sitting Ht Eye Ht Sitting Knee Ht Sitting Butt-Knee L (ANSU Bideltoid Br Reported Weight	$\begin{array}{c} 117.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\ 120.00\\$	24.41 20.04 35.04 29.76 14.65 41.81 33.78 29.33 29.33 14.45 20.67 58.23 31.06 20.00 15.75 63.94 54.21 51.57 52.64 36.97 35.08 28.03 14.61 33.66 29.21 19.29 22.20 22.13 17.80 135.00	33.27 24.92 40.94 41.38 37.40 18.31 48.94 42.13 36.42 20.63 28.15 68.31 36.61 25.28 20.08 73.62 63.35 60.71 44.76 42.87 35.20 17.60 38.62 33.74 25.91 25.63 20.35 190.00	28.74 22.42 38.17 38.58 34.07 16.10 45.53 38.09 33.46 33.17 18.82 24.74 64.33 34.41 18.21 68.46 58.94 55.89 56.61 41.28 39.49 32.07 16.06 36.12 31.54 21.57 23.90 23.86 163.50	29.13 22.05 37.60 38.98 33.98 15.55 45.35 37.20 35.43 31.89 18.90 25.28 62.80 34.06 23.23 17.68 56.30 56.61 42.01 38.62 31.97 16.10 34.80 31.38 20.79 22.44 23.07 18.23 165.00	28.63 22.41 38.17 38.44 33.95 16.08 45.39 38.32 33.07 18.77 24.77 64.30 23.03 18.17 68.60 58.86 55.90 56.56 41.26 39.51 32.07 16.00 36.19 31.49 21.48 23.87 23.84 18.99 162.01	$\begin{array}{c} 1.72\\ 1.00\\ 1.23\\ 1.27\\ 1.52\\ 0.65\\ 1.49\\ 1.56\\ 1.69\\ 1.56\\ 1.69\\ 1.00\\ 1.53\\ 1.74\\ 1.01\\ 0.90\\ 0.84\\ 1.85\\ 1.73\\ 1.53\\ 1.73\\ 1.53\\ 1.73\\ 1.53\\ 1.70\\ 1.41\\ 0.64\\ 1.12\\ 1.05\\ 0.81\\ 0.86\\ 0.84\\ 0.66\\ 9.80\end{array}$	
	P	oat Rit	Cigo Num	bor=40 -				
¥73 D	D	MTN	MAY	MEDIAN	MODE	MFAN	ናሞቦ	
Weight Upper Thigh Circ Buttock Circ Hip Circ Max Hip Ht Neck Circ Shoulder Circ Chest Circ Waist Circ Omph Waist Circ Pref Waist Back Crotch Lth VTC Sleeve Lth Tot Sleeve Outseam Sleeve Inseam Stature	128.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00 131.00	27.76 20.94 36.34 36.30 31.34 15.04 43.70 35.47 29.53 30.04 16.22 21.85 62.09 31.57 21.46 16.42 65.31	37.20 27.17 43.39 43.82 38.70 18.03 50.59 44.45 39.69 38.94 21.73 29.25 71.81 37.09 26.34 20.79 74.80	31.10 23.35 39.41 39.69 34.53 16.46 46.65 35.24 34.84 19.29 25.55 65.94 34.84 19.29 25.55 65.94 34.84 18.27 69.96	33.07 24.02 38.78 38.58 31.54 16.54 46.81 35.28 35.04 19.88 24.33 67.72 33.86 23.23 19.02 70.63	31.46 23.45 39.52 39.72 34.62 16.43 46.74 39.59 35.05 34.71 19.22 25.45 66.20 34.81 23.35 18.33 69.82	1.86 1.15 1.37 1.46 1.57 0.56 1.54 1.54 1.70 2.19 2.00 1.04 1.47 2.16 1.14 0.94 0.91 2.00	••
	Crotch Ht Biacromial Br Sitting Ht Eye Ht Sitting Butt-Knee L (ANSU Butt-Knee L (AF) Bideltoid Br Reported Weight VAR Weight Upper Thigh Circ Buttock Circ Hip Circ Max Hip Ht Neck Circ Shoulder Circ Chest Circ Omph Waist Circ Pref Waist Back Crotch Lth VTC Sleeve Lth Tot Sleeve Inseam Stature Cervicale Ht Acromion Ht Neck Ht Waist Ht Pref Crotch Ht Biacromial Br Sitting Ht Eye Ht Sitting Butt-Knee L (ANSU Butt-Knee L (ASU Butt-Knee L (AF) Bideltoid Br Reported Weight VAR Weight Upper Thigh Circ Buttock Circ Hip Circ Max Hip Ht Neck Circ Shoulder Circ Chest Circ Waist Circ Pref Waist Back Crotch Lth VTC Sleeve Lth Tot Sleeve Inseam Stature	Crotch Ht 39.00 Biacromial Br 39.00 Sitting Ht 23.00 Eye Ht Sitting 23.00 Butt-Knee L (ANSU 23.00 Butt-Knee L (ANSU 23.00 Bideltoid Br 23.00 Reported Weight 39.00 VAR N Weight 117.00 Upper Thigh Circ 120.00 Hip Circ Max 120.00 Hip Circ Max 120.00 Neck Circ 120.00 Shoulder Circ 120.00 Waist Circ Omph 120.00 Waist Circ Pref 120.00 Waist Circ Pref 120.00 Sleeve Lth Tot 120.00 Sleeve Inseam 120.00 Sitting Ht 84.00 Eye Ht Sitting 84.00 Bideltoid Br 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 Butt-Knee L (ANSU 84.00 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39.00       125.00	Crotch Ht       39.00       28.82       35.67         Biacromial Br       39.00       14.17       16.54         Sitting Ht       23.00       32.33       7.95         Eye Ht Sitting       23.00       19.72       22.76         Butt-Knee L (ANSU       23.00       22.13       25.51         Bideltoid Br       23.00       17.28       19.25         Reported Weight       39.00       125.00       170.00	Crotch Ht       39.00       28.82       35.67       31.77         Biacromial Br       39.00       14.17       16.54       15.59         Sitting Ht       23.00       28.90       32.87       31.06         Knee Ht Sitting       23.00       22.05       25.71       23.43         Butt-Knee L (AF)       23.00       22.13       25.51       23.43         Butt-Knee L (AF)       23.00       17.28       19.25       18.35         Reported Weight       39.00       125.00       170.00       145.00	Crotch Ht       39.00       28.82       35.67       31.77       32.44         Biacromial Br       39.00       14.17       16.54       15.59       15.87         Sitting Ht       23.00       28.90       32.87       31.06       31.06         Knee Ht Sitting       23.00       22.05       25.71       23.43       23.39         Butt-Knee L (ANSU       23.00       17.28       19.25       18.35       17.76         Reported Weight       39.00       17.00       145.00       145.00       145.00	Crotch Ht       39.00       28.82       35.67       31.77       32.44       31.91         Blacromial Br       39.00       14.17       16.54       15.59       35.63       33.27       15.52         Sitting Ht       21.00       32.07       35.64       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.06       31.07       32.46       32.00       12.00       14.00       31.07       32.46       32.06       14.00       31.06       31.07       32.46       32.06       31.07       32.46       32.06       31.07       32.46       32.06       31.06       31.07       32.46       32.07       31.06 </td <td>Crotch Ht       39.00       28.62       35.67       31.77       32.44       31.91       1.49         Blacromial Br       39.00       14.17       16.54       15.59       35.63       33.23       35.54       1.31         Bye HtSitting       33.00       20.07       22.76       21.18       21.34       32.39       23.46       0.86       1.24         Butt-Knee L       (ANP)       23.00       22.05       25.51       23.43       33.58       23.39       0.79         Bideltoid Br       33.00       17.28       19.25       18.35       17.76       18.34       0.44         Reported Weight       39.00       125.00       170.00       145.00       147.08       10.00        </td>	Crotch Ht       39.00       28.62       35.67       31.77       32.44       31.91       1.49         Blacromial Br       39.00       14.17       16.54       15.59       35.63       33.23       35.54       1.31         Bye HtSitting       33.00       20.07       22.76       21.18       21.34       32.39       23.46       0.86       1.24         Butt-Knee L       (ANP)       23.00       22.05       25.51       23.43       33.58       23.39       0.79         Bideltoid Br       33.00       17.28       19.25       18.35       17.76       18.34       0.44         Reported Weight       39.00       125.00       170.00       145.00       147.08       10.00

