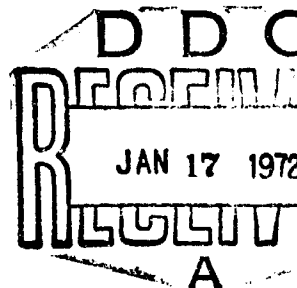


SELECTED ANTHROPOMETRIC DIMENSIONS OF NAVAL AVIATION PERSONNEL

William F. Moroney, Robert S. Kennedy, Edmund C. Gifford,
and Joseph R. Provost



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| 13. ABSTRACT <p>Since the previous study of the anthropometric features of naval airmen, the physical and academic requirements for entrance into the flight program have been changed. The present study was undertaken to determine whether these changes combine with changes in the anthropometric features of the population in general to influence certain anthropometric dimensions. Selected anthropometric features of 6534 aviation training candidates were examined. These measures included: weight, stature, sitting height, shoulder width, buttock-knee length, buttock-heel length, per cent of body fat, and lean body weight. Measures of central tendency and dispersion were calculated for each variable, and correlations between variables were obtained. In addition, t tests were used to determine the significance of the differences between mean values obtained by the aviation training candidates and the mean values reported by the Naval Air Development Center and the USAF Aeromedical Laboratory for other populations.</p> <p>The dimensions of the aviation training candidates in this study differed significantly from those reported in the other samples. Possible reasons for these differences include: growth of the population in general, characteristics of the samples involved, and different anthropometric and academic requirements for acceptance into the aviation training program.</p> | | | |

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Since the previous study of the anthropometric features of naval aircrewmembers was conducted, the physical and academic requirements for entrance into the flight program have been changed. The present study was undertaken to determine if these changes, combined with changes in the anthropometric features of the population in general, have been reflected in the bodily dimensions of the naval aviator population. The following anthropometric measures of 6534 aviation training candidates were examined: weight, stature, sitting height, shoulder width, buttock-knee length, buttock-heel length, per cent body fat, and lean body weight. Measures of central tendency and dispersion were calculated for each variable, and correlations between variables were obtained. In addition, t tests were used to determine the significance of the differences between mean values obtained by these naval aviation training candidates and the mean values reported on other samples by the Naval Air Development Center and the USAF Aeromedical Laboratory.

FINDINGS

The dimensions of the naval aviation training candidates differed significantly from those reported in the other samples. Possible reasons for these differences include: growth of the population in general, characteristics of the samples involved, and different anthropometric and academic requirements for acceptance into the aviation training program.

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and Lazo (3) of the Naval Air Development Center (NADC)*. The population for this study comprised approximately 10 per cent of the naval aircrewmembers then on active duty, and descriptive data for 96 anthropometric dimensions were reported.

Data reported by Newman (5), by Stoult, Damon, McFarland, and Roberts (8), and by Damon, Stoult, and McFarland (2) indicated that bodily dimensions of the American population have been changing with time. For example, Damon et al. (2) reported that the average American soldier in WWII was 13 pounds heavier and 0.7 inch taller than his counterpart in WWI. If changes in anthropometric dimensions are to be encountered with time, then these changes must be incorporated into the design of new aircraft systems.

In addition to changes in the anthropometric features of the population in general, changes in standards for acceptance into training have occurred. BUMED Instruction 6110.8 (1) established the following physical standards: candidates for naval flight training must attain a minimum stature of 64 inches and cannot exceed 78 inches provided the sitting height is not less than 32 inches nor more than 41 inches and the buttock-leg length is not less than 36 inches nor more than 50 inches. Marine candidates must meet the sitting height and buttock-leg length requirements cited above; however, they must attain a minimum overall height of 66 inches but cannot exceed the 78-inch maximum.

Since 1965 candidates for naval flight training have been required to have a college degree awarded by an accredited college or university. While this requirement does not apply to Marine Corps entrants to naval flight training, approximately 93 per cent of the recent Marine Corps flight students were college graduates. Stoult et al. (8) and Damon et al. (2) have reported that college students are taller and lighter than noncollege individuals of the same age group. Newman (5) reported that the limits placed on sitting height in WWII eliminated approximately 5 per cent of the potential aircraft- and armored-vehicle operator population; however, these same limits would have eliminated between 15 and 20 per cent of the college population. On the basis of the aforementioned findings it is reasonable to expect that a group of recent naval flight students would be taller than the other military groups considered (mostly noncollege graduates).

Characteristics of the sample may also explain differences between the groups. The NADC sample (3) included Navy and Marine Corps aviators, aviation officers, and enlisted aviation personnel (N = 1549). The USAF Aeromedical Laboratory (AML) collected data (4) describing 132 anthropometric features of over 4000 USAF flying personnel from all flight categories (pilots, navigators, bombardiers, observers, gunners). The population examined at the Naval Aerospace Medical Institute (NAMI) included all individuals (for whom records were available) who had entered the flight training program between January 1966 and August 1969 inclusive, and thus enlisted personnel were excluded.

*At the time of the study the Air Crew Equipment Laboratory was part of the Naval Air Engineering Center.

1) changes in the morphological features of the population as a whole, 2) changes in the physical and academic requirements for admission into the flight training program, and 3) differences in the compositions of the samples examined.

PROCEDURE

METHOD

In 1964 Provost and Gifford (7) reported on their design of an integrated anthropometric measuring device that would permit assessment of select (i.e., relatively unique and operationally important) morphological features of aircrewmembers: weight, stature (standing height), sitting height, shoulder width, trunk height, buttock-knee length, buttock-heel length, and functional reach. The device did not require complicated or sophisticated mensuration, and it was felt that it could be utilized with precision by persons with a minimum of training and experience.

