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This report documents the development of a minimal set of flight suit sizes designed specifically for females. The project goal is to improve flight suit accommodation for females across all services. Researchers used fit test results of existing prototypes to establish the relationship between anthropometry and fit for women, and expressed the proper proportioning as the degree of change from the prototypes. The prototypes were the existing flight suit sizes proportioned for men. Analysis included fit test data of the Modified Enhanced Air Force Flight Suit (MEAFFS) collected independently by the Air Force and Navy. The results indicate that female sizes should have narrower shoulders, smaller necks and waists, shorter upper torsos, and shorter legs. Researchers examined neighboring size data from the Air Force fit test and differences between male and female anthropometry to determine how much change was needed to generate a base female size. Four more female 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 proportioned sizes. The estimated grade for existing sizes can be applied to the female base size to generate these sizes.

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Kathleen M. Robinette 18 Dec 96

PI - Signature Date

PREFACE

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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.

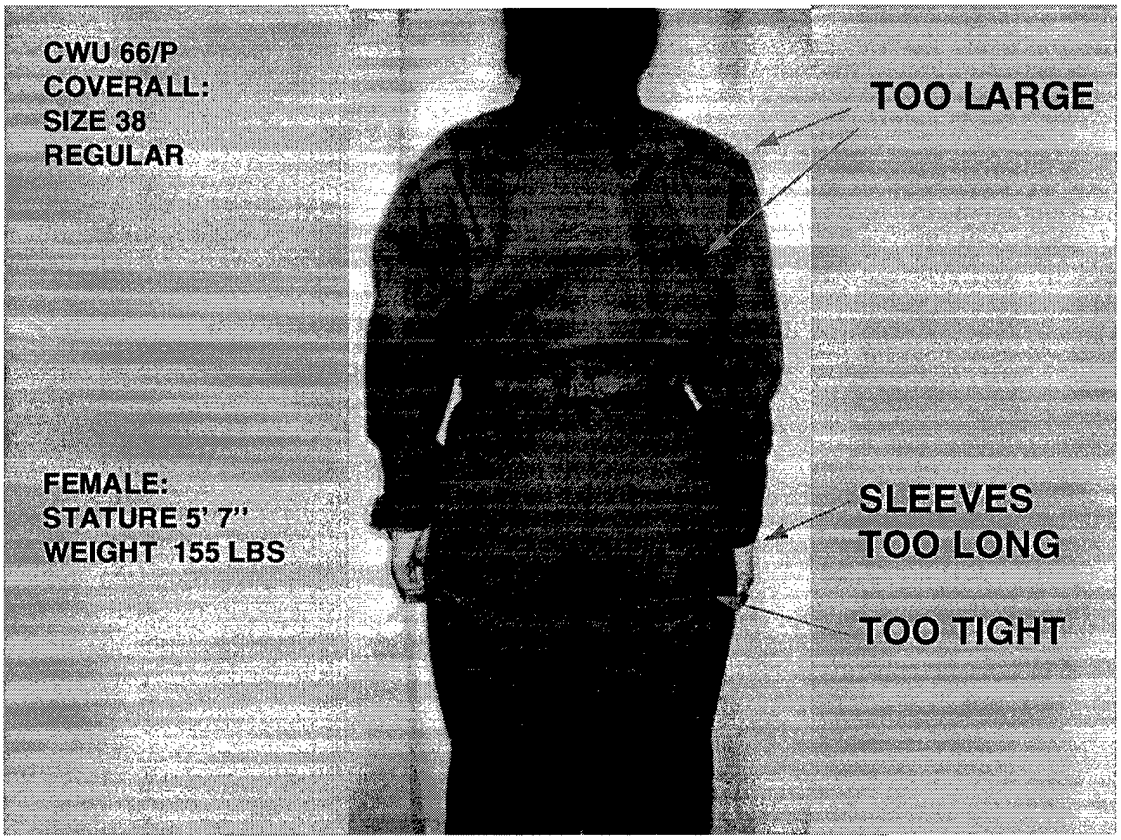


Figure 1. *Fit problem for women in flight suits.*

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.

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)

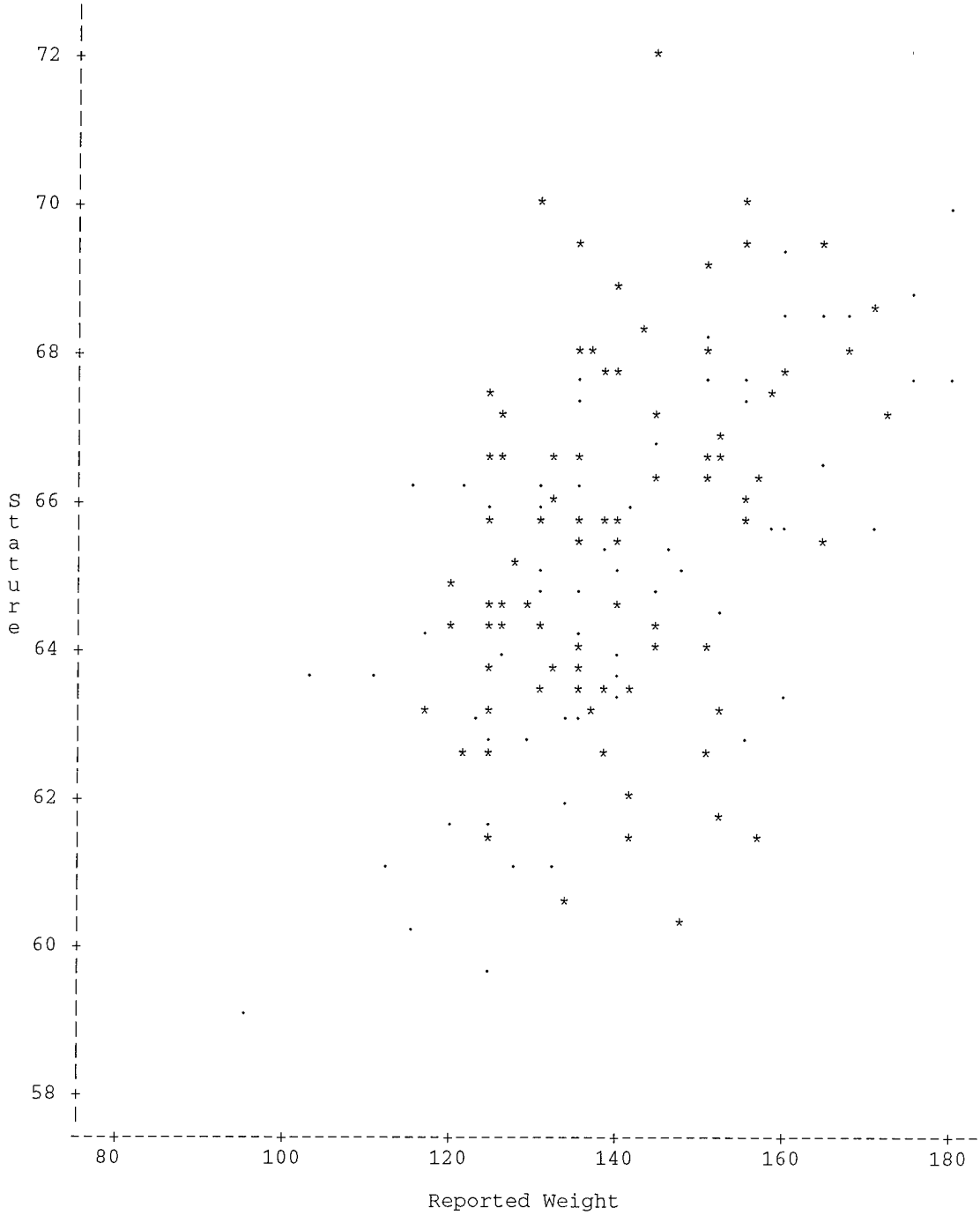
Variable	Label	N	Mean	Std Dev	Delta*
X1	Reported Weight	89	139.50	12.67	-0.57
Y1	Acromial Ht	89	53.53	2.32	0.33
Y2	Biacromial Br	89	14.72	0.61	0.29
Y4	Cervicale Ht	89	56.03	2.26	0.31
Y5	Chest Circ	89	37.09	2.26	0.50
Y7	Crotch Lth Total Nat**	88	28.08	1.70	1.34
Y8	Crotch Ht Adj	89	30.71	1.66	0.24
Y9	Hip 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.

**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(*)

Plot of N10*N12. Symbol is value of SYMBOL.

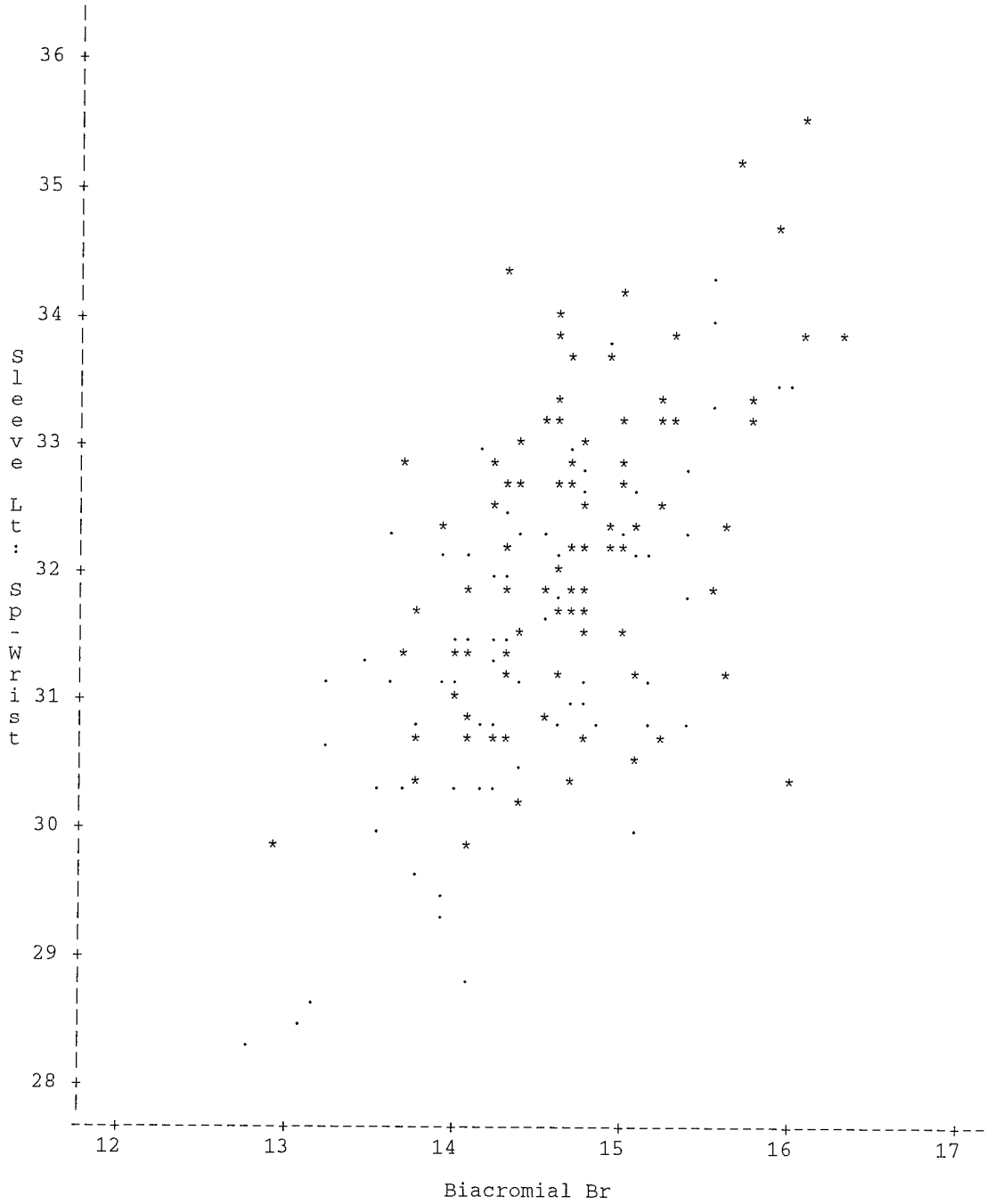


NOTE: 1 obs had missing values. 22 obs hidden.