Neck Ht Waist Ht Omph Waist Ht Pref Crotch Ht Biacromial Br Sitting Ht Eye Ht Sitting Butt-Knee L (ANSU Butt-Knee L (AF) Bideltoid Br Reported Weight	131.00131.00131.00131.00131.0085.0085.0085.0085.0085.0085.00128.00	53.54 38.03 35.91 28.58 14.49 34.02 29.49 20.16 22.40 22.28 18.15 160.00	62.20 46.42 44.13 36.26 18.46 39.37 34.49 23.82 26.26 26.22 21.85 207.00	57.68 41.85 39.92 32.44 16.26 36.93 32.05 21.77 24.17 24.21 19.57 175.50	57.44 40.47 40.31 31.73 16.54 37.60 31.30 21.26 23.23 23.70 19.72 170.00	57.68 41.92 40.03 32.49 16.21 36.78 31.97 21.84 24.25 24.23 19.63 177.63	1.76 1.66 1.73 1.60 0.62 1.16 1.11 0.81 0.84 0.83 0.71 9.65	
	D	est fit	SIZE NUM		NODE		CIIID	
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Weight Upper Thigh Circ Buttock Circ Hip Circ Max Hip Ht Neck Circ Shoulder Circ Chest Circ Omph Waist Circ Pref Waist Back Crotch Lth VTC Sleeve Lth Tot Sleeve Lth Tot Sleeve Unseam Stature Cervicale Ht Acromion Ht Neck Ht Waist Ht Omph Waist Ht Pref Crotch Ht Biacromial Br Sitting Ht Eye Ht Sitting Butt-Knee L (ANSU Butt-Knee L (AF) Bideltoid Br Reported Weight	$\begin{array}{c} 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75.00\\ 75$	29.92 22.24 37.76 37.95 31.34 15.59 45.75 37.01 32.56 33.19 16.81 23.27 63.78 32.48 21.22 16.02 65.16 56.14 53.15 52.99 37.13 34.88 27.95 15.900 34.65 30.04 19.41 22.40 22.56 18.86 165.00	39.96 27.64 44.61 44.88 39.96 18.31 52.05 44.88 41.73 41.85 21.77 30.91 73.827 25.59 20.71 76.69 62.44 64.13 47.83 37.32 17.833 39.76 34.84 27.09 26.97 21.00	35.04 24.61 41.46 41.73 34.96 16.97 47.91 41.61 37.76 37.17 19.45 26.54 68.39 35.51 24.06 18.666 70.83 60.71 58.46 42.17 40.55 32.87 16.97 32.20 22.24 25.00 20.04 194.00	35.24 24.61 40.55 40.75 34.57 17.13 46.65 40.39 38.98 38.19 19.80 25.39 67.91 34.41 23.39 68.90 60.39 56.57 54.80 41.89 32.13 16.14 35.98 30.63 21.73 25.16 24.02 19.84 190.00	34.86 24.61 41.36 41.59 35.15 16.89 48.11 41.48 37.57 37.10 19.39 26.62 68.29 35.47 23.84 18.58 70.69 60.93 58.04 58.60 42.32 40.45 32.90 16.42 37.19 32.31 22.27 24.98 24.99 20.13 193.08	2.11 1.25 1.50 1.60 1.72 0.61 1.354 1.98 1.92 1.06 1.73 1.94 1.01 2.53 2.21 2.29 2.11 2.00 1.77 0.63 1.23 1.18 0.95 0.884 0.61 12.58	
	В	est Fit	Size Num	ber=44 -				
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Weight Upper Thigh Circ Buttock Circ Hip Circ Max Hip Ht Neck Circ Shoulder Circ Chest Circ Waist Circ Omph Waist Circ Pref Waist Back Crotch Lth VTC Sleeve Lth Tot Sleeve Outseam Sleeve Inseam	29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00 29.00	33.27 23.31 39.09 39.49 32.60 15.35 44.17 39.45 35.08 16.97 24.45 64.13 33.03 22.28 16.10	$\begin{array}{c} 41.73\\ 27.68\\ 46.93\\ 47.32\\ 38.43\\ 19.06\\ 53.31\\ 46.26\\ 43.66\\ 42.20\\ 21.65\\ 30.87\\ 74.09\\ 38.82\\ 26.02\\ 20.83 \end{array}$	37.40 25.28 42.64 42.68 36.42 17.09 49.53 43.39 39.76 39.49 19.49 27.09 70.08 35.87 24.45 18.74	37.20 24.45 42.64 43.50 37.05 16.10 47.76 41.93 40.04 40.55 21.50 25.04 70.08 35.55 24.06 17.40	37.62 25.54 42.73 42.74 35.85 17.00 49.64 43.08 39.67 39.20 19.64 27.29 69.85 35.95 24.30 18.80	1.99 1.23 1.46 1.49 0.78 1.79 1.82 1.99 1.83 1.20 1.65 2.08 1.36 1.06 1.06	