BUMED Instruction 6110.8 (1) required that the device be employed in connection with the aviation training entrance physical examination administered at the School of Aviation Medicine (now the Naval Aerospace Medical Institute, NAMI) for all aviation training candidates. These measurements were then reported on the Anthropometric Data Record Form, NAVMED 1460 (11-64). Appropriate identifying information, i.e., name, rank, rate, file, service number, designator, service, age, and date of examination, were also recorded on NAVMED 1460 (11-64). (See Appendix A.)

DATA PROCESSING

The measurements and identifying information specified above were collected from 6534 aviation training candidates (mean age 22.7 years; S.D. 1.24; range 20.00 - 28.33) who commenced training between 1 January 1966 and August 1969. This information was then coded and placed on punched cards, along with accession codes that permit the Aerospace Psychology Department to trace the individual and his concomitant academic and flight grades from the point of introduction into the flight training program until his assignment to a Navy or Marine Corps operational squadron. All the above data constituted the input deck. An output deck was obtained by means of appropriate programs. This output deck contained: 1) the variables specified in the input deck, and 2) selected derived variables--lean body weight and per cent body fat as calculated according to the technique of Pierson and Eagle (6). From this output deck, measures of central tendency and dispersion for each variable and correlations between variables were obtained. Frequency distributions were plotted and percentiles were also obtained (Appendix B). In addition, t tests were used to determine the significance of the differences between the mean values obtained from the NAMI population and the mean values obtained by the previously cited Navy (3) and USAF aircrewmembers studies (4).

ated with the measurement of trunk height and functional reach. These inconsistencies were ultimately traced to unauthorized (bias inducing) modifications of the measuring device. Therefore, the data describing trunk height and functional reach are not included in this report.

A description of the variables measured and the frequency distribution obtained for each variable are presented in Figures 1 through 8. The standard errors associated with the mean, with standard deviation, and with coefficient of variation for each variable are reported in the parenthesis located immediately after the value of interest. Table I presents a comparison of the values associated with the 5th, 50th, and 95th percentiles for the groups measured at NAMI, at NADC, and at AML.

An examination of Table II reveals that the mean value attained by the student naval aviation personnel examined at NAMI differed from the mean value attained by an earlier sample of naval aviation personnel examined by NADC in weight (4.25 lb lighter); stature (0.21 in. taller); sitting height (0.48 in. taller); shoulder width (0.90 in. narrower); buttock-knee length (0.45 in. longer). They were also younger than the NADC sample. Furthermore, the student naval aviation population examined at NAMI were 3.49 pounds heavier, 1.04 inches taller in stature, 0.82 inch taller in sitting height, and had longer buttock-knee lengths (0.92 in.) and buttock-heel lengths (1.16 in.) than the aviation personnel sampled by AML and were also younger. Significant differences ($p < .01$) were found between the means associated with each variable, except for shoulder width, which was identical for the NAMI and the AML samples. While the anthropometric features of the NAMI population were significantly different from those of the other samples, a judgment of the meaningfulness of that significant difference must be made by the user of the data.

Correlations are reported in Table III for these variables. As expected, stature correlated well with segmental and limb lengths, while weight correlated well with breadth- and mass-related factors.

DISCUSSION

The difference in weight between the NAMI and the NADC groups may be in part attributed to the selection process. The American College Health Association study cited by Stoudt et al. (8) reported that college students had an average weight of 3 pounds less than noncollege students of the same age range. Since the majority of the NADC sample were not college graduates (as opposed to the NAMI sample) and had a wider range in weight than the NAMI sample, it is reasonable to expect a higher mean weight for the NADC group.

A similar rationale could explain the differences in stature, sitting height, and buttock-knee length between the NAMI and the NADC groups. In addition to the trend for the population as a whole to become taller, Stoudt et al. (8) reported that college students (from the same age group from which SNA's and SNFO's volunteer) are taller than noncollege students of the same age group.

Table I**Percentile Values of Selected Anthropometric Measures Obtained by NAMI, NADC, and AML***

| Percentile: | NAMI | | | NADC | | | AML | |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 5 | 50 | 95 | 5 | 50 | 95 | 5 | 50 |
| 1. Weight (lb) | 135.9 | 165.0 | 196.4 | 140.3 | 171.1 | 203.6 | 132.5 | 161.9 |
| 2. Stature (in.) | 65.8 | 69.7 | 73.8 | 66.2 | 69.9 | 73.9 | 65.2 | 69.1 |
| 3. Sitting height (in.) | 34.3 | 36.3 | 38.4 | 34.2 | 36.3 | 38.4 | 33.8 | 36.0 |
| 4. Shoulder width (in.) | 16.0 | 17.4 | 19.9 | 17.3 | 18.8 | 20.3 | 16.5 | 17.9 |
| 5. Buttock-knee length (in.) | 22.1 | 24.1 | 26.3 | 22.5 | 24.1 | 25.8 | 21.9 | 23.6 |
| 6. Buttock-heel length (in.) | 40.2 | 43.5 | 46.9 | | | | 39.4 | 42.7 |
| 7. Per cent body fat | 4.5 | 11.9 | 17.8 | | | | | |
| 8. Lean body weight | 124.3 | 143.9 | 165.8 | | | | | |

*Empty cells indicate that the measurement was not taken or calculated.