Figure 2. *Stature and Reported Weight Distributions*

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

Plot of N9*N2. Symbol is value of SYMBOL.



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.

NAVY

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 $\alpha = .05$. 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.

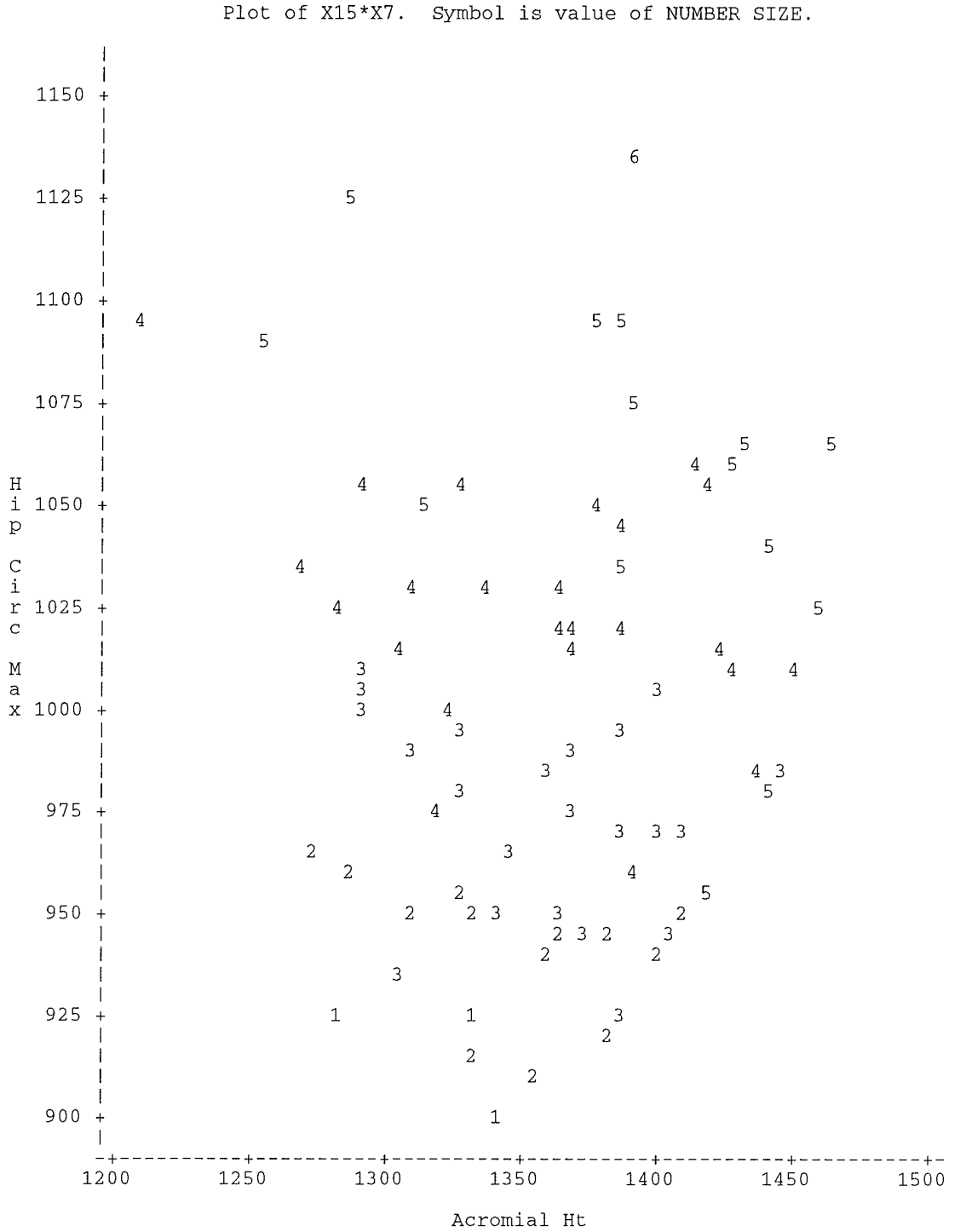
The correlation between each anthropometric variable and the scores for each of the significant eigenvectors results in Weight being the best discriminator for number size ($r = .96816$) and letter size ($r = .88819$). However, Hip Circ Max was the next best discriminator for number size ($r = .91538$), 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.)

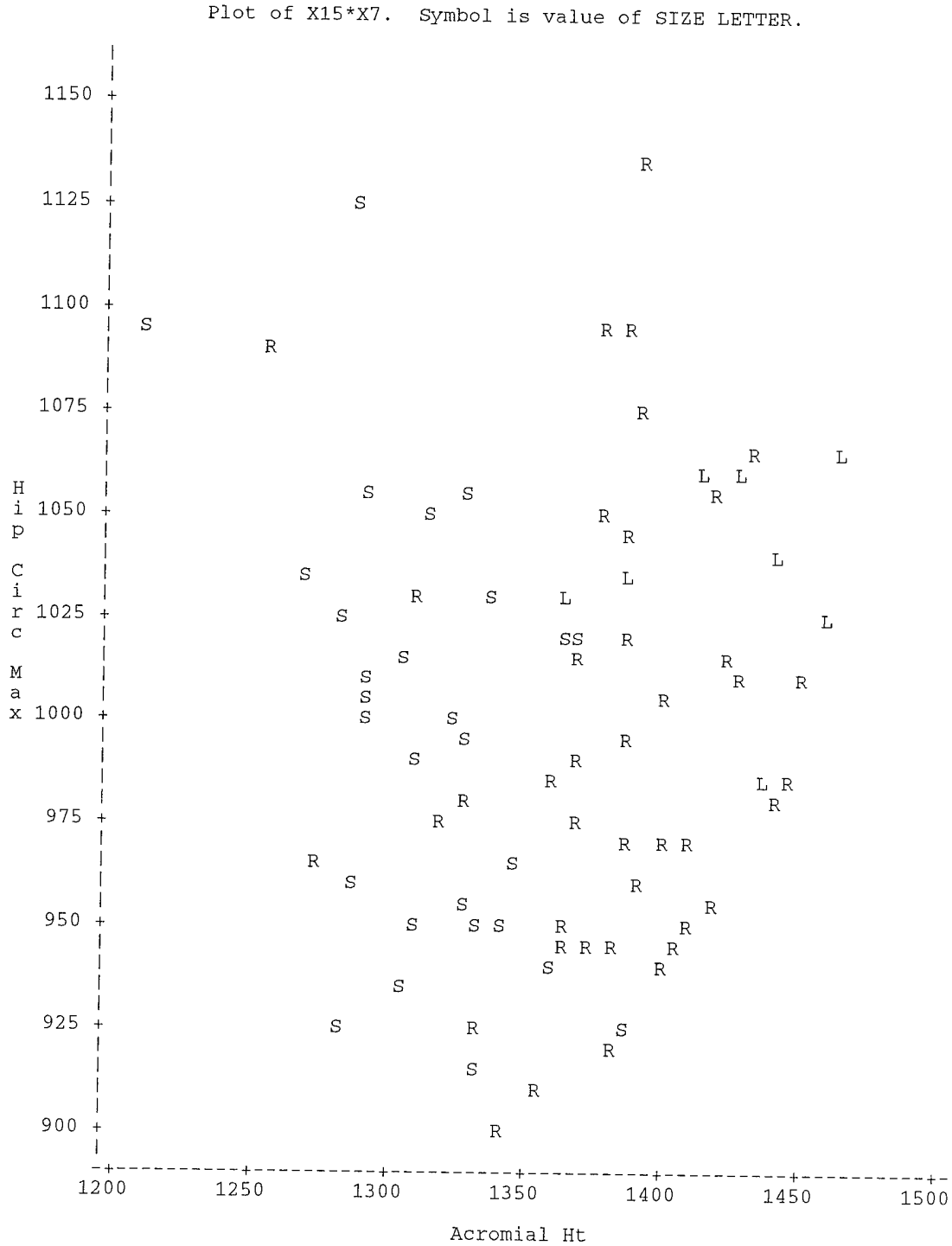
The confusing results reported for the Air Force may result from the inclusion in the sample of all subjects regardless of fit. How reliable are key variables that are based on unacceptable fits? An exact answer is unknown. Logically, however, greater consistency may have been achieved if only acceptable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



NOTE: 3 obs hidden.

1=size 32, 2=size 34, 3=size 36,
4=size 38, 5=size 40, 6=size 42

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



NOTE: 3 obs hidden.

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

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. Re-analysis 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

Problem Areas for the Unacceptable Fits
Based on the Weighted Ratings

Area and Problem	Percentage of Unacceptable Fits
Collar - Too Loose	19%
Shoulders - Too Loose	69%
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%

ANALYSIS

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 circumferece, 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

Specifications for Female Sizes in Terms of Existing Sizes

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

< 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

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

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

Existing Sizes	**Female Proportioned Sizes**
32S, 32R	32S, 32R
34S, 34R	34S. 34R
36S, 36R	36S, 36R
38S, 38R	38S, 38R
40S, 40R	40S, 40R

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 _____

OVERALL FIT

FITTER 1 2 3 4			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	_____	OK	_____	LONG	_____
WAIST TAB	HIGH	_____	OK	_____	LOW	_____
RISE	SHORT	_____	OK	_____	WRINKLED	_____

COMMENTS:

RANGE OF MOTION

SITTING

SLV	TIGHT	_____	OK	_____	LOOSE	_____
TIGHT	TIGHT	_____	OK	_____	LOOSE	_____

COMMENTS:

SQUATTING

SLV	TIGHT	_____	OK	_____	LOOSE	_____
THIGH	TIGHT	_____	OK	_____	LOOSE	_____

COMMENTS:

BENDING

SLV	TIGHT	_____	OK	_____	LOOSE	_____
THIGH	TIGHT	_____	OK	_____	LOOSE	_____

COMMENTS:

CLIMBING

SLV	TIGHT	_____	OK	_____	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	32	34	36	38	40	42	Total
L	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	4 4.55 44.44 13.79	5 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 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	Excellent	Total
Fair	2 2.35 33.33 40.00	2 2.35 33.33 8.70	2 2.35 33.33 4.17	0 0.00 0.00 0.00	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 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

Frequencies of Two Weighted Overall Rating Methods

Rate	Set 1	Set 2	
E	5 (5.8%)	0 (0%)	
G	13 (15.1%)	27 (33.8%)	
F	0 (0%)		7 (8.8%)
P	68 (79.1%)	46 (57.5%)	

(* 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 OK
F=All 4 Critical Areas OK; 1 or 2 Non-Critical Areas OK
P=Not All Critical Areas OK