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Stature	29.00	65.98	77.13	71.89	72.87	71.56	2.52
Cervicale Ht	29.00	57.24	67.13	61.77	59.92	61.76	2.18
Acromion Ht	29.00	54.06	64.37	58.90	54.06	58.88	2.20
Neck Ht	29.00	54.72	65.00	59.49	54.72	59.48	2.33
Waist Ht Omph	29.00	38.78	47.64	42.72	42.52	42.85	2.17
Waist Ht Pref	29.00	36.77	45.20	40.87	36.77	40.92	.2.01
Crotch Ht	29.00	30.12	36.14	33.62	30.12	33.40	1.65
Biacromial Br	29.00	15.00	17.56	16.77	16.97	16.65	0.69
Sitting Ht	13.00	34.33	38.58	37.87	38.39	37.24	1.43
Eve Ht Sitting	13.00	29.72	33.86	32.95	29.72	32.49	1.26
Knee Ht Sitting	13.00	21.38	23.70	22.52	21.38	22.54	0.71
Butt-Knee L (ANSU	13.00	24.02	26.85	25.24	24.25	25.19	0.85
Butt-Knee L (AF)	13.00	23.98	26.77	25.35	23.98	25.22	0.90
Bideltoid Br	13.00	19.29	21.69	20.79	21.38	20.66	0.82
Reported Weight	29.00	180.00	230.00	205.00	200.00	207.97	12.80