Table II

Means, Standard Deviations, and Ranges of Selected Anthropometric Measures Obtained by NAMI, NADC, and AML

| | NAMI | | | NADC | | | AML | | |
|------------------------------|--------|-------|---------------|--------|-------|---------------|--------|-------|---------|
| | Mean | S. D. | Range | Mean | S. D. | Range | Mean | S. D. | |
| 1. Weight (lb) | 167.15 | 18.38 | 117.00-244.00 | 171.40 | 19.09 | 109.50-245.50 | 163.66 | 20.86 | 100-200 |
| 2. Stature (in.) | 70.15 | 2.40 | 62.70- 78.00 | 69.94 | 2.33 | 63.43- 77.25 | 69.11 | 2.44 | 59-79 |
| 3. Sitting height (in.) | 36.76 | 1.21 | 31.70- 41.00 | 36.28 | 1.25 | 32.19- 41.62 | 35.94 | 1.29 | 29-42 |
| 4. Shculder width (in.) | 17.88 | 0.91 | 15.00- 21.30 | 18.78 | 0.91 | 14.82- 21.70 | 17.88 | 0.91 | 15-21 |
| 5. Buttock-knee length (in.) | 24.54 | 1.26 | 20.40- 29.90 | 24.09 | 1.00 | 20.73- 27.81 | 23.62 | 1.06 | 18-30 |
| 6. Buttock-heel length (in.) | 43.86 | 2.08 | 32.50- 50.70 | | | | 42.70 | 2.04 | 33-52 |
| 7. Per cent body fat | 12.10 | 4.02 | 0.10- 23.90 | | | | | | |
| 8. Lean body weight | 146.29 | 12.65 | 109.00-193.00 | | | | | | |

* Empty cells indicate that the measurement was not taken or calculated.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------------|---|-----|-----|-----|-----|-----|-------|-----|
| 1. Weight | | .58 | .53 | .69 | .46 | .51 | .68 | .92 |
| 2. Stature | | | .77 | .46 | .68 | .78 | -.20 | .85 |
| 3. Sitting height | | | | .49 | .35 | .45 | -.05* | .71 |
| 4. Shoulder width | | | | | .31 | .35 | .41 | .66 |
| 5. Buttock-knee length | | | | | | .73 | -.06* | .62 |
| 6. Buttock-heel length | | | | | | | -.10 | .70 |
| 7. Per cent body fat | | | | | | | | .34 |
| 8. Lean body weight | | | | | | | | |

†All values significant at .01 except those with *.

Differences between the NAMI and the AML group may be in part a function of the number of years that elapsed between data collections. The NAMI data were collected between 1966 and 1969 while the AML data were collected prior to 1950. This represents a gap of at least 16 to 19 years during which the dimensions of the population as a whole were generally increasing. It is reasonable to expect, therefore, that the anthropometric features of the NAMI group would be somewhat larger than those of the AML group. Age at the time of measurement and the different compositions of the populations can also be considered contributory factors.

It was noted in Table II that the mean shoulder widths of the NAMI and AML groups were identical, and both mean widths were smaller than the mean shoulder width of the NADC group. A possible explanation for this apparent reversal of the general trend of increasing body dimensions may lie in the age differences among the groups examined. The NAMI group consisted of individuals (mostly college graduates) who were younger than the cross-section of the naval aviation sample examined by NADC. The NAMI group, therefore, would not have the body fat common to the older population, and the NAMI mean shoulder width would fall closer to the smaller dimensioned sample examined by AML.

PERCENTILE VALUES

| <u>P₅</u> | <u>LB</u> | <u>KG</u> |
|----------------------|-----------|-----------|
| 1 | 126.8 | 57.5 |
| 2 | 130.3 | 59.1 |
| 3 | 132.5 | 60.1 |
| 5 | 135.9 | 61.7 |
| 10 | 141.8 | 64.3 |
| 15 | 146.1 | 66.3 |
| 20 | 149.6 | 67.9 |
| 25 | 152.7 | 69.3 |
| 30 | 155.3 | 70.5 |
| 35 | 157.9 | 71.6 |
| 40 | 160.4 | 72.8 |
| 45 | 162.7 | 73.8 |
| 50 | 165.0 | 74.9 |
| 55 | 167.5 | 76.0 |
| 60 | 170.1 | 77.2 |
| 65 | 172.7 | 78.4 |
| 70 | 175.6 | 79.7 |
| 75 | 178.3 | 80.9 |
| 80 | 181.7 | 82.4 |
| 85 | 185.3 | 84.1 |
| 90 | 190.0 | 86.2 |
| 95 | 196.4 | 89.1 |
| 97 | 201.0 | 91.2 |
| 98 | 203.6 | 92.4 |
| 99 | 208.6 | 94.7 |

Each subject determined his own weight on standard medical type scales.

Mean: 167.15 (.23) lb ; 75.84 (.10) kg

Standard Deviation: 18.38 (.16) lb ; 8.34 (.07) kg

Range: 117 - 244 lb ; 53.09 - 110.71 kg

Coefficient of Variation: 11.0 (.10) %

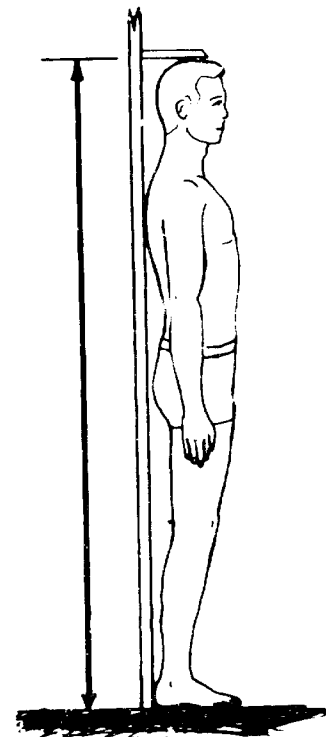
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All descriptions were adapted from Anthropometry of Flying Personnel - 1950.

Figure 1 Weight

PERCENTILE VALUES

| <u>P₅</u> | <u>IN.</u> | <u>CM</u> |
|----------------------|------------|-----------|
| 1 | 64.4 | 163.7 |
| 2 | 65.0 | 165.0 |
| 3 | 65.3 | 166.0 |
| 5 | 65.8 | 167.2 |
| 10 | 66.6 | 169.2 |
| 15 | 67.2 | 170.7 |
| 20 | 67.6 | 171.8 |
| 25 | 68.0 | 172.8 |
| 30 | 68.4 | 173.7 |
| 35 | 68.7 | 174.5 |
| 40 | 69.0 | 175.3 |
| 45 | 69.3 | 176.1 |
| 50 | 69.7 | 177.0 |
| 55 | 69.9 | 177.7 |
| 60 | 70.3 | 178.5 |
| 65 | 70.6 | 179.4 |
| 70 | 70.9 | 180.3 |
| 75 | 71.4 | 181.2 |
| 80 | 71.8 | 182.3 |
| 85 | 72.2 | 183.4 |
| 90 | 72.9 | 185.0 |
| 95 | 73.8 | 187.5 |
| 97 | 74.3 | 188.7 |
| 98 | 74.8 | 189.9 |
| 99 | 75.3 | 191.4 |



The subject stands erect with his back, shoulders, and feet firmly positioned against the back of the device. The measurer moves the measuring probe until it touches the scalp firmly. The subject's height is then read on a scale.