RATING BEST FIT SIZE

Frequency Percent Row Pct Col Pct	32R	32S	34R	34S	36R	36S	38L	38R	38S	40L	40R	40S	42R	Total
Excellent	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 1.16 20.00 12.50	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	2 2.33 40.00 16.67	1 1.16 20.00 8.33	1 1.16 20.00 20.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	5 5.81
Good	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	2 2.33 15.38 15.38	2 2.33 15.38 22.22	1 1.16 7.69 33.33	4 4.65 30.77 33.33	2 2.33 15.38 16.67	1 1.16 7.69 20.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 1.16 7.69 50.00	13 15.12
Poor	2 2.33 2.94 100.00	1 1.16 1.47 100.00	7 8.14 10.29 87.50	7 8.14 10.29 100.00	11 12.79 16.18 84.62	7 8.14 10.29 77.78	2 2.33 2.94 66.67	6 6.98 8.82 50.00	9 10.47 13.24 75.00	3 3.49 4.41 60.00	9 10.47 13.24 100.00	3 3.49 4.41 100.00	1 1.16 1.47 50.00	68 79.07
Total	2 2.33	1 1.16	8 9.30	7 8.14	13 15.12	9 10.47	3 3.49	12 13.95	12 13.95	5 5.81	9 10.47	3 3.49	2 2.33	86 100.00

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:

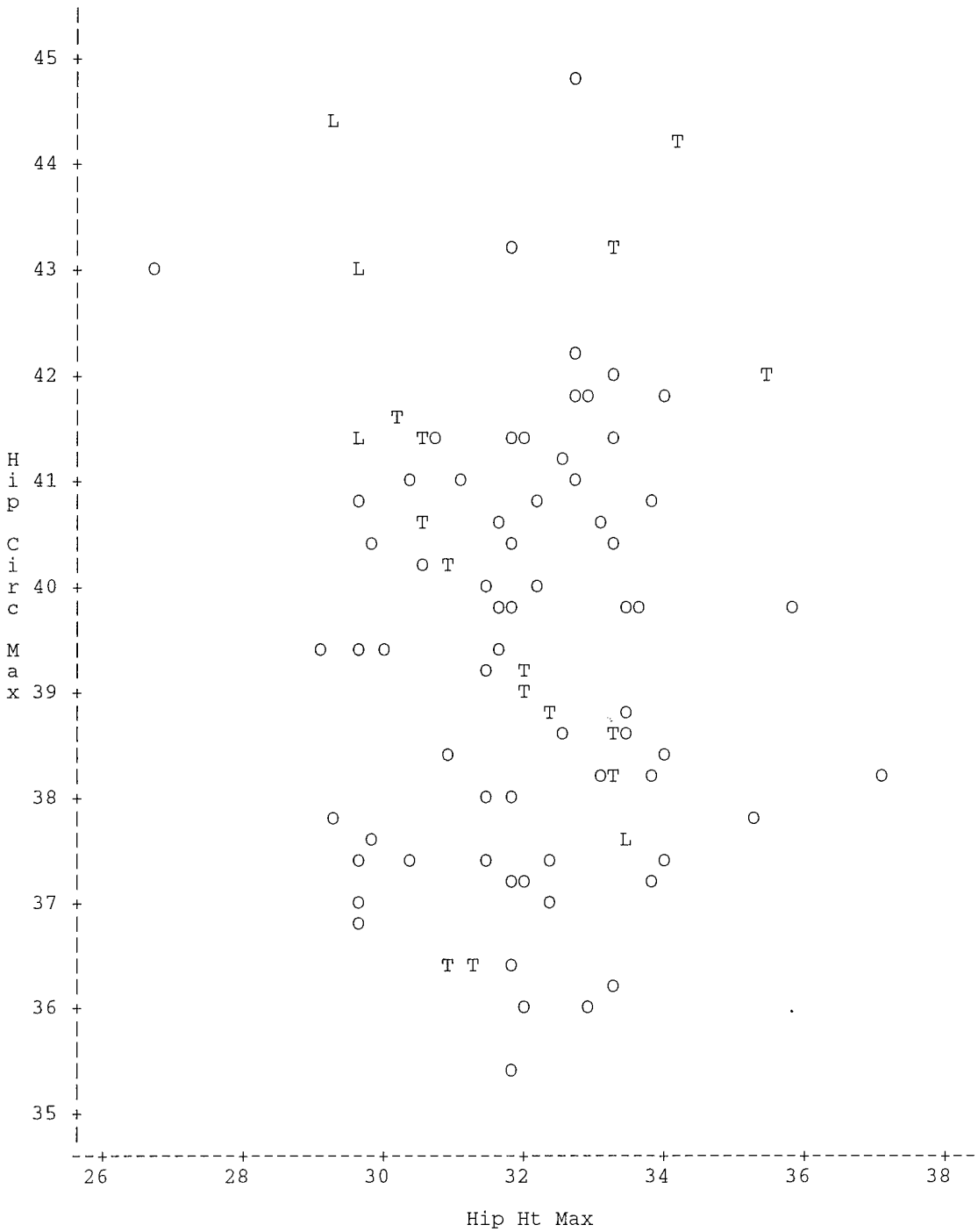
1. Make the shoulder narrower.

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 rise	65.7% short

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

Comparison of Rise Measurements

Size	Air Force	Navy
36S	31.0 cm	24.5 cm
36R	31.1 cm	25.0 cm
38S	30.3 cm	23.5 cm

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 numberous 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

Plot of N14*N5. Symbol is value of SYMBOL.

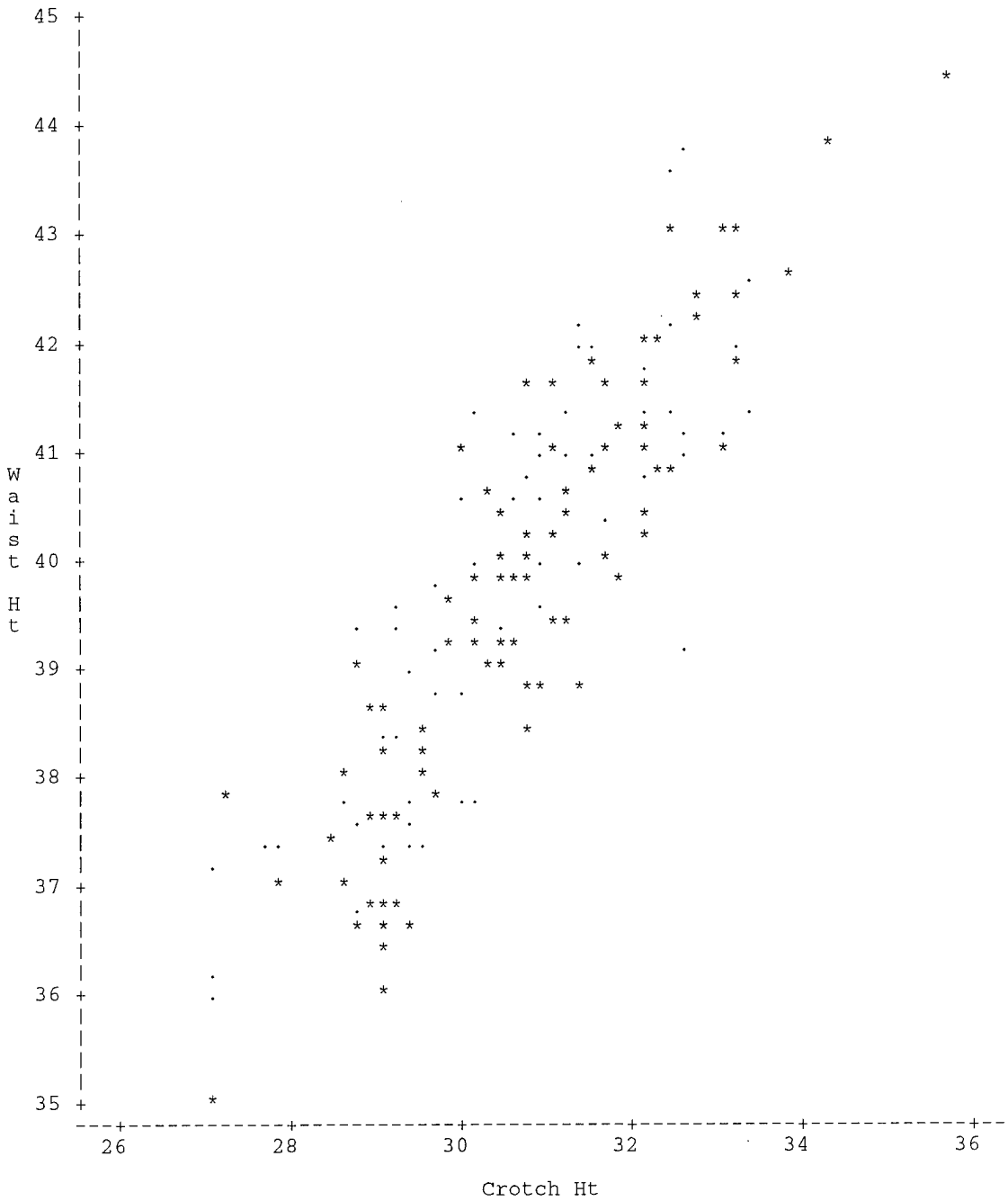


Figure 8. *Air Force Flight Suit Females (.). Overlaid with Navy Flight Suit Females(*).*

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.

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 reduced by more than one size smaller. In order to estimate just how much smaller 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.

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.

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

Males Only Males and Some Females Females Only

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

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

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APPENDIX A
AIR FORCE ANTHROPOMETRY

Variable	Label	N	Mean	Std Dev	Minimum	Maximum	Skewness	Kurtosis
D16	REPORTED_WEIGHT (LB)	71	140.07	17.92	95.00	180.00	0.16	-0.04
X1	WEIGHT	72	639.76	92.14	460.00	900.00	0.67	0.72
X2	UPPER THIGH CIRC	72	591.10	46.02	487.00	725.00	0.11	0.41
X3	BUTTOCK CIRC	72	993.88	68.93	862.00	1169.00	0.42	0.13
X4	HIP CIRC MAX	72	1003.26	69.82	864.00	1198.00	0.42	0.23
X5	HIP HT	72	802.72	45.86	712.00	909.00	0.04	-0.58
X6	NECK CIRC	72	353.92	18.74	319.00	395.00	0.17	-0.82
X7	SHOULDER CIRC	72	1041.17	57.68	930.00	1202.00	0.27	-0.02
X8	CHEST CIRC	72	929.50	70.96	775.00	1098.00	0.43	0.07
X9	WAIST CIRC OMPH	72	801.75	81.75	632.00	1040.00	0.51	0.19
X10	WAIST CIRC PREFER	72	761.64	71.83	638.00	952.00	0.53	0.18
X11	WAIST BACK	72	398.43	29.12	305.00	450.00	-0.45	0.11
X12	CROTCH LTH	72	679.00	46.49	554.00	789.00	0.19	0.29
X13	VTC	72	1531.88	71.35	1336.00	1693.00	-0.07	0.12
X14	SLEEVE LTH TOTAL	72	799.19	32.54	721.00	870.00	-0.24	0.12
X15	SLEEVE OUTSEAM	72	549.88	25.58	492.00	593.00	-0.44	-0.71
X16	SLEEVE INSEAM	72	439.99	24.72	386.00	491.00	-0.32	-0.58
X17	STATURE	72	1651.29	59.58	1499.00	1778.00	-0.27	-0.08
X18	CERVICALE HT	72	1415.14	58.34	1260.00	1526.00	-0.39	0.07
X19	ACROMION HT	72	1351.28	54.30	1206.00	1454.00	-0.49	0.43
X20	NECK HT	72	1361.85	55.39	1215.00	1469.00	-0.39	0.04
X21	WAIST HT OMPH	72	990.43	42.11	888.00	1082.00	-0.24	-0.11
X22	WAIST HT PREFER	72	1009.08	46.48	913.00	1110.00	-0.14	-0.73
X23	CROTCH HT	72	773.78	39.99	686.00	848.00	-0.24	-0.32
X24	BIACROMIAL BR	72	366.50	17.49	325.00	407.00	-0.00	-0.25
X25	SITTING HT	63	874.46	31.89	797.00	935.00	-0.12	-0.45
X26	EYE HT SIT	63	761.21	31.06	677.00	825.00	-0.17	-0.22
X27	KNEE HT SIT	63	512.27	24.32	457.00	571.00	0.10	-0.23
X28	BUTT-KNEE LTH (ANSUR)	63	587.63	25.12	535.00	647.00	0.15	-0.37
X29	BUTT-KNEE LTH (AF)	63	588.98	25.75	536.00	655.00	0.34	-0.21
X30	BIDELTOID BR	63	437.27	23.97	388.00	490.00	0.06	-0.25