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			DIZC Nun	001-10			
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight	3.00	39.57	42.91	42.32	39.57	41.60	1.79
Upper Thigh Circ	3.00	23.78	27.83	26.38	23.78	26.00	2.05
Buttock Circ	3.00	42.80	45.04	44.33	42.80	44.06	1.15
Hip Circ Max	3.00	42.44	45.67	45.35	42.44	44.49	1.78
Hip Ht	3.00	35.91	39.02	35.91	35.91	36.94	1.80
Neck Circ	3.00	16.14	19.49	18.54	16.14	18.06	1.73
Shoulder Circ	3.00	49.65	53.46	51.61	49.65	51.57	1.91
Chest Circ	3.00	43.70	46.89	45.63	43.70	45.41	1.61
Waist Circ Omph	3.00	41.54	43.11	41.57	41.54	42.07	0.90
Waist Circ Pref	3.00	39.96	41.54	41.54	41.54	41.01	0.91
Waist Back	3.00	20.47	22.56	20.67	20.47	21.23	1.15
Crotch Lth	3.00	23.03	29.61	27.80	23.03	26.81	3.40
VTC	3.00	70.87	73.07	71.89	70.87	71.94	1.10
Sleeve Lth Tot	3.00	34.84	37.80	37.72	34.84	36.78	1.68
Sleeve Outseam	3.00	24.65	26.10	24.76	24.65	25.17	0.81
Sleeve Inseam	3.00	18.27	20.83	19.53	18.27	19.54	1.28
Stature	3.00	71.50	72.64	71.73	71.50	71.96	0.60
Cervicale Ht	3.00	61.93	63.35	61.97	61.93	62.41	0.81
Acromion Ht	3.00	59.41	60.35	59.65	59.41	59.80	0.49
Neck Ht	3.00	59.41	60.94	59.72	59.41	60.03	0.81
Waist Ht Omph	3.00	42.05	43.86	43.07	42.05	42.99	0.91
Waist Ht Pref	3.00	38.50	44.45	39.88	38.50	40.94	3.11
Crotch Ht	3.00	33.35	35.28	33.46	33.35	34.03	1.08
Biacromial Br	3.00	15.87	18.27	16.38	15.87	16.84	1.26
Sitting Ht	1.00	37.28	37.28	37.28	37.28	37.28	•
Eye Ht Sitting	1.00	32.28	32.28	32.28	32.28	32.28	•
Knee Ht Sitting	1.00	22.20	22.20	22.20	22.20	22.20	•
Butt-Knee L (ANSU	1.00	25.35	25.35	25.35	25.35	25.35	•
Butt-Knee L (AF)	1.00	25.55	25.55	25.55	25.55	25.55	•
Bideltoid Br	1.00	21.42	21.42	21.42	21.42	21.42	•
Reported Weight	3.00	220.00	240.00	228.00	220.00	229.33	10.07
	D	ogt Rit	Cizo Num	bor=18 -			
	D	est rit	SIZE NUL	Wer-40 -			
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight	2.00	41.14	47.05	44.09	41.14	44.09	4.18
Upper Thigh Circ	2.00	26.22	27.44	26.83	26.22	26.83	0.86
Buttock Circ	2.00	43.31	45.35	44.33	43.31	44.33	1.45

Buttock Circ	2.00	43.31	45.35	44.33	43.31	44.33	1.45
Hip Circ Max	2.00	43.54	46.14	44.84	43.54	44.84	1.84
Hip Ht	2.00	33.98	35.51	34.74	33.98	34.74	1.09
Neck Circ	2.00	18.11	18.58	18.35	18.11	18.35	0.33
Shoulder Circ	2.00	51.02	54.92	52.97	51.02	52.97	2.76
Chest Circ	2.00	46.57	50.55	48.56	46.57	48.56	2.81
Waist Circ Omph	2.00	41.14	44.69	42.91	41.14	42.91	2.51
Waist Circ Pref	2.00	40.59	42.87	41.73	40.59	41.73	1.61
Waist Back	2.00	17.01	20.91	18.96	17.01	18.96	2.76
Crotch Lth	2.00	26.30	32.36	29.33	26.30	29.33	4.29
VTC	2.00	71.02	72.32	71.67	71.02	71.67	0.92