Mean: 70.15 (.03) in.; 178.19 (.08) cm.

Standard Deviation: 2.40 (.02) in.; 6.10

Range: 62.7 - 78.0 in.; 159.26 - 198.12

Coefficient of Variation: 3.4 (.03) %

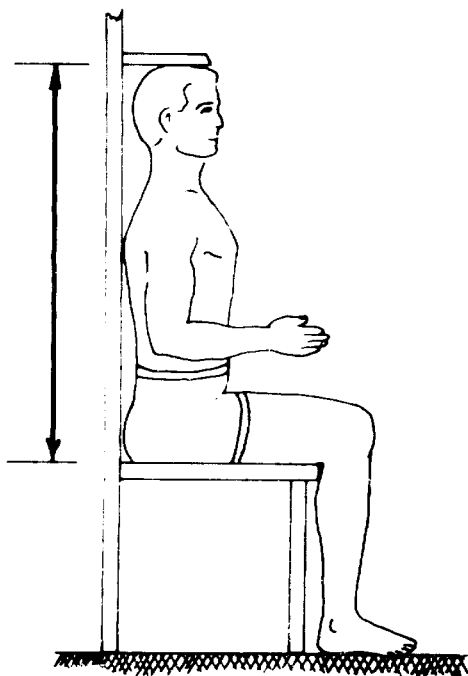
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Figure 2 Stature (Standing Height)

Values reported in parenthesis in all figures are the Standard Error of the statistic with which they are associated.

PERCENTILE VALUES

| | IN. | CM |
|----|------|------|
| 1 | 33.7 | 85.6 |
| 2 | 33.9 | 86.1 |
| 3 | 34.0 | 86.5 |
| 5 | 34.3 | 87.2 |
| 10 | 34.8 | 88.3 |
| 15 | 35.0 | 89.0 |
| 20 | 35.3 | 89.6 |
| 25 | 35.5 | 90.1 |
| 30 | 35.7 | 90.6 |
| 35 | 35.8 | 91.0 |
| 40 | 36.0 | 91.4 |
| 45 | 36.1 | 91.8 |
| 50 | 36.3 | 92.2 |
| 55 | 36.5 | 92.6 |
| 60 | 36.6 | 93.0 |
| 65 | 36.8 | 93.4 |
| 70 | 37.0 | 93.9 |
| 75 | 37.1 | 94.3 |
| 80 | 37.3 | 94.8 |
| 85 | 37.6 | 95.5 |
| 90 | 37.9 | 96.3 |
| 95 | 38.4 | 97.4 |
| 97 | 38.6 | 98.1 |
| 98 | 38.9 | 98.7 |
| 99 | 39.1 | 99.4 |



The subject sits erect beneath the measuring probe. He looks directly forward, with his head, shoulders, back, and buttocks firmly positioned against the back of the seat. His feet rest on the floor of the platform so that his knees are bent at approximately right angles. The measurer moves the measuring probe until the flat surface of the probe makes contact with the highest surface on the subject's head. The measurer then reads the distance on the scale.

Mean: 36.76 (.02) in.; 93.37 (.04) cm.

Standard Deviation: 1.21 (.01) in.; 3.06 (.05) cm.

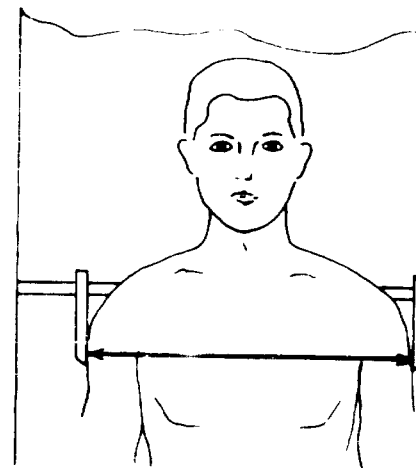
Range: 31.7 - 41.0; 80.52 - 104.14 cm.

Coefficient of Variation: 3.3 (.03) %

N = 6534

PERCENTILE VALUES

| | IN. | CM |
|----|------|------|
| 1 | 15.5 | 39.3 |
| 2 | 15.6 | 39.7 |
| 3 | 15.8 | 40.0 |
| 5 | 16.0 | 40.7 |
| 10 | 16.3 | 41.4 |
| 15 | 16.5 | 42.0 |
| 20 | 16.7 | 42.3 |
| 25 | 16.8 | 42.7 |
| 30 | 16.9 | 43.0 |
| 35 | 17.1 | 43.3 |
| 40 | 17.2 | 43.6 |
| 45 | 17.3 | 44.0 |
| 50 | 17.4 | 44.3 |
| 55 | 17.6 | 44.6 |
| 60 | 17.7 | 45.2 |
| 65 | 17.8 | 45.5 |
| 66 | 17.9 | 45.9 |
| 75 | 18.1 | 45.9 |
| 80 | 18.3 | 46.4 |
| 85 | 18.4 | 46.8 |
| 90 | 18.7 | 47.5 |
| 95 | 19.0 | 48.2 |
| 97 | 19.3 | 48.9 |
| 98 | 19.4 | 49.3 |
| 99 | 19.7 | 50.1 |



The subject sits with his upper arms hanging at his sides and his forearms extended horizontally forward. His right deltoid muscle rests against a fixed plate; a sliding plate is then moved until it contacts the subject's left deltoid muscle. The distance between the inner portions of the two plates is then read from a scale which runs between the two plates.