APPENDIX B
NAVY ANTHROPOMETRY

Variable	Label	N	Mean	Std Dev	Minimum	Maximum	Skewness	Kurtosis
X1	Reported Weight	89	139.50	12.67	117.00	172.00	0.50	-0.39
X2	Reported Height	88	66.15	2.54	61.00	73.00	0.06	-0.38
X4	Reported Chest Size Number	86	35.56	1.34	34.00	40.00	0.56	0.32
X5	Stature	89	1662.01	62.57	1533.00	1828.00	0.04	-0.45
X6	Cervicale Ht	89	1423.01	57.33	1282.00	1570.00	-0.02	-0.42
X7	Acromial Ht	89	1359.75	58.74	1209.00	1513.00	-0.03	-0.40
X8	Waist Back Ht Nat	88	1058.75	49.77	948.00	1198.00	0.12	-0.48
X9	Waist Front Ht Nat	88	1044.77	50.42	926.00	1163.00	-0.01	-0.57
X10	Crotch Ht	89	769.88	42.08	677.00	896.00	0.26	-0.08
X11	Biacromial Br	89	373.65	15.35	328.00	414.00	0.28	0.61
X12	Shoulder Circ	89	1036.38	45.15	942.00	1172.00	0.51	-0.04
X13	Chest Circ	89	942.12	57.39	837.00	1147.00	0.91	1.10
X14	Waist Circ	88	726.68	50.37	638.00	885.00	0.74	0.35
X15	Hip Circ Max	89	1001.73	54.77	899.00	1137.00	0.27	-0.56
X16	Hip Ht Max	89	813.66	43.82	680.00	944.00	0.07	0.71
X17	Wrist Circ	89	150.26	5.84	137.00	168.00	0.14	0.43
X18	Sleeve Lt: Sp-Wrist	89	817.31	31.02	756.00	902.00	0.27	-0.28
X19	Biceps Circ	89	283.53	19.96	238.00	331.00	0.12	-0.20
X20	Waist Back Lth Nat	88	382.40	20.98	335.00	429.00	0.05	-0.41
X21	Waist Front Lth Nat	88	340.40	25.82	279.00	410.00	0.35	0.42
X22	Crotch Lth Total Nat	88	713.13	43.25	626.00	822.00	0.34	-0.17
X23	Crotch Lth Back Nat	88	378.52	26.61	318.00	451.00	0.24	0.18
X24	Thigh Circ	89	595.10	41.96	511.00	681.00	0.17	-0.91
X25	Crotch Ht Adj	89	779.88	42.08	687.00	906.00	0.26	-0.08
X28	Rise Inches	88	10.39	0.87	8.40	12.40	-0.03	-0.36

APPENDIX C
STATISTICAL COMPARISON OF AIR FORCE AND NAVY ANTHROPOMETRY

Univariate Analyses of Variance

Dependent Variable: N1 Reported Weight

Source	DF	Sum of Squares	Mean 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

Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	12.8505502	12.8505502	0.06	0.8142

Dependent Variable: N2 Acromial 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

Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	3.99624837	3.99624837	0.79	0.3744

Dependent Variable: N3 Biacromial 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 Cervicale 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

Dependent Variable: N5 Chest Circ

Source	DF	Sum of Squares	Mean 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	1	8.60836767	8.60836767	1.36	0.2449

Dependent Variable: N6 Crotch Ht

Source	DF	Sum of Squares	Mean 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 Variable: N7 Hip Circ Max

Source	DF	Sum of Squares	Mean 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			

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 Variable: N8 Hip Ht Max

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	6.04613266	6.04613266	1.97	0.1628
Error	158	485.73820983	3.07429247		
Corrected Total	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

Dependent Variable: N9 Shoulder Circ

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	1.54100728	1.54100728	0.38	0.5392
Error	158	642.92258988	4.06913032		
Corrected Total	159	644.46359716			

R-Square	C.V.	Root MSE	N9 Mean
0.002391	4.933268	2.01721	40.8899

Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	1.54100728	1.54100728	0.38	0.5392

Dependent Variable: N10 Sleeve Lt: Sp-Wrist

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	19.7091788	19.7091788	12.57	0.0005
Error	158	247.7884625	1.5682814		
Corrected Total	159	267.4976414			

R-Square	C.V.	Root MSE	N10 Mean
0.073680	3.930029	1.25231	31.8652

Source	DF	Type IV SS	Mean Square	F Value	Pr > F
SURVEY	1	19.7091788	19.7091788	12.57	0.0005

Dependent Variable: N11 Stature

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	6.65428328	6.65428328	1.14	0.2870

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 Thigh Circ

Source	DF	Sum of Squares	Mean 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	(Reported Weight)	0.02061864	(Acromial Height)
0.07054901	(Biacromial Breadth)	0.08818974	(Cervicale Height)
0.01707785	(Chest Circ)	-0.01722315	(Crotch Height)
-0.02426893	(Hip Circ Max)	0.01062900	(Hip Height Max)
-0.04209579	(Shoulder Circ)	0.08126173	(Sleeve L: Sp-Wrist)
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 Percent: 64.97

First Eigenvector V'EV=1:

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

Second Eigenvalue: 1.04504501 Percent: 17.94

Second Eigenvector V'EV=1:

0.01270305	(Reported Weight)	0.00312334	(Stature)
-0.00828320	(Cervicale Ht)	0.00340687	(Acromial Ht)
-0.00770759	(Waist Back Ht Nat)	0.00393786	(Waist Front Ht Nat)
0.00937367	(Crotch Ht)	0.00704188	(Biacromial Br)
-0.00254931	(Shoulder Circ)	-0.00115679	(Chest Circ)
0.00438224	(Waist Circ Nat)	-0.00284226	(Hip Circ Max)
-0.00180029	(Hip Ht Max)	0.00945981	(Wrist Circ)
-0.00300711	(Sleeve Lth)	-0.00077579	(Biceps Circ)
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)
-0.00035314	(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)		

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

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

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

Backward Elimination: Step 0

All variables have been entered

Multivariate Statistics

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

Average Squared Canonical Correlation = 0.41071057

Backward Elimination: Step 1

Statistics for Removal, DF = 5, 53

Variable	Partial 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
		Prob > F = 0.0001	
Pillai's Trace =	2.046541	F(100, 290) =	2.009
		Prob > F = 0.0001	

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 be included

The Method for Selecting Variables will be: BACKWARD

Significance Level to Stay = 0.1500

Class Level Information

SZLETTER	Frequency	Weight	Proportion
L	8	8.0000	0.101266
R	42	42.0000	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

Variable	Partial 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:
X9

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 Correlation Matrix: Total = 21 Average = 1

	1	2	3	4	5
Eigenvalue	8.4781	5.7058	1.4958	1.1977	0.9620
Difference	2.7723	4.2100	0.2981	0.2358	0.2641
Proportion	0.4037	0.2717	0.0712	0.0570	0.0458
Cumulative	0.4037	0.6754	0.7467	0.8037	0.8495

	6	7	8	9	10
Eigenvalue	0.6979	0.5663	0.3881	0.3587	0.2934
Difference	0.1316	0.1782	0.0294	0.0653	0.0673
Proportion	0.0332	0.0270	0.0185	0.0171	0.0140
Cumulative	0.8827	0.9097	0.9282	0.9453	0.9592

	11	12	13	14	15
Eigenvalue	0.2261	0.1396	0.1248	0.1095	0.0904
Difference	0.0865	0.0149	0.0152	0.0191	0.0427
Proportion	0.0108	0.0066	0.0059	0.0052	0.0043
Cumulative	0.9700	0.9766	0.9826	0.9878	0.9921

	16	17	18	19	20
Eigenvalue	0.0478	0.0440	0.0296	0.0239	0.0143
Difference	0.0037	0.0145	0.0057	0.0096	0.0082
Proportion	0.0023	0.0021	0.0014	0.0011	0.0007
Cumulative	0.9944	0.9965	0.9979	0.9990	0.9997

	21
Eigenvalue	0.0061
Difference	
Proportion	0.0003
Cumulative	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	0.28216	0.77683	0.48033	0.10584	Reported Weight
X5	0.94233	0.11873	0.07347	0.23962	Stature
X6	0.95251	0.12237	0.05107	0.24558	Cervicale Ht
X7	0.91549	0.08763	0.06196	0.22092	Acromial Ht
X8	0.95862	0.16027	0.09119	-0.06862	Waist Back Ht Nat
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

FACTOR1	FACTOR2	FACTOR3	FACTOR4
7.444830	4.599481	3.515041	1.318155

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	L R S

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

Statistic	Value	F	Num DF	Den DF	Pr > F
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 Breadth)	-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

Statistic	Value	F	Num DF	Den DF	Pr > F

Wilks' Lambda	0.46021292	2.2124	24	112	0.0029
Pillai's Trace	0.58626154	1.9698	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)
-0.11889356	(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	0.40679809	0.9389	60	266.0044	0.6052
Pillai's Trace	0.79639314	0.9473	60	300	0.5887

APPENDIX I
AIR FORCE: ANTHROPOMETRY AND EIGENVECTOR CORRELATION

Air Force Flight Suit Females

Correlation Analysis
Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 72

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

Class Level Information

C3	Frequency	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 = 0.03059292 F(96, 284) = 2.520 Prob > F = 0.0001
Pillai's Trace = 1.909869 F(96, 324) = 1.576 Prob > F = 0.0019

Average Squared Canonical Correlation = 0.31831147

Backward Elimination: Step 1

Statistics for Removal, DF = 6, 49

Variable	Partial 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:
X8

Multivariate Statistics
Wilks' Lambda = 0.03109911 F(90, 288) = 2.730 Prob > F = 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

	1	2	3	4	5
Eigenvalue	17.7127	5.4467	1.6050	1.4751	0.7538
Difference	12.2661	3.8417	0.1298	0.7214	0.2117
Proportion	0.5904	0.1816	0.0535	0.0492	0.0251
Cumulative	0.5904	0.7720	0.8255	0.8747	0.8998

	6	7	8	9	10
Eigenvalue	0.5420	0.5313	0.4066	0.3002	0.2200
Difference	0.0107	0.1248	0.1063	0.0803	0.0371
Proportion	0.0181	0.0177	0.0136	0.0100	0.0073
Cumulative	0.9178	0.9356	0.9491	0.9591	0.9664