Sleeve Lth Tot Sleeve Outseam	2.00	35.16	37.60 25.31	$36.38 \\ 24.19 \\ 18.21$	35.16 23.07	36.38 24.19	$1.73 \\ 1.59 \\ 1.75$
Sleeve Inseam	2.00	16.97	19.45	18.21 71 09	70 20	71 08	1.25
	2.00	60.28	62 01	61 14	60.28	61.14	1.22
Acromion Ht	2.00	58.27	59.61	58.94	58.27	58.94	0.95
Neck Ht	2.00	58.46	59.21	58.84	58.46	58.84	0.53
Waist Ht Omph	2.00	41.61	43.74	42.68	41.61	42.68	1.50
Waist Ht Pref	2.00	40.16	41.77	40.96	40.16	40.96	1.14
Crotch Ht	2.00	32.95	33.46	33.21	32.95	33.21	0.36
Biacromial Br	2.00	16.22	17.44	16.83	16.22	16.83	0.86
Sitting Ht	1.00	37.17	37.17	37.17	37.17	37.17	•
Eye Ht Sitting	1.00	31.57	31.57	31.57	31.57	31.57	•
Knee Ht Sitting	1.00	23.07	23.07	23.07	23.07	23.07	•
Butt-Knee L (ANSU	1.00	25.98	25.98	25.98	25.98	25.98	•
Butt-Knee L (AF)	1.00	25.94	25.94	25.94	25.94	25.94	•
Bideltoid Br	1.00	22.40	22.40	22.40	22.40	22.40	• • • • •
Reported Weight	2.00	220.00	260.00	240.00	220.00	240.00	28.28

## SUMMARY STATISTICS FOR AF AND NAVY FEMALES WITH ACCEPTABLE FITS

		BFCT	FTT STZF	NUMBER-32				
		DEGI	TTT DIDD	NOMDER-52				
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Acromion Ht Biacromial Cervicale H Chest Circ Crotch Ht Hip Circ Ma Hip Ht Max Shoulder Ci Sleeve Lth Stature Thigh Circ Waist Circ,	$\begin{array}{c} \mathbf{N} \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \end{array}$	MIN 48.07 13.07 50.83 32.48 27.13 34.02 28.11 36.69 28.50 60.16 19.17 25.12	54.06 14.76 56.89 34.61 30.87 37.52 33.27 39.13 32.80 66.26 21.89 27.99	50.96 13.98 53.35 33.54 29.69 34.92 30.26 38.31 30.02 62.42 20.18 26.67	48.07 13.07 50.83 32.48 27.13 34.02 28.11 36.69 28.50 60.16 19.17 25.12	51.01 13.95 53.60 33.54 29.34 35.34 30.47 38.11 30.33 62.81 20.35 26.61	2.49 0.71 2.65 1.04 1.60 1.51 2.19 1.09 1.81 2.74 1.19 1.30	
		BEST	FIT SIZE	NUMBER=34				
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Acromion Ht Biacromial Cervicale H Chest Circ Crotch Ht Hip Circ Ma Hip Ht Max Shoulder Ci Sleeve Lth Stature Thigh Circ Waist Circ,	10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00	50.79 13.46 52.87 31.50 28.74 35.08 29.88 37.20 30.35 61.61 19.65 25.47	54.84 15.00 57.09 38.78 32.64 40.87 32.87 42.76 33.03 67.44 24.09 30.12	53.13 14.31 55.43 35.78 30.49 37.54 31.50 40.55 31.34 65.02 22.13 28.84	50.79 14.17 52.87 31.50 28.74 35.08 31.50 40.55 30.35 64.33 23.15 29.53	53.22 14.34 55.48 35.53 30.45 37.72 31.42 40.38 31.58 64.98 22.22 28.57	$1.20 \\ 0.51 \\ 1.33 \\ 2.22 \\ 1.24 \\ 1.59 \\ 1.02 \\ 1.46 \\ 0.80 \\ 1.67 \\ 1.19 \\ 1.29 $	
		0031	FII 5146	NOMDER-50				
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Acromion Ht Biacromial Cervicale H Chest Circ Crotch Ht Hip Circ Ma Hip Ht Max	15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00	50.12 13.94 52.05 34.84 28.82 37.01 29.17	56.42 15.55 59.37 40.35 33.35 39.88 34.80	52.91 14.60 55.71 36.65 30.71 38.74 31.10	50.12 14.09 52.05 36.65 28.82 37.01 29.60	53.13 14.54 55.76 36.75 30.82 38.61 31.69	1.77 0.45 2.02 1.42 1.66 0.86 1.82	