Mean: 17.88 (.01) in.; 45.42 (.03) cm.

Standard Deviation: 1.91 (.01) in.; 2.30 cm.

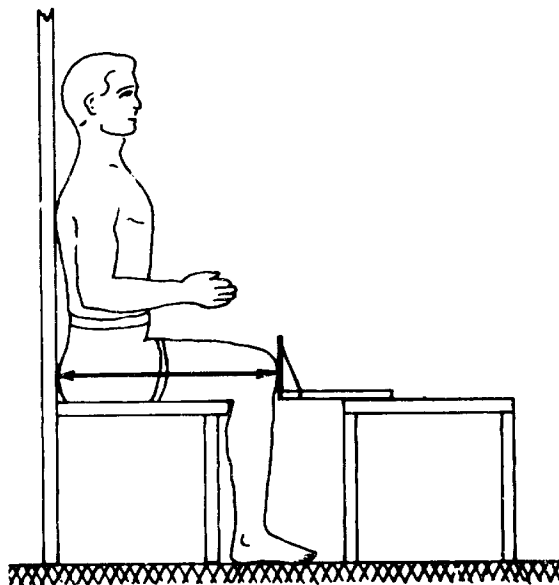
Range: 15.0 - 21.3 in.; 38.10 - 54.10 cm.

Coefficient of Variation: 5.1 (.05) %

N = 6534

PERCENTILE VALUES

| % | IN. | CM |
|----|------|------|
| 1 | 20.8 | 52.9 |
| 2 | 21.6 | 54.9 |
| 3 | 21.8 | 55.4 |
| 5 | 22.1 | 56.1 |
| 10 | 22.5 | 57.2 |
| 15 | 22.8 | 57.9 |
| 20 | 23.0 | 58.5 |
| 25 | 23.1 | 59.0 |
| 30 | 23.4 | 59.5 |
| 35 | 23.6 | 59.9 |
| 40 | 23.8 | 60.3 |
| 45 | 23.9 | 60.8 |
| 50 | 24.1 | 61.1 |
| 55 | 24.2 | 61.5 |
| 60 | 24.4 | 61.9 |
| 65 | 24.5 | 62.3 |
| 70 | 24.7 | 62.8 |
| 75 | 24.9 | 63.3 |
| 80 | 25.2 | 63.9 |
| 85 | 25.5 | 64.7 |
| 90 | 25.7 | 65.4 |
| 95 | 26.3 | 66.7 |
| 97 | 26.7 | 67.7 |
| 98 | 26.9 | 68.4 |
| 99 | 27.4 | 69.5 |



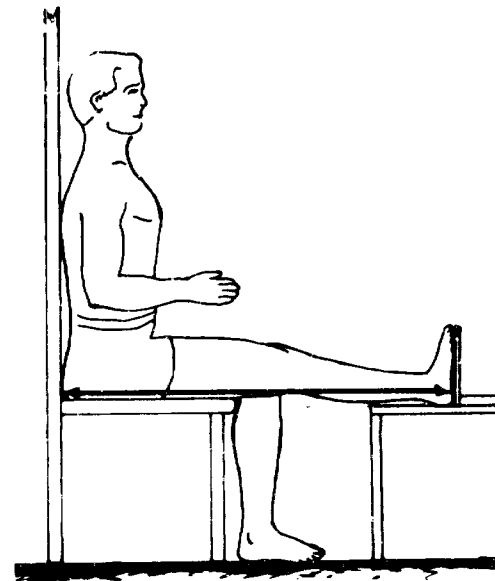
The subject remains in the sitting height position. A plate mounted on a slide is then positioned against his knee cap. The measurer then reads the distance on a scale.

Mean: 24.54 (.02) in.; 62.33 (.04) cm.
 Standard Deviation: 1.26 (.01) in.; 3.21 (.03) cm.
 Range: 20.4 - 29.9 in.; 51.82 - 75.95 cm.
 Coefficient of Variation: 5.1 (.05) %
 N = 6534

Figure 5 Buttock-Knee Length

PERCENTILE VALUES

| % | IN. | CM |
|----|------|-------|
| 1 | 38.7 | 98.3 |
| 2 | 39.3 | 99.9 |
| 3 | 39.7 | 100.8 |
| 5 | 40.2 | 102.0 |
| 10 | 41.0 | 104.1 |
| 15 | 41.3 | 105.0 |
| 20 | 41.7 | 105.9 |
| 25 | 42.0 | 106.7 |
| 30 | 42.3 | 107.5 |
| 35 | 42.6 | 108.3 |
| 40 | 42.9 | 109.0 |
| 45 | 43.2 | 109.7 |
| 50 | 43.5 | 110.4 |
| 55 | 43.7 | 111.0 |
| 60 | 43.9 | 111.6 |
| 65 | 44.3 | 112.4 |
| 70 | 44.7 | 113.4 |
| 75 | 44.9 | 113.9 |
| 80 | 45.2 | 114.9 |
| 85 | 45.7 | 116.0 |
| 90 | 46.2 | 117.3 |
| 95 | 46.9 | 119.1 |
| 97 | 47.4 | 120.3 |
| 98 | 47.8 | 121.3 |
| 99 | 48.4 | 122.9 |



The subject remains in the sitting height position. He extends his right leg as far as possible on the leg bench. The measuring probe is then moved until it comes into contact with the subject's heel.