	11	12	13	14	15
Eigenvalue	0.1828	0.1290	0.1056	0.0988	0.0895
Difference	0.0539	0.0234	0.0068	0.0093	0.0165
Proportion	0.0061	0.0043	0.0035	0.0033	0.0030
Cumulative	0.9725	0.9768	0.9804	0.9837	0.9866

	16	17	18	19	20
Eigenvalue	0.0731	0.0595	0.0551	0.0532	0.0391
Difference	0.0136	0.0043	0.0020	0.0141	0.0074
Proportion	0.0024	0.0020	0.0018	0.0018	0.0013
Cumulative	0.9891	0.9911	0.9929	0.9947	0.9960

	21	22	23	24	25
Eigenvalue	0.0316	0.0226	0.0176	0.0119	0.0105
Difference	0.0090	0.0050	0.0057	0.0013	0.0025
Proportion	0.0011	0.0008	0.0006	0.0004	0.0004
Cumulative	0.9970	0.9978	0.9984	0.9988	0.9991

	26	27	28	29	30
Eigenvalue	0.0080	0.0071	0.0047	0.0038	0.0030
Difference	0.0009	0.0024	0.0009	0.0008	
Proportion	0.0003	0.0002	0.0002	0.0001	0.0001
Cumulative	0.9994	0.9996	0.9998	0.9999	1.0000

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	0.86117	-0.24362	0.20901	0.16446	SLEEVE LTH TOTAL
X15	0.80442	-0.43681	0.19146	-0.00445	SLEEVE OUTSEAM
X16	0.71957	-0.51335	0.13007	0.06086	SLEEVE INSEAM
X17	0.91531	-0.34407	-0.12917	0.05880	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

Orthogonal Transformation Matrix

	1	2	3	4
1	0.73040	0.52758	0.32708	0.28493
2	-0.61994	0.71830	-0.04636	0.31238
3	0.23154	0.40622	-0.67198	-0.57431
4	-0.16906	0.20173	0.66281	-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
X3	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

X15	0.90343	0.18752	0.15176	-0.01408	SLEEVE OUTSEAM
X16	0.86365	0.07601	0.21209	-0.07269	SLEEVE INSEAM
X17	0.84199	0.19515	0.44110	0.18629	STATURE
X18	0.86284	0.22262	0.40519	0.14227	CERVICALE HT
X19	0.86768	0.22919	0.33693	0.17698	ACROMION HT
X20	0.86823	0.17769	0.40490	0.17605	NECK HT
X21	0.92638	0.04505	0.23546	0.12195	WAIST HT OMPH
X22	0.90600	-0.03336	0.12062	0.28576	WAIST HT PREFER
X23	0.94708	0.11790	0.04573	0.03579	CROTCH HT
X24	0.35730	0.64509	0.36641	-0.02784	BIACROMIAL BR
X25	0.46484	0.17187	0.78946	0.28707	SITTING HT
X26	0.44527	0.15709	0.79985	0.31014	EYE HT SIT
X27	0.91747	0.21357	0.08919	0.13033	KNEE HT SIT
X28	0.75050	0.47372	0.04158	0.31933	BUTT-KNEE LTH (ANSUR)
X29	0.74359	0.48495	0.02463	0.32531	BUTT-KNEE LTH (AF)
X30	0.22820	0.88193	0.15562	0.11546	BIDELTOID BR

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	L R S

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)	-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

MEAFFS Pattern	SIZES								
Measurements (in)	32S	34S	36S	38S	40S	42S	44S	46S	
Torso Neckline (Front)	5 1/8	5 3/8	5 3/8	5 6/8	not available				
Torso Neckline (Back)	6 5/8	7	7 2/8	7 4/8	not 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 available	29 5/8	30 1/8		
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 available	29 2/8	30 3/8		
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				
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	8	8 3/8	8 5/8*	8 7/8*	9 1/8	9*	
Sleeve Cuff (Top)	9	9	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	

MEAFFS 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 (Front)	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
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	

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 available	
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

MEAFFS Pattern Measurements (in)	34S - 32S	36S - 34S	38S - 36S	40S - 38S	42S - 40S
Sleeve Inseam (Bottom)	2/8	1/8	3/8	1/8	3/8
Sleeve Back Seam (Top)	1/8	1/8	1/8	0	0
Sleeve Back Seam (Bottom)	1/8	0	1/8	-1/8	2/8

MEASUREMENTS FOR SIZES OF LENGTH R

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

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

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

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

CHANGE BETWEEN SIZES OF LENGTH R

MEAFFS Pattern Measurements (in)	34R - 32R	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	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	

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

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

MEASUREMENTS FOR SIZES OF LENGTH L

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

MEAFFS Pattern Measurements (in)	SIZES								
			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)			8	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	9 7/8
Sleeve Cuff (Bottom)			6 3/8	6 2/8	6 4/8	6 4/8	6 4/8	6 5/8	6 6/8
Sleeve Inseam (Top)			25 7/8	26 1/8	26 2/8	26 3/8	26 5/8	26 7/8	27 3/8

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

* Measured the longest point on the pattern

CHANGE BETWEEN SIZES OF LENGTH L

MEAFFS Pattern 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	7/8	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				

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

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

CHANGE BETWEEN LENGTHS FOR EACH SIZE

MEAFFS Pattern Measurements (in)	SIZES							
	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

MEAFFS Pattern Measurements (in)	SIZES							
	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 Measurements (in)	SIZES							
	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 (Bottom)	1 1/8	1 1/8	6/8	1	not available	1	1	not available
Sleeve Back Seam (Top)	1	7/8	1	1 1/8	not available	1	1	not available
Sleeve Back Seam (Bottom)	1 1/8	1 1/8	1 1/8	1 1/8	not available	1	1	not available

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.

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.

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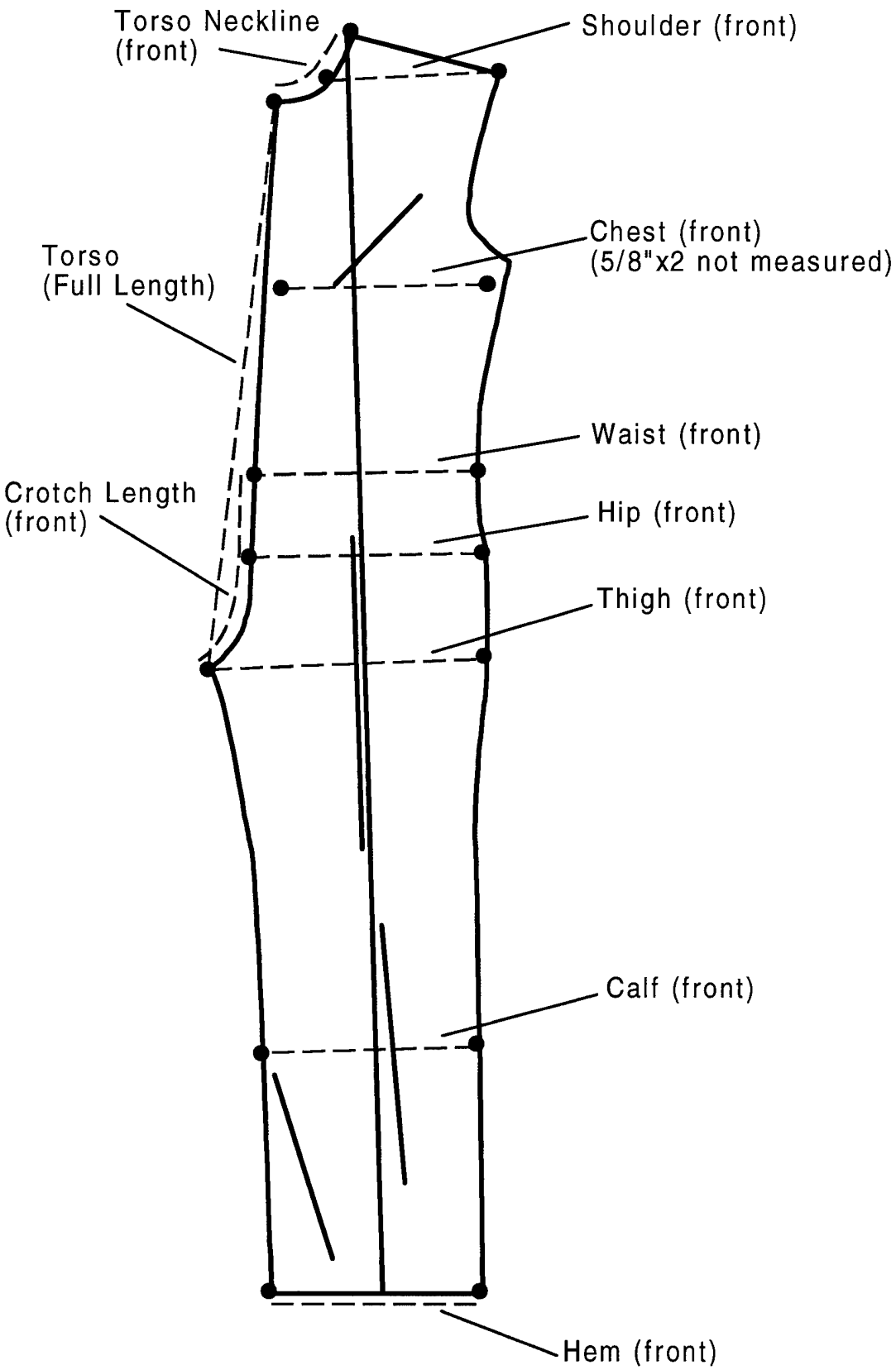
[1] There were no "points" on a few of the sleeve patterns. When that occurred the measurements were taken to the longest part of the sleeve length near that edge.

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.

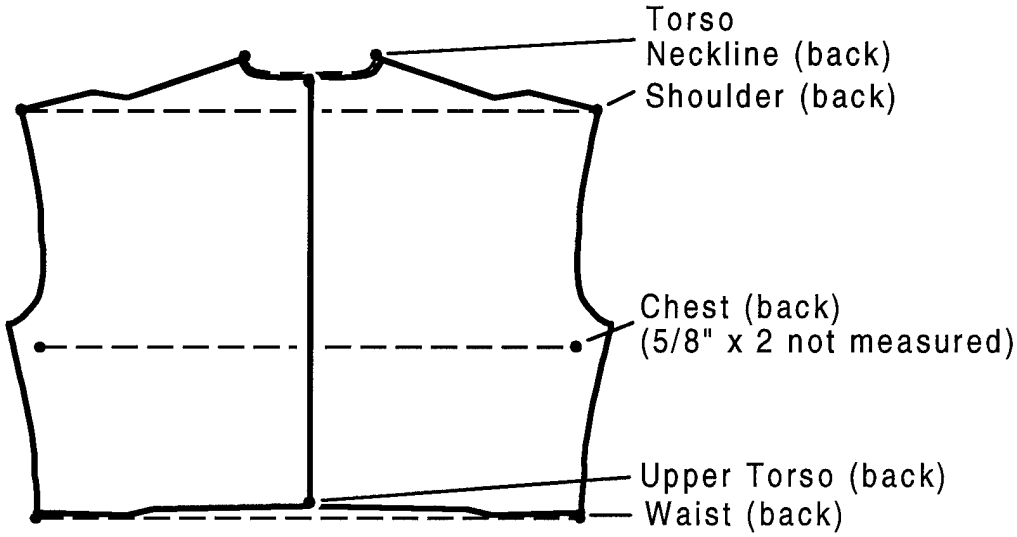
Waist (front): On the full-length pattern, measure from the waist mark on the left side of the pattern to the waist mark on the right side of the pattern. *Note:* There is no waist mark on the full-length pattern. See **Crotch length (front)** for instructions on finding and marking the waist point.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