Shoulder Ci Sleeve Lth Stature Thigh Circ Waist Circ,	15.00 15.00 15.00 15.00 15.00	39.41 28.78 61.65 21.57 28.70	43.46 34.25 69.29 24.61 32.36	40.63 31.81 64.76 23.00 30.16	39.41 28.78 61.65 23.03 29.77	41.02 31.86 64.96 23.00 30.42	1.20 1.31 2.08 0.84 1.05	
		BEST	FIT SIZE	NUMBER=38				-
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Acromion Ht Biacromial Cervicale H Chest Circ Crotch Ht Hip Circ Ma Hip Ht Max Shoulder Ci Sleeve Lth Stature Thigh Circ Waist Circ,	$17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 17.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.00 \\ 10.0$	49.80 13.62 53.50 35.59 27.90 38.23 29.70 40.20 30.30 62.60 22.90 28.57	57.00 16.00 58.90 40.70 32.70 42.76 34.17 45.16 33.90 68.40 25.28 34.53	53.80 14.92 56.60 38.07 31.10 40.20 32.20 42.60 32.28 66.14 24.30 30.67	53.70 14.70 57.00 35.59 29.00 39.90 29.70 40.20 32.28 65.67 24.50 28.57	53.89 14.96 56.48 38.23 30.81 40.25 32.33 42.43 32.03 65.84 24.12 30.76	1.71 0.60 1.36 1.65 1.12 1.24 1.24 1.43 0.97 1.47 0.70 1.66	
		BEST	FIT SIZE	NUMBER=40				-
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Acromion Ht Biacromial Cervicale H Chest Circ Crotch Ht Hip Circ Ma Hip Ht Max Shoulder Ci Sleeve Lth Stature Thigh Circ Waist Circ,	6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00	54.69 13.98 57.32 36.46 30.70 41.00 31.97 40.31 31.50 66.69 24.21 30.59	57.01 15.80 59.29 42.20 33.19 43.50 34.37 44.40 34.06 68.70 25.80 34.87	56.38 15.17 58.58 37.85 32.29 41.61 34.08 43.33 33.04 68.17 24.49 31.54	54.69 13.98 57.32 36.46 30.70 41.00 31.97 40.31 31.50 66.69 24.21 30.59	56.19 15.08 58.49 38.66 32.00 41.81 33.58 42.92 32.94 67.98 24.81 32.11	0.85 0.67 2.42 0.99 0.88 1.00 1.53 1.03 0.76 0.67 1.77	
		BEST	FIT SIZE	NUMBER=42				-
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD	
Acromion Ht Biacromial Cervicale H Chest Circ Crotch Ht Hip Circ Ma Hip Ht Max Shoulder Ci Sleeve Lth Stature Thigh Circ Waist Circ,	$\begin{array}{c} 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\ 1.00\\$	54.80 15.80 57.80 37.50 30.80 44.80 32.60 43.90 33.20 67.60 26.40 28.97	54.80 15.80 57.80 37.50 30.80 44.80 32.60 43.90 33.20 67.60 26.40 28.97	54.80 15.80 57.80 30.80 44.80 32.60 43.90 33.20 67.60 26.40 28.97	54.80 15.80 57.80 37.50 30.80 44.80 32.60 43.90 33.20 67.60 26.40 28.97	54.80 15.80 57.80 30.80 44.80 32.60 43.90 33.20 67.60 26.40 28.97	• • • • • • • • • • • • • • •	-

## APPENDIX Q

## SUMMARY STATISTICS FOR FEMALES TO BE ACCOMMODATED BY NEW SIZES

The Navy's Waist Circ Nat has been adjusted to approximate the Air Force's Waist Circ Pref. This was done by subracting the average difference between the two measurements from the each Navy measurement.