Mean: 43.86 (.03) in.; 111.39 (.07) cm.
 Standard Deviation: 2.08 (.02) in.; 5.28 (.05) cm.
 Range: 32.5 - 50.7 in.; 82.55 - 128.78 cm.
 Coefficient of Variation: 4.7 (.04) %
 N = 6534

Figure 6 Buttock-Heel Length

PERCENTILE VALUES

| | <u>%</u> |
|----|----------|
| 1 | 1.8 |
| 2 | 2.9 |
| 3 | 3.5 |
| 5 | 4.5 |
| 10 | 6.2 |
| 15 | 7.2 |
| 20 | 8.2 |
| 25 | 8.9 |
| 30 | 9.6 |
| 35 | 10.2 |
| 40 | 10.8 |
| 45 | 11.3 |
| 50 | 11.9 |
| 55 | 12.4 |
| 60 | 12.9 |
| 65 | 13.5 |
| 70 | 14.1 |
| 75 | 14.6 |
| 80 | 15.3 |
| 85 | 16.1 |
| 90 | 16.7 |
| 95 | 17.8 |
| 97 | 18.2 |
| 98 | 18.5 |
| 99 | 19.0 |

Per cent Body Fat was calculated according to the technique of Pierson and Eagle.

Mean: 12.10 (.05) %
 Standard Deviation: 4.02 (.04) %
 Range: 0.1 - 23.9%
 Coefficient of Variation: .33 (.003) %
 N = 6534

Figure 7 Per Cent Body Fat

PERCENTILE VALUES

| <u>%</u> | <u>LB</u> | <u>KG</u> |
|----------|-----------|-----------|
| 1 | 118.1 | 53.6 |
| 2 | 120.3 | 54.6 |
| 3 | 122.0 | 55.4 |
| 5 | 124.3 | 56.4 |
| 10 | 128.3 | 58.2 |
| 15 | 131.0 | 59.4 |
| 20 | 133.3 | 60.5 |
| 25 | 135.3 | 61.4 |
| 30 | 137.2 | 62.3 |
| 35 | 139.0 | 63.1 |
| 40 | 140.7 | 63.8 |
| 45 | 142.3 | 64.6 |
| 50 | 143.9 | 65.3 |
| 55 | 145.6 | 66.1 |
| 60 | 147.4 | 66.9 |
| 65 | 148.9 | 67.6 |
| 70 | 150.7 | 68.4 |
| 75 | 152.7 | 69.3 |
| 80 | 155.1 | 70.4 |
| 85 | 158.1 | 71.7 |
| 90 | 161.2 | 73.1 |
| 95 | 165.8 | 75.2 |
| 97 | 168.9 | 76.6 |
| 98 | 171.1 | 77.6 |
| 99 | 175.4 | 79.6 |

Lean Body Weight was calculated according to the technique of Pierson and Eagle.

Mean: 146.29 (.16) lb - 66.38 (.07) kg
 Standard Deviation: 12.65 (.11) lb : 5.73 (.05) kg
 Range: 109 - 193 lb , 49.64 - 87.66 kg
 Coefficient of Variation: 8.6 (.08) %
 N = 6534

Figure 8 Lean Body Weight

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APPENDIX A

Anthropometric Data Record NAVMED 1460 (11-64)

ANTHROPOMETRIC DATA

MEASUREMENTS

| | |
|--|--------|
| 1. <u>WEIGHT</u> <i>Taken to nearest pound on standard scale with subject in underwear.</i> | POUNDS |
| 2. <u>HEIGHT</u> <i>Vertical distance from floor to top of head with subject standing erect in bare feet.</i> | INCHES |
| 3. <u>SITTING HEIGHT</u> <i>Vertical distance from seat surface to top of head with subject sitting erect.</i> | INCHES |
| 4. <u>SHOULDER WIDTH</u> <i>Distance across shoulders between greatest protusion of deltoid muscles.</i> | INCHES |
| 5. <u>TRUNK HEIGHT</u> <i>Vertical distance from seat surface to right shoulder with subject sitting erect.</i> | INCHES |
| 6. <u>BUTTOCK-KNEE LENGTH</u> <i>Distance from back of right buttock to front of kneecap with subject sitting erect.</i> | INCHES |
| 7. <u>BUTTOCK-LEG LENGTH</u> <i>Distance from back of right buttock to heel of foot with subject sitting erect.</i> | INCHES |
| 8. <u>FUNCTIONAL REACH</u> <i>Horizontal distance from back of right shoulder to tips of thumb and forefinger pressed together.</i> | INCHES |

SIZE CODE

| SITTING HEIGHT CODE <i>(From Item 3 Above)</i> | HEIGHT CODE <i>(From Item 2 Above)</i> |
|---|---|
| A-32.0-34.9 INCHES | a-64.0-67.9 INCHES |
| B-35.0-37.5 INCHES | b-68.0-71.9 INCHES |
| C-37.6-38.5 INCHES | c-72.0-74.9 INCHES |
| D-38.6-41.0 INCHES | d-75.0-78.0 INCHES |

IN BLOCK BELOW ENTER SITTING HEIGHT CODE FIRST USING A CAPITAL LETTER

FOLLOWED BY HEIGHT CODE USING A SMALL LETTER EXAMPLE - A. B.

SIZE CODE

DISTRIBUTION

1. ORIGINAL - To be retained in health record
 2. COPY - Forward with SF88 or SF600 to BUMED CODE 511 Washington, D.C. 20340
 3. COPY - Send to Commanding Officer Naval Air Engineering Center (NAEC), Philadelphia, Pa. 19112
- SIGNATURE (Of Examining Medical Officer/Flight Surgeon)

APPENDIX B

**Frequency Distributions of Age and Eight Selected Variables Describing the
6534 Student Naval Aviators/Student Naval Flight Officers Examined in this Report**

| | | | | |
|-------|------|---------|---------|--|
| 252.0 | 699 | 0.10698 | 0.10820 | XXXXXXXXXXXX |
| 264.0 | 2762 | 0.42271 | 0.53092 | XX |
| 276.0 | 1788 | 0.27365 | 0.80456 | XX |
| 288.0 | 761 | 0.11647 | 0.92103 | XXXXXXXXXXXX |
| 300.0 | 325 | 0.04974 | 0.97077 | XXXXXX |
| 312.0 | 124 | 0.01898 | 0.98975 | XX |
| 324.0 | 40 | 0.00612 | 0.99587 | X |
| 336.0 | 21 | 0.00321 | 0.99908 | |
| 348.0 | 6 | 0.00092 | 1.00000 | |