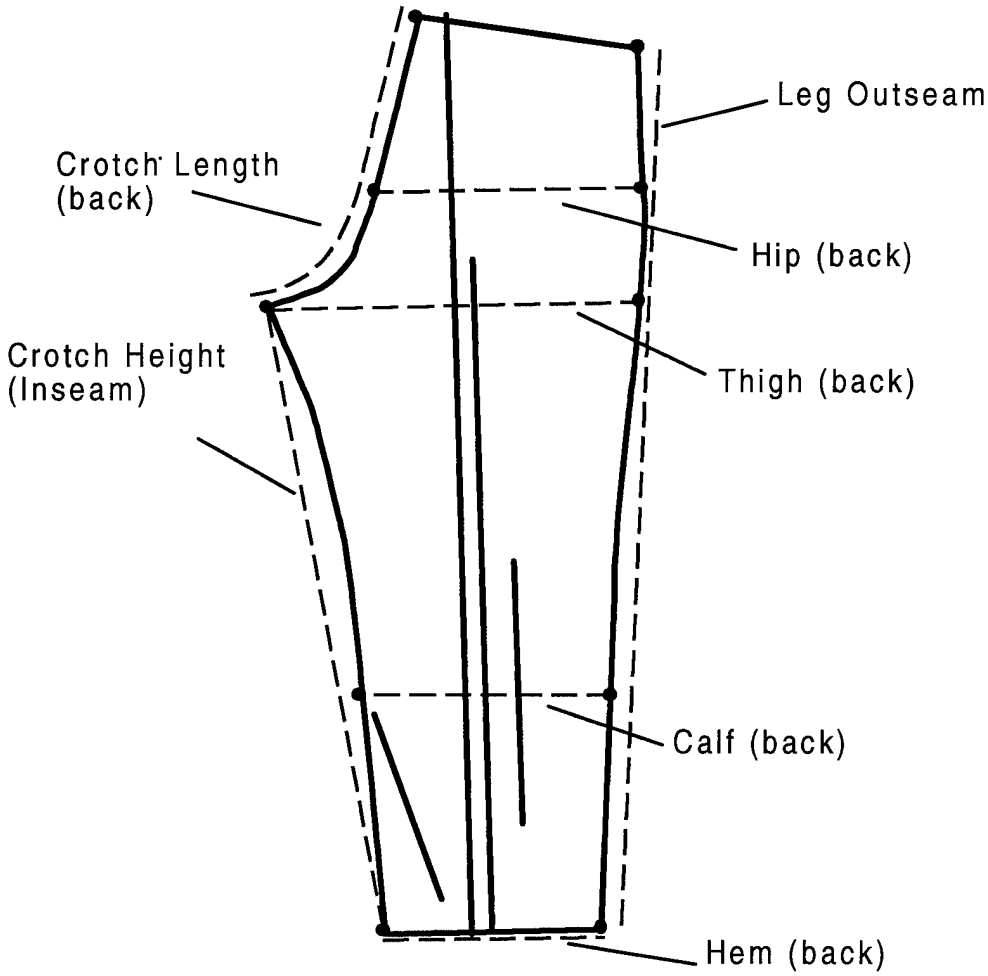
FULL FRONT PATTERN



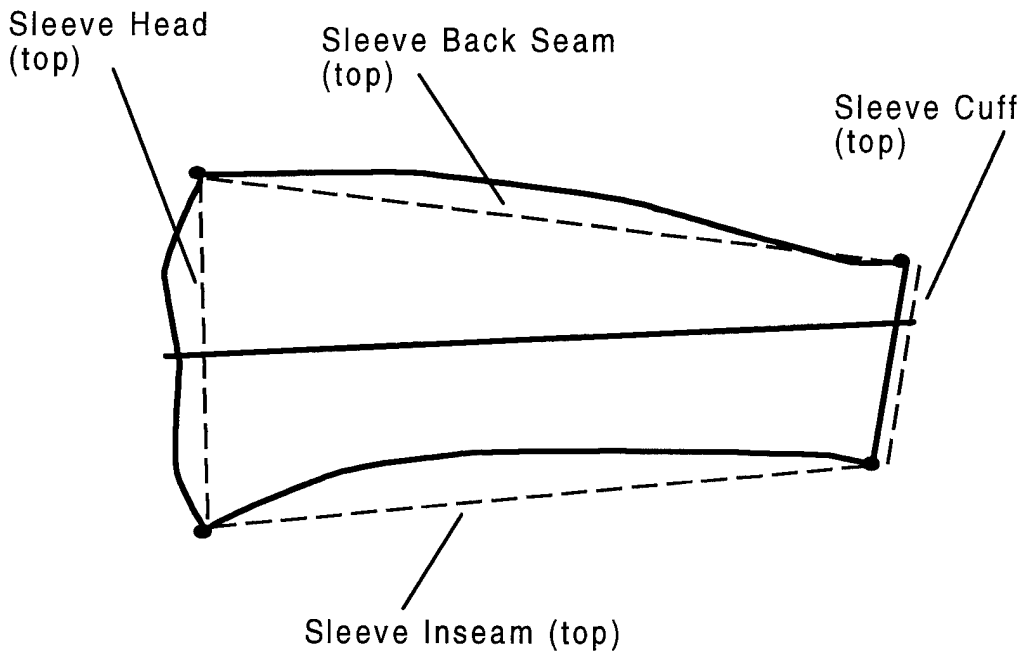
UPPER BACK PATTERN



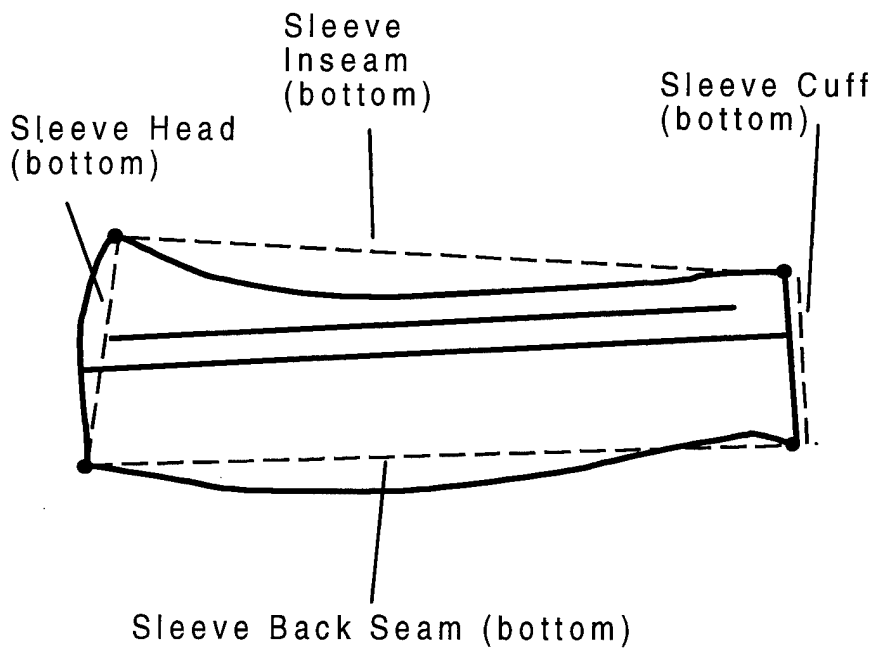
BACK LEG PATTERN



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.

TOTAL GROWTH BETWEEN SIZES FOR CURRENT PATTERNS						
	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.
[3] Rise is computed by subtracting Leg Inseam from Leg Outseam.

TOTAL GROWTH BETWEEN SIZES FOR CURRENT PATTERNS						
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

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

TOTAL GROWTH BETWEEN LENGTHS FOR CURRENT PATTERNS				
	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 (Top)	1	22 1/2	23 1/2	24 1/2
Sleeve Back	1	22 7/8	23 7/8	24 7/8

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

---------- Best Fit Size Number=34 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight	4.00	20.67	23.62	21.56	20.67	21.85	1.45
Upper Thigh Circ	4.00	18.50	19.92	18.96	18.50	19.08	0.60
Buttock Circ	4.00	33.23	34.72	34.00	33.23	33.99	0.83
Hip Circ Max	4.00	32.87	34.84	34.04	32.87	33.95	1.02
Hip Ht	4.00	31.89	35.71	34.41	31.89	34.10	1.65
Neck Circ	4.00	14.49	15.20	15.18	15.20	15.01	0.35
Shoulder Circ	4.00	38.98	41.26	40.35	38.98	40.24	1.11
Chest Circ	4.00	32.13	34.84	34.31	32.13	33.90	1.27
Waist Circ Omph	4.00	28.54	29.45	28.76	28.54	28.88	0.42
Waist Circ Pref	4.00	28.50	29.96	29.13	28.50	29.18	0.68
Waist Back	4.00	17.24	19.09	17.68	17.24	17.92	0.81
Crotch Lth	4.00	22.64	24.84	23.43	22.64	23.58	1.02
VTC	4.00	58.62	65.16	60.41	58.62	61.15	2.81
Sleeve Lth Tot	4.00	31.34	33.78	33.27	31.34	32.91	1.14
Sleeve Outseam	4.00	21.81	23.46	22.58	21.81	22.61	0.76
Sleeve Inseam	4.00	16.42	19.25	18.25	16.42	18.04	1.19
Stature	4.00	65.51	69.72	66.77	65.51	67.19	1.79
Cervicale Ht	4.00	56.22	59.96	56.97	56.22	57.53	1.70
Acromion Ht	4.00	53.11	58.27	54.37	53.11	55.03	2.24
Neck Ht	4.00	53.46	58.31	54.74	53.46	55.31	2.10
Waist Ht Omph	4.00	38.98	43.07	40.31	38.98	40.67	1.73
Waist Ht Pref	4.00	38.31	40.59	39.29	38.31	39.37	1.00
Crotch Ht	4.00	30.20	33.66	31.91	30.20	31.92	1.41
Biacromial Br	4.00	14.65	15.20	14.90	14.65	14.91	0.23
Sitting Ht	4.00	34.96	36.14	35.53	34.96	35.54	0.49
Eye Ht Sitting	4.00	30.20	31.18	30.87	30.87	30.78	0.41
Knee Ht Sitting	4.00	19.96	21.61	20.30	19.96	20.54	0.73
Butt-Knee L (ANSU	4.00	22.28	23.54	22.91	22.28	22.91	0.64
Butt-Knee L (AF)	4.00	22.17	23.58	22.87	22.17	22.87	0.71
Bideltoid Br	4.00	16.81	17.17	16.97	16.81	16.98	0.16
Reported Weight	4.00	120.00	135.00	127.50	120.00	127.50	6.45