Summary Statistics for Anthropometry of Air Force and Navy Females Not Accommodated by Current Sizes ------ Best Fit Current Size=32; Expected Female Size Category 1 -------VAR Ν MIN MAX MEDIAN MODE MEAN STD 1.80 8 47.48 Acromion Ht 53.15 51.97 47.48 51.47 Biacromial 13.19 14.90 14.47 14.80 14.21 0.74 8 49.61 49.61 Cervicale H 55.43 54.79 54.00 1.89 8 Chest Circ 8 30.51 35.40 33.86 30.51 33.59 1.74 Crotch Ht 8 27.01 31.90 29.67 27.01 29.68 1.43 Hip Circ Ma 8 34.25 36.97 36.10 34.25 35.86 0.86 Hip Ht Max 28.58 28.58 8 32.17 31.15 30.93 1.16 36.61 8 38.68 Shoulder Ci 40.60 38.80 36.61 1.63 Sleeve Lth 8 28.62 32.10 30.85 28.62 30.82 1.00 59.02 Stature 59.02 64.92 63.36 1.94 8 63.96 Thigh Circ 8 19.84 21.80 20.91 19.84 20.92 0.66 Waist C, Pref 8 25.28 28.17 26.92 25.28 26.81 1.11 ----- Best Fit Current Size=34; Expected Female Size Category 2 ------VAR Ν MIN MAX MEDIAN MODE MEAN STD Acromion Ht 23 49.13 56.81 52.40 52.40 52.71 1.98 12.80 15.30 14.25 14.21 0.55 Biacromial 23 14.10 23 58.78 55.06 2.00 Cervicale H 51.42 55.00 55.00 23 33.00 38.50 35.20 35.38 Chest Circ 34.40 1.56 Crotch Ht 23 27.01 32.80 29.72 29.10 30.18 1.52 Hip Circ Ma 23 35.90 39:96 37.60 37.30 37.79 1.08 23 28.82 34.00 Hip Ht Max 31.30 31.50 31.22 1.55 Shoulder Ci 23 37.10 39.50 39.50 39.55 42.20 1.18 Sleeve Lth 23 28.39 33.30 31.42 31.30 31.43 1.15 Stature 23 61.10 67.83 64.29 67.30 64.31 2.09 0.88 Thigh Circ 22.00 22.00 23 21.00 24.02 22.27 Waist C, Pref 23 26.38 30.17 28.57 28.57 28.42 1.08 ------ Best Fit Current Size=36; Expected Female Base Size ------VAR Ν MIN MAX MEDIAN MODE MEAN STD Acromion Ht 26 47.48 57.00 53.84 53.60 53.34 1.98 26 13.70 15.39 14.35 14.30 14.49 0.47 Biacromial 55.75 55.63 55.82 Cervicale H 26 50.20 59.30 1.91 Chest Circ 26 33.60 38.20 35.70 34.25 35.73 1.38 27.05 30.50 30.44 32.50 1.25 Crotch Ht 26 30.50 Hip Circ Ma 36.40 38.30 1.35 26 41.54 38.85 38.85 33.90 31.95 Hip Ht Max 2.6 28.03 32.00 31.60 1.53 Shoulder Ci 26 37.60 43.03 39.78 39.50 40.12 1.44 Sleeve Lth 26 29.29 33.80 32.24 32.80 32.06 1.07 Stature 26 59.65 69.40 65.52 66.50 65.35 2.06 Thigh Circ 22.90 1.19 26 20.50 24.65 23.10 22.70 26.47 Waist C, Pref 26 32.56 28.90 28.97 29.24 1.61

Best	Fit Cu	rrent Siz	e=38; Exp	ected Fema	le Size	Category	4
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht Biacromial Cervicale H Chest Circ Crotch Ht Hip Circ Ma Hip Ht Max Shoulder Ci Sleeve Lth Stature Thigh Circ Waist Circ,	23 23 23 23 23 23 23 23 23 23 23 23 23	47.60 12.90 50.50 34.90 27.00 37.80 26.80 38.30 29.80 60.40 22.10 27.47	56.70 16.10 59.60 42.05 34.30 43.00 35.80 44.80 35.50 69.20 26.80 37.01	52.80 14.60 55.70 37.80 30.20 40.90 31.46 40.60 31.10 64.72 24.29 30.71	47.60 14.30 58.60 39.20 28.60 40.90 33.50 41.60 29.80 68.10 23.70 31.47	53.05 14.56 55.51 37.78 30.39 40.73 31.67 41.08 31.78 64.92 24.16 30.90	2.35 0.73 2.53 1.68 1.86 1.25 2.00 1.78 1.59 2.58 1.01 2.10
Best	Fit Cu	rrent Siz	e=40; Exp	ected Fema	le Size	Category	5
VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht Biacromial Cervicale H Chest Circ Crotch Ht Hip Circ Ma Hip Ht Max Shoulder Ci Sleeve Lth Stature Thigh Circ Waist C,Pref	21 21 21 21 21 21 21 21 21 21 21 21 20	49.20 14.00 51.80 35.00 27.30 37.50 29.30 38.30 30.20 60.60 22.30 28.67	57.60 16.30 60.08 45.20 33.39 45.31 35.79 45.98 34.70 70.00 26.80 37.48	54.60 15.00 57.00 38.70 30.80 42.00 32.80 41.90 32.09 66.10 25.50 32.12	50.70 15.00 51.80 32.80 42.00 33.30 30.60 60.60 25.40 29.57	54.09 14.98 56.72 39.22 30.91 42.15 32.46 41.95 32.17 65.98 25.25 32.38	2.67 0.59 2.65 2.90 1.81 1.97 1.84 1.92 1.31 2.93 1.28 2.44