AGE IN MONTHS

| | | | | |
|-------|-----|---------|---------|--------------|
| 127.0 | 23 | 0.00352 | 0.01041 | XXXX |
| 129.0 | 30 | 0.00459 | 0.01500 | XXXXX |
| 131.0 | 52 | 0.00796 | 0.02296 | XXXXXX |
| 133.0 | 62 | 0.00949 | 0.03245 | XXXXXXXX |
| 135.0 | 78 | 0.01194 | 0.04438 | XXXXXXXXXX |
| 137.0 | 82 | 0.01255 | 0.05693 | XXXXXXXXXX |
| 139.0 | 116 | 0.01775 | 0.07469 | XXXXXXXXXXXX |
| 141.0 | 114 | 0.01745 | 0.09213 | XXXXXXXXXXXX |
| 143.0 | 130 | 0.01990 | 0.11203 | XXXXXXXXXXXX |
| 145.0 | 154 | 0.02357 | 0.13560 | XXXXXXXXXXXX |
| 147.0 | 187 | 0.02862 | 0.16422 | XXXXXXXXXXXX |
| 149.0 | 185 | 0.02831 | 0.19253 | XXXXXXXXXXXX |
| 151.0 | 182 | 0.02785 | 0.22039 | XXXXXXXXXXXX |
| 153.0 | 236 | 0.03612 | 0.25650 | XXXXXXXXXXXX |
| 155.0 | 258 | 0.03949 | 0.29599 | XXXXXXXXXXXX |
| 157.0 | 241 | 0.03688 | 0.33287 | XXXXXXXXXXXX |
| 159.0 | 250 | 0.03826 | 0.37114 | XXXXXXXXXXXX |
| 161.0 | 284 | 0.04346 | 0.41460 | XXXXXXXXXXXX |
| 163.0 | 273 | 0.04178 | 0.45638 | XXXXXXXXXXXX |
| 165.0 | 299 | 0.04576 | 0.50214 | XXXXXXXXXXXX |
| 167.0 | 256 | 0.03918 | 0.54132 | XXXXXXXXXXXX |
| 169.0 | 255 | 0.03903 | 0.58035 | XXXXXXXXXXXX |
| 171.0 | 238 | 0.03642 | 0.61677 | XXXXXXXXXXXX |
| 173.0 | 256 | 0.03918 | 0.65595 | XXXXXXXXXXXX |
| 175.0 | 223 | 0.03413 | 0.69008 | XXXXXXXXXXXX |
| 177.0 | 253 | 0.03872 | 0.72880 | XXXXXXXXXXXX |
| 179.0 | 215 | 0.03290 | 0.76171 | XXXXXXXXXXXX |
| 181.0 | 199 | 0.03046 | 0.79216 | XXXXXXXXXXXX |
| 183.0 | 170 | 0.02602 | 0.81819 | XXXXXXXXXXXX |
| 185.0 | 188 | 0.02877 | 0.84695 | XXXXXXXXXXXX |
| 187.0 | 152 | 0.02326 | 0.87022 | XXXXXXXXXXXX |
| 189.0 | 131 | 0.02005 | 0.89027 | XXXXXXXXXXXX |
| 191.0 | 128 | 0.01959 | 0.90986 | XXXXXXXXXXXX |
| 193.0 | 95 | 0.01454 | 0.92440 | XXXXXXXXXXXX |
| 195.0 | 107 | 0.01638 | 0.94077 | XXXXXXXXXXXX |
| 197.0 | 89 | 0.01362 | 0.95439 | XXXXXXXXXXXX |
| 199.0 | 63 | 0.00964 | 0.96403 | XXXXXXXXXXXX |
| 201.0 | 40 | 0.00612 | 0.97016 | XXXXXX |
| 203.0 | 56 | 0.00857 | 0.97873 | XXXXXXXXXX |
| 205.0 | 30 | 0.00459 | 0.98332 | XXXXX |
| 207.0 | 24 | 0.00367 | 0.98699 | XXXX |
| 209.0 | 25 | 0.00363 | 0.99082 | XXXX |
| 211.0 | 15 | 0.00230 | 0.99311 | XX |
| 213.0 | 15 | 0.00230 | 0.99541 | XX |
| 215.0 | 5 | 0.00077 | 0.99617 | X |
| 217.0 | 3 | 0.00046 | 0.99663 | |
| 219.0 | 6 | 0.00092 | 0.99705 | X |
| 221.0 | 3 | 0.00046 | 0.99801 | |
| 223.0 | 5 | 0.00077 | 0.99878 | X |
| 225.0 | 6 | 0.00092 | 0.99969 | X |
| 227.0 | 6 | 0.00000 | 0.99969 | |
| 229.0 | 1 | 0.00015 | 0.99985 | |
| 231.0 | 0 | 0.00000 | 0.99985 | |
| 233.0 | 0 | 0.00000 | 0.99985 | |
| 235.0 | 0 | 0.00000 | 0.99985 | |
| 237.0 | 0 | 0.00000 | 0.99985 | |
| 239.0 | 0 | 0.00000 | 0.99985 | |
| 241.0 | 0 | 0.00000 | 0.99985 | |
| 243.0 | 1 | 0.00015 | 1.00000 | |