---------- Best Fit Size Number=36 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight	39.00	22.05	29.72	25.79	25.98	25.77	1.85
Upper Thigh Circ	39.00	18.90	23.98	21.26	20.51	21.12	1.06
Buttock Circ	39.00	33.15	39.17	36.38	37.99	36.48	1.38
Hip Circ Max	39.00	33.39	39.53	36.65	35.63	36.54	1.37
Hip Ht	39.00	31.18	37.36	33.66	32.68	33.89	1.60
Neck Circ	39.00	14.65	17.36	15.51	15.79	15.58	0.58
Shoulder Circ	39.00	39.96	46.26	43.66	44.53	43.63	1.26
Chest Circ	39.00	32.80	38.39	36.46	34.84	36.26	1.41
Waist Circ Omph	39.00	27.83	34.53	30.71	29.96	31.09	1.72
Waist Circ Pref	39.00	28.82	34.72	30.51	30.35	30.98	1.49
Waist Back	39.00	16.50	20.94	18.27	17.01	18.26	1.04
Crotch Lth	39.00	21.06	26.73	24.21	23.62	24.27	1.32
VTC	39.00	58.66	68.62	62.52	62.52	62.55	2.09
Sleeve Lth Tot	39.00	31.89	35.63	33.90	31.89	33.78	1.06
Sleeve Outseam	39.00	20.63	24.96	22.87	21.61	22.81	0.93
Sleeve Inseam	39.00	16.73	20.39	18.23	16.73	18.19	0.83
Stature	39.00	63.27	72.64	67.83	65.63	67.88	2.40
Cervicale Ht	39.00	54.29	62.48	58.31	57.24	58.29	2.12
Acromion Ht	39.00	50.83	60.16	55.12	55.67	55.35	2.10
Neck Ht	39.00	51.69	60.43	55.75	55.51	55.94	2.17
Waist Ht Omph	39.00	37.72	44.65	40.59	40.59	40.94	1.75
Waist Ht Pref	39.00	36.02	43.54	39.37	40.79	39.47	1.90

Crotch Ht	39.00	28.82	35.67	31.77	32.44	31.91	1.49
Biacromial Br	39.00	14.17	16.54	15.59	15.87	15.52	0.57
Sitting Ht	23.00	33.23	37.95	35.63	33.23	35.54	1.31
Eye Ht Sitting	23.00	28.90	32.87	31.06	31.06	30.86	1.24
Knee Ht Sitting	23.00	19.72	22.76	21.18	21.38	21.19	0.72
Butt-Knee L (ANSU	23.00	22.05	25.71	23.43	23.39	23.46	0.82
Butt-Knee L (AF)	23.00	22.13	25.51	23.43	23.58	23.39	0.79
Bideltoid Br	23.00	17.28	19.25	18.35	17.76	18.34	0.48
Reported Weight	39.00	125.00	170.00	145.00	145.00	147.08	10.00

---------- Best Fit Size Number=38 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight	117.00	24.41	33.27	28.74	29.13	28.63	1.72
Upper Thigh Circ	120.00	20.04	24.92	22.42	22.05	22.41	1.00
Buttock Circ	120.00	35.04	40.94	38.17	37.60	38.17	1.23
Hip Circ Max	120.00	35.04	41.38	38.58	38.98	38.44	1.27
Hip Ht	120.00	29.76	37.40	34.07	33.98	33.95	1.52
Neck Circ	120.00	14.65	18.31	16.10	15.55	16.08	0.65
Shoulder Circ	120.00	41.81	48.94	45.53	45.35	45.39	1.49
Chest Circ	120.00	33.78	42.13	38.09	37.20	38.10	1.56
Waist Circ Omph	120.00	29.33	37.32	33.46	35.43	33.32	1.85
Waist Circ Pref	120.00	29.33	36.42	33.17	31.89	33.07	1.69
Waist Back	120.00	14.45	20.63	18.82	18.90	18.77	1.00
Crotch Lth	120.00	20.67	28.15	24.74	25.28	24.77	1.53
VTC	120.00	58.23	68.31	64.33	62.80	64.30	1.74
Sleeve Lth Tot	120.00	31.06	36.61	34.41	34.06	34.30	1.01
Sleeve Outseam	120.00	20.00	25.28	23.11	23.23	23.03	0.90
Sleeve Inseam	120.00	15.75	20.08	18.21	17.87	18.17	0.84
Stature	120.00	63.94	73.62	68.46	68.03	68.60	1.91
Cervicale Ht	120.00	54.21	63.35	58.94	57.68	58.86	1.82
Acromion Ht	120.00	51.57	60.87	55.89	56.30	55.90	1.85
Neck Ht	120.00	52.64	60.71	56.61	56.61	56.56	1.73
Waist Ht Omph	120.00	36.97	44.76	41.28	42.01	41.26	1.53
Waist Ht Pref	120.00	35.08	42.87	39.49	38.62	39.51	1.70
Crotch Ht	120.00	28.03	35.20	32.07	31.97	32.07	1.41
Biacromial Br	120.00	14.61	17.60	16.06	16.10	16.00	0.64
Sitting Ht	84.00	33.66	38.62	36.12	34.80	36.19	1.12
Eye Ht Sitting	84.00	29.21	33.74	31.54	31.38	31.49	1.05
Knee Ht Sitting	84.00	19.29	23.11	21.57	20.79	21.48	0.81
Butt-Knee L (ANSU	84.00	22.20	25.91	23.90	22.44	23.87	0.86
Butt-Knee L (AF)	84.00	22.13	25.63	23.86	23.07	23.84	0.84
Bideltoid Br	84.00	17.80	20.35	18.94	18.23	18.99	0.66
Reported Weight	118.00	135.00	190.00	163.50	165.00	162.01	9.80

---------- Best Fit Size Number=40 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight	128.00	27.76	37.20	31.10	33.07	31.46	1.86
Upper Thigh Circ	131.00	20.94	27.17	23.35	24.02	23.45	1.15
Buttock Circ	131.00	36.34	43.39	39.41	38.78	39.52	1.37
Hip Circ Max	131.00	36.30	43.82	39.69	38.58	39.72	1.46
Hip Ht	131.00	31.34	38.70	34.53	31.54	34.62	1.57
Neck Circ	131.00	15.04	18.03	16.46	16.54	16.43	0.56
Shoulder Circ	131.00	43.70	50.59	46.65	46.81	46.74	1.54
Chest Circ	131.00	35.47	44.45	39.45	38.19	39.59	1.70
Waist Circ Omph	131.00	29.53	39.69	35.24	35.28	35.05	2.19
Waist Circ Pref	131.00	30.04	38.94	34.84	35.04	34.71	2.00
Waist Back	131.00	16.22	21.73	19.29	19.88	19.22	1.04
Crotch Lth	131.00	21.85	29.25	25.55	24.33	25.45	1.47
VTC	131.00	62.09	71.81	65.94	67.72	66.20	2.16
Sleeve Lth Tot	131.00	31.57	37.09	34.84	33.86	34.81	1.14
Sleeve Outseam	131.00	21.46	26.34	23.31	23.23	23.35	0.94
Sleeve Inseam	131.00	16.42	20.79	18.27	19.02	18.33	0.91
Stature	131.00	65.31	74.80	69.96	70.63	69.82	2.00
Cervicale Ht	131.00	55.87	65.24	60.24	60.16	60.05	1.87
Acromion Ht	131.00	52.95	61.26	57.09	57.28	57.08	1.82

Neck Ht	131.00	53.54	62.20	57.68	57.44	57.68	1.76
Waist Ht Omph	131.00	38.03	46.42	41.85	40.47	41.92	1.66
Waist Ht Pref	131.00	35.91	44.13	39.92	40.31	40.03	1.73
Crotch Ht	131.00	28.58	36.26	32.44	31.73	32.49	1.60
Biacromial Br	131.00	14.49	18.46	16.26	16.54	16.21	0.62
Sitting Ht	85.00	34.02	39.37	36.93	37.60	36.78	1.16
Eye Ht Sitting	85.00	29.49	34.49	32.05	31.30	31.97	1.11
Knee Ht Sitting	85.00	20.16	23.82	21.77	21.26	21.84	0.81
Butt-Knee L (ANSU	85.00	22.40	26.26	24.17	23.23	24.25	0.84
Butt-Knee L (AF)	85.00	22.28	26.22	24.21	23.70	24.23	0.83
Bideltoid Br	85.00	18.15	21.85	19.57	19.72	19.63	0.71
Reported Weight	128.00	160.00	207.00	175.50	170.00	177.63	9.65

---------- Best Fit Size Number=42 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight	75.00	29.92	39.96	35.04	35.24	34.86	2.11
Upper Thigh Circ	75.00	22.24	27.64	24.61	24.61	24.61	1.25
Buttock Circ	75.00	37.76	44.61	41.46	40.55	41.36	1.50
Hip Circ Max	75.00	37.95	44.88	41.73	40.75	41.59	1.60
Hip Ht	75.00	31.34	39.96	34.96	34.57	35.15	1.72
Neck Circ	75.00	15.59	18.31	16.97	17.13	16.89	0.61
Shoulder Circ	75.00	45.75	52.05	47.91	46.65	48.11	1.35
Chest Circ	75.00	37.01	44.88	41.61	40.39	41.48	1.54
Waist Circ Omph	75.00	32.56	41.73	37.76	38.98	37.57	1.98
Waist Circ Pref	75.00	33.19	41.85	37.17	38.19	37.10	1.92
Waist Back	75.00	16.81	21.77	19.45	19.80	19.39	1.06
Crotch Lth	75.00	23.27	30.91	26.54	25.39	26.62	1.73
VTC	75.00	63.78	73.82	68.39	67.91	68.29	1.94
Sleeve Lth Tot	75.00	32.48	38.27	35.51	34.41	35.47	1.19
Sleeve Outseam	75.00	21.22	25.59	24.06	23.39	23.84	1.01
Sleeve Inseam	75.00	16.02	20.71	18.66	18.39	18.58	1.01
Stature	75.00	65.16	76.69	70.83	68.90	70.69	2.53
Cervicale Ht	75.00	56.14	66.61	60.71	60.39	60.93	2.30
Acromion Ht	75.00	53.15	62.44	58.19	56.57	58.04	2.21
Neck Ht	75.00	52.99	64.13	58.46	54.80	58.60	2.29
Waist Ht Omph	75.00	37.13	47.83	42.17	41.89	42.32	2.11
Waist Ht Pref	75.00	34.88	45.35	40.55	40.28	40.45	2.00
Crotch Ht	75.00	27.95	37.32	32.87	32.13	32.90	1.77
Biacromial Br	75.00	15.00	17.83	16.46	16.14	16.42	0.63
Sitting Ht	45.00	34.65	39.76	36.97	35.98	37.19	1.23
Eye Ht Sitting	45.00	30.04	34.84	32.20	30.63	32.31	1.18
Knee Ht Sitting	45.00	19.41	24.84	22.24	21.73	22.27	0.95
Butt-Knee L (ANSU	45.00	22.40	27.09	25.00	25.16	24.98	0.88
Butt-Knee L (AF)	45.00	22.56	26.97	25.00	24.02	24.99	0.84
Bideltoid Br	45.00	18.86	21.93	20.04	19.84	20.13	0.61
Reported Weight	74.00	165.00	221.00	194.00	190.00	193.08	12.58

---------- Best Fit Size Number=44 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Weight	29.00	33.27	41.73	37.40	37.20	37.62	1.99
Upper Thigh Circ	29.00	23.31	27.68	25.28	24.45	25.54	1.23
Buttock Circ	29.00	39.09	46.93	42.64	42.64	42.73	1.46
Hip Circ Max	29.00	39.49	47.32	42.68	43.50	42.74	1.40
Hip Ht	29.00	32.60	38.43	36.42	37.05	35.85	1.49
Neck Circ	29.00	15.35	19.06	17.09	16.10	17.00	0.78
Shoulder Circ	29.00	44.17	53.31	49.53	47.76	49.64	1.79
Chest Circ	29.00	39.45	46.26	43.39	41.93	43.08	1.82
Waist Circ Omph	29.00	35.08	43.66	39.76	40.04	39.67	1.99
Waist Circ Pref	29.00	35.08	42.20	39.49	40.55	39.20	1.83
Waist Back	29.00	16.97	21.65	19.49	21.50	19.64	1.20
Crotch Lth	29.00	24.45	30.87	27.09	25.04	27.29	1.65
VTC	29.00	64.13	74.09	70.08	70.08	69.85	2.08
Sleeve Lth Tot	29.00	33.03	38.82	35.87	35.55	35.95	1.36
Sleeve Outseam	29.00	22.28	26.02	24.45	24.06	24.30	1.06
Sleeve Inseam	29.00	16.10	20.83	18.74	17.40	18.80	1.06