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## APPENDIX R

PATTERN DIMENSIONS FOR FLIGHT SUIT FEMALE SIZES							
	Grade		l	Base Size ⁵			
Neckline (Torso)	3/4	15 7/8	16 5/8	17 3/8	18 1/8	18 7/8	
Shoulder (Front)	1/2	20 1/4	20 3/4	21 1/4	21 3/4	22 1/4	
Shoulder (Back)	1/2	26 1/8	26 5/8	27 1/8	27 5/8	28 1/8	
Chest ⁶	2 1/4	46 1/8	48 3/8	50 5/8	52 7/8	55 1/8	
Waist	2 1/4	40	42 1/4	44 1/2	46 3/4	49	
Hip	1 3/4	44 3/4	46 1/2	48 1/4	50	51 3/4	
Thigh	1	29 1/2	30 1/2	31 1/2	32 1/2	33 1/2	
Calf	1/2	21 3/8	21 7/8	22 3/8	22 7/8	23 3/8	
Hem	1/2	20 1/2	21	21 1/2	22	22 1/2	
Upper Torso (Front)	1/4	15 5/8	15 7/8	16 1/8	16 3/8	16 5/8	
Upper Torso (Back)	1/4	19 1/4	19 1/2	19 3/4	20	20 1/4	
Rise ⁷	1/4	11 3/4	12	12 1/4	12 1/2	12 3/4	
Leg Inseam	0	31 5/8	31 5/8	31 5/8	31 5/8	31 5/8	
Leg Outseam	1/4	43 3/8	43 5/8	43 7/8	44 1/8	44 3/8	
Sleeve Hole	3/4	20 7/8	21 5/8	22 3/8	23 1/8	23 7/8	
Sleeve Cuff	1/4	14 5/8	14 7/8	15 1/8	15 3/8	15 5/8	
Sleeve Inseam	1/4	24 3/8	24 5/8	24 7/8	25 1/8	25 3/8	
Sleeve Back Seam (Top)	1/8	23 1/4	23 3/8	23 1/2	23 5/8	23 3/4	
Sleeve Back Seam (Bot) ⁸	1/8	23 1/8	23 3/4	23 7/8	24	24 1/8	

⁵ The pattern for the female base size is based on the pattern for current size 36.
⁶ Since seam allowances were not measured, a total of 3 3/4" (5/8" x 6) has been added to approximate entire pattern dimension.
⁷ Rise is computed by subtracting Leg Inseam from Leg Outseam.
⁸ The difference in top and bottom measurements is not understood.

PATTERN DIMENSIONS FOR FLIGHT SUIT FEMALE LENGTHS								
	Grade	S	R ⁹	L				
Neckline (Torso)	0	17 3/8	17 3/8	17 3/8				
Shoulder (Front)	0	21 1/4	21 1/4	21 1/4				
Shoulder (Back)	0	27 1/8	27 1/8	27 1/8				
Chest ⁶	0	50 5/8	50 5/8	50 5/8				
Waist	0	44 1/2	44 1/2	44 1/2				
Hip	0	48 1/4	48 1/4	48 1/4				
Thigh	0	31 1/2	31 1/2	31 1/2				
Calf	0	22 3/8	22 3/8	22 3/8				
Hem	0	21 1/2	21 1/2	21 1/2				
Upper Torso (Front)	5/8	15 1/2	16 1/8	16 3/4				
Upper Torso (Back)	5/8	19 1/8	19 3/4	20 5/8				
Rise ⁷	3/8	11 7/8	12 1/4	12 5/8				
Leg Inseam	2 1/8	29 1/2	31 5/8	33 3/4				
Leg Outseam	2 1/2	41 3/8	43 7/8	46 3/8				
Sleeve Hole	0	22 3/8	22 3/8	22 3/8				
Sleeve Cuff	0	15 1/8	15 1/8	15 1/8				
Sleeve Inseam	1	23 7/8	24 7/8	25 7/8				
Sleeve Back Seam (Top)	1	22 1/2	23 1/2	24 1/2				
Sleeve Back Seam (Bot) ⁸	1	22 7/8	23 7/8	24 7/8				

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⁹ The pattern for length R is based on the pattern for the female base size.