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
Eye 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

---------- Best Fit Size Number=46 ----------

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

---------- Best Fit Size Number=48 ----------

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
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	2.00	35.16	37.60	36.38	35.16	36.38	1.73
Sleeve Outseam	2.00	23.07	25.31	24.19	23.07	24.19	1.59
Sleeve Inseam	2.00	16.97	19.45	18.21	16.97	18.21	1.75
Stature	2.00	70.20	71.97	71.08	70.20	71.08	1.25
Cervicale Ht	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

---------- BEST FIT SIZE NUMBER=32 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	4.00	48.07	54.06	50.96	48.07	51.01	2.49
Biacromial	4.00	13.07	14.76	13.98	13.07	13.95	0.71
Cervicale H	4.00	50.83	56.89	53.35	50.83	53.60	2.65
Chest Circ	4.00	32.48	34.61	33.54	32.48	33.54	1.04
Crotch Ht	4.00	27.13	30.87	29.69	27.13	29.34	1.60
Hip Circ Ma	4.00	34.02	37.52	34.92	34.02	35.34	1.51
Hip Ht Max	4.00	28.11	33.27	30.26	28.11	30.47	2.19
Shoulder Ci	4.00	36.69	39.13	38.31	36.69	38.11	1.09
Sleeve Lth	4.00	28.50	32.80	30.02	28.50	30.33	1.81
Stature	4.00	60.16	66.26	62.42	60.16	62.81	2.74
Thigh Circ	4.00	19.17	21.89	20.18	19.17	20.35	1.19
Waist Circ,	4.00	25.12	27.99	26.67	25.12	26.61	1.30

---------- BEST FIT SIZE NUMBER=34 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	10.00	50.79	54.84	53.13	50.79	53.22	1.20
Biacromial	10.00	13.46	15.00	14.31	14.17	14.34	0.51
Cervicale H	10.00	52.87	57.09	55.43	52.87	55.48	1.33
Chest Circ	10.00	31.50	38.78	35.78	31.50	35.53	2.22
Crotch Ht	10.00	28.74	32.64	30.49	28.74	30.45	1.24
Hip Circ Ma	10.00	35.08	40.87	37.54	35.08	37.72	1.59
Hip Ht Max	10.00	29.88	32.87	31.50	31.50	31.42	1.02
Shoulder Ci	10.00	37.20	42.76	40.55	40.55	40.38	1.46
Sleeve Lth	10.00	30.35	33.03	31.34	30.35	31.58	0.80
Stature	10.00	61.61	67.44	65.02	64.33	64.98	1.67
Thigh Circ	10.00	19.65	24.09	22.13	23.15	22.22	1.19
Waist Circ,	10.00	25.47	30.12	28.84	29.53	28.57	1.29

---------- BEST FIT SIZE NUMBER=36 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	15.00	50.12	56.42	52.91	50.12	53.13	1.77
Biacromial	15.00	13.94	15.55	14.60	14.09	14.54	0.45
Cervicale H	15.00	52.05	59.37	55.71	52.05	55.76	2.02
Chest Circ	15.00	34.84	40.35	36.65	36.65	36.75	1.42
Crotch Ht	15.00	28.82	33.35	30.71	28.82	30.82	1.66
Hip Circ Ma	15.00	37.01	39.88	38.74	37.01	38.61	0.86
Hip Ht Max	15.00	29.17	34.80	31.10	29.60	31.69	1.82

Shoulder Ci	15.00	39.41	43.46	40.63	39.41	41.02	1.20
Sleeve Lth	15.00	28.78	34.25	31.81	28.78	31.86	1.31
Stature	15.00	61.65	69.29	64.76	61.65	64.96	2.08
Thigh Circ	15.00	21.57	24.61	23.00	23.03	23.00	0.84
Waist Circ,	15.00	28.70	32.36	30.16	29.77	30.42	1.05

---------- BEST FIT SIZE NUMBER=38 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	17.00	49.80	57.00	53.80	53.70	53.89	1.71
Biacromial	17.00	13.62	16.00	14.92	14.70	14.96	0.60
Cervicale H	17.00	53.50	58.90	56.60	57.00	56.48	1.36
Chest Circ	17.00	35.59	40.70	38.07	35.59	38.23	1.65
Crotch Ht	17.00	27.90	32.70	31.10	29.00	30.81	1.37
Hip Circ Ma	17.00	38.23	42.76	40.20	39.90	40.25	1.12
Hip Ht Max	17.00	29.70	34.17	32.20	29.70	32.33	1.24
Shoulder Ci	17.00	40.20	45.16	42.60	40.20	42.43	1.43
Sleeve Lth	17.00	30.30	33.90	32.28	32.28	32.03	0.97
Stature	17.00	62.60	68.40	66.14	65.67	65.84	1.47
Thigh Circ	17.00	22.90	25.28	24.30	24.50	24.12	0.70
Waist Circ,	17.00	28.57	34.53	30.67	28.57	30.76	1.66

---------- BEST FIT SIZE NUMBER=40 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	6.00	54.69	57.01	56.38	54.69	56.19	0.85
Biacromial	6.00	13.98	15.80	15.17	13.98	15.08	0.65
Cervicale H	6.00	57.32	59.29	58.58	57.32	58.49	0.67
Chest Circ	6.00	36.46	42.20	37.85	36.46	38.66	2.42
Crotch Ht	6.00	30.70	33.19	32.29	30.70	32.00	0.99
Hip Circ Ma	6.00	41.00	43.50	41.61	41.00	41.81	0.88
Hip Ht Max	6.00	31.97	34.37	34.08	31.97	33.58	1.00
Shoulder Ci	6.00	40.31	44.40	43.33	40.31	42.92	1.53
Sleeve Lth	6.00	31.50	34.06	33.04	31.50	32.94	1.03
Stature	6.00	66.69	68.70	68.17	66.69	67.98	0.76
Thigh Circ	6.00	24.21	25.80	24.49	24.21	24.81	0.67
Waist Circ,	6.00	30.59	34.87	31.54	30.59	32.11	1.77

---------- BEST FIT SIZE NUMBER=42 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	1.00	54.80	54.80	54.80	54.80	54.80	.
Biacromial	1.00	15.80	15.80	15.80	15.80	15.80	.
Cervicale H	1.00	57.80	57.80	57.80	57.80	57.80	.
Chest Circ	1.00	37.50	37.50	37.50	37.50	37.50	.
Crotch Ht	1.00	30.80	30.80	30.80	30.80	30.80	.
Hip Circ Ma	1.00	44.80	44.80	44.80	44.80	44.80	.
Hip Ht Max	1.00	32.60	32.60	32.60	32.60	32.60	.
Shoulder Ci	1.00	43.90	43.90	43.90	43.90	43.90	.
Sleeve Lth	1.00	33.20	33.20	33.20	33.20	33.20	.
Stature	1.00	67.60	67.60	67.60	67.60	67.60	.
Thigh Circ	1.00	26.40	26.40	26.40	26.40	26.40	.
Waist Circ,	1.00	28.97	28.97	28.97	28.97	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	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	8	47.48	53.15	51.97	47.48	51.47	1.80
Biacromial	8	13.19	14.90	14.47	14.80	14.21	0.74
Cervicale H	8	49.61	55.43	54.79	49.61	54.00	1.89
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	8	28.58	32.17	31.15	28.58	30.93	1.16
Shoulder Ci	8	36.61	40.60	38.80	36.61	38.68	1.63
Sleeve Lth	8	28.62	32.10	30.85	28.62	30.82	1.00
Stature	8	59.02	64.92	63.96	59.02	63.36	1.94
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	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	23	49.13	56.81	52.40	52.40	52.71	1.98
Biacromial	23	12.80	15.30	14.25	14.10	14.21	0.55
Cervicale H	23	51.42	58.78	55.00	55.00	55.06	2.00
Chest Circ	23	33.00	38.50	35.20	34.40	35.38	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
Hip Ht Max	23	28.82	34.00	31.30	31.50	31.22	1.55
Shoulder Ci	23	37.10	42.20	39.50	39.50	39.55	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
Thigh Circ	23	21.00	24.02	22.00	22.00	22.27	0.88
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	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	26	47.48	57.00	53.84	53.60	53.34	1.98
Biacromial	26	13.70	15.39	14.35	14.30	14.49	0.47
Cervicale H	26	50.20	59.30	55.75	55.63	55.82	1.91
Chest Circ	26	33.60	38.20	35.70	34.25	35.73	1.38
Crotch Ht	26	27.05	32.50	30.50	30.50	30.44	1.25
Hip Circ Ma	26	36.40	41.54	38.85	38.30	38.85	1.35
Hip Ht Max	26	28.03	33.90	31.95	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	26	20.50	24.65	22.90	23.10	22.70	1.19
Waist C,Pref	26	26.47	32.56	28.90	28.97	29.24	1.61

--------- Best Fit Current Size=38; Expected Female Size Category 4 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	23	47.60	56.70	52.80	47.60	53.05	2.35
Biacromial	23	12.90	16.10	14.60	14.30	14.56	0.73
Cervicale H	23	50.50	59.60	55.70	58.60	55.51	2.53
Chest Circ	23	34.90	42.05	37.80	39.20	37.78	1.68
Crotch Ht	23	27.00	34.30	30.20	28.60	30.39	1.86
Hip Circ Ma	23	37.80	43.00	40.90	40.90	40.73	1.25
Hip Ht Max	23	26.80	35.80	31.46	33.50	31.67	2.00
Shoulder Ci	23	38.30	44.80	40.60	41.60	41.08	1.78
Sleeve Lth	23	29.80	35.50	31.10	29.80	31.78	1.59
Stature	23	60.40	69.20	64.72	68.10	64.92	2.58
Thigh Circ	23	22.10	26.80	24.29	23.70	24.16	1.01
Waist Circ,	23	27.47	37.01	30.71	31.47	30.90	2.10

--------- Best Fit Current Size=40; Expected Female Size Category 5 ----------

VAR	N	MIN	MAX	MEDIAN	MODE	MEAN	STD
Acromion Ht	21	49.20	57.60	54.60	50.70	54.09	2.67
Biacromial	21	14.00	16.30	15.00	15.00	14.98	0.59
Cervicale H	21	51.80	60.08	57.00	51.80	56.72	2.65
Chest Circ	21	35.00	45.20	38.70	36.50	39.22	2.90
Crotch Ht	21	27.30	33.39	30.80	32.80	30.91	1.81
Hip Circ Ma	21	37.50	45.31	42.00	42.00	42.15	1.97
Hip Ht Max	21	29.30	35.79	32.80	33.30	32.46	1.84
Shoulder Ci	21	38.30	45.98	41.90	38.30	41.95	1.92
Sleeve Lth	21	30.20	34.70	32.09	30.60	32.17	1.31
Stature	21	60.60	70.00	66.10	60.60	65.98	2.93
Thigh Circ	21	22.30	26.80	25.50	25.40	25.25	1.28
Waist C,Pref	20	28.67	37.48	32.12	29.57	32.38	2.44

APPENDIX R

PATTERN DIMENSIONS FOR FLIGHT SUIT FEMALE SIZES						
	Grade			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

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