| | | | | |
|------|-----|---------|---------|------------------------------|
| 63.2 | 2 | 0.00031 | 0.00046 | X |
| 63.7 | 15 | 0.00230 | 0.00275 | XX |
| 64.2 | 27 | 0.00413 | 0.00689 | XXXX |
| 64.7 | 46 | 0.00704 | 0.01393 | XXXXXX |
| 65.2 | 73 | 0.01117 | 0.02510 | XXXXXXXX |
| 65.7 | 119 | 0.01821 | 0.04331 | XXXXXXXXXX |
| 66.2 | 177 | 0.02709 | 0.07040 | XXXXXXXXXXXX |
| 66.7 | 242 | 0.03704 | 0.10744 | XXXXXXXXXXXXXXXX |
| 67.2 | 289 | 0.04423 | 0.15167 | XXXXXXXXXXXXXXXXXX |
| 67.7 | 359 | 0.05494 | 0.20661 | XXXXXXXXXXXXXXXXXXXX |
| 68.2 | 455 | 0.06964 | 0.27625 | XXXXXXXXXXXXXXXXXXXXXXXX |
| 68.7 | 471 | 0.07208 | 0.34833 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 69.2 | 528 | 0.08081 | 0.42914 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 69.7 | 494 | 0.07560 | 0.50474 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 70.2 | 557 | 0.08525 | 0.58999 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 70.7 | 476 | 0.07285 | 0.66284 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 71.2 | 455 | 0.06964 | 0.73248 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 71.7 | 399 | 0.06107 | 0.79354 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 72.2 | 362 | 0.05540 | 0.84894 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 72.7 | 274 | 0.04193 | 0.89088 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 73.2 | 201 | 0.03076 | 0.92164 | XXXXXXXXXXXXXXXXXXXX |
| 73.7 | 161 | 0.02464 | 0.94628 | XXXXXXXXXXXXXXXXXXXX |
| 74.2 | 137 | 0.02097 | 0.96725 | XXXXXXXXXXXX |
| 74.7 | 78 | 0.01194 | 0.97919 | XXXXXX |
| 75.2 | 60 | 0.00918 | 0.98837 | XXXXX |
| 75.7 | 40 | 0.00612 | 0.99449 | XXX |
| 76.2 | 19 | 0.00291 | 0.99740 | XX |
| 76.7 | 12 | 0.00184 | 0.99923 | X |
| 77.2 | 1 | 0.00015 | 0.99939 | |
| 77.7 | 4 | 0.00061 | 1.00000 | |

STATURE
(Standing Height)

| | | | | |
|------|------|---------|---------|--|
| 31.7 | 1 | 0.00015 | 0.00015 | |
| 32.2 | 2 | 0.00031 | 0.00046 | |
| 32.7 | 4 | 0.00061 | 0.00107 | |
| 33.2 | 15 | 0.00230 | 0.00337 | X |
| 33.7 | 43 | 0.00658 | 0.00995 | XX |
| 34.2 | 179 | 0.02740 | 0.03734 | XXXXXXXXXX |
| 34.7 | 331 | 0.05066 | 0.08800 | XXXXXXXXXXXXXXXXXX |
| 35.2 | 598 | 0.09152 | 0.17952 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 35.7 | 884 | 0.13529 | 0.31481 | XX |
| 36.2 | 1014 | 0.15519 | 0.47000 | XX |
| 36.7 | 1040 | 0.15917 | 0.62917 | XX |
| 37.2 | 943 | 0.14432 | 0.77349 | XX |
| 37.7 | 651 | 0.09963 | 0.87313 | XX |
| 38.2 | 435 | 0.0657 | 0.93970 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 38.7 | 227 | 0.03474 | 0.97444 | XXXXXXXXXXXX |
| 39.2 | 115 | 0.01760 | 0.99204 | XXXXX |
| 39.7 | 38 | 0.00582 | 0.99786 | XX |
| 40.2 | 12 | 0.00184 | 0.99969 | X |
| 40.7 | 2 | 0.00031 | 1.00000 | |

SITTING HEIGHT

| | | | | |
|------|------|---------|---------|--|
| 15.5 | 57 | 0.00872 | 0.01056 | XX |
| 16.0 | 240 | 0.03765 | 0.04821 | XXXXXXXXXX |
| 16.5 | 568 | 0.08693 | 0.13514 | XXXXXXXXXXXXXXXXXXXX |
| 17.0 | 1280 | 0.19590 | 0.33104 | XX |
| 17.5 | 1270 | 0.19437 | 0.52541 | XX |
| 18.0 | 1351 | 0.20676 | 0.73217 | XX |
| 18.5 | 881 | 0.13483 | 0.86700 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 19.0 | 566 | 0.08647 | 0.95347 | XXXXXXXXXXXXXXXXXXXXXX |
| 19.5 | 210 | 0.03214 | 0.98561 | XXXXXXX |
| 20.0 | 66 | 0.01010 | 0.99571 | XX |
| 20.5 | 20 | 0.00306 | 0.99878 | X |
| 21.0 | 6 | 0.00122 | 1.00000 | |

SHOULDER WIDTH

| | | | | |
|------|------|---------|---------|--|
| 20.4 | 5 | 0.00077 | 0.00077 | |
| 20.9 | 25 | 0.00383 | 0.00459 | X |
| 21.4 | 42 | 0.00643 | 0.01102 | XX |
| 21.9 | 151 | 0.02311 | 0.03413 | XXXXXXXX |
| 22.4 | 306 | 0.04683 | 0.08096 | XXXXXXXXXXXX |
| 22.9 | 501 | 0.08586 | 0.16682 | XXXXXXXXXXXXXXXXXXXX |
| 23.4 | 858 | 0.13131 | 0.29813 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 23.9 | 959 | 0.14677 | 0.44490 | XX |
| 24.4 | 1108 | 0.16957 | 0.61448 | XX |
| 24.9 | 853 | 0.13055 | 0.74503 | XX |
| 25.4 | 715 | 0.10943 | 0.85445 | XX |
| 25.9 | 446 | 0.06826 | 0.92271 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 26.4 | 251 | 0.03841 | 0.96113 | XXXXXXXXXXXX |
| 26.9 | 120 | 0.01837 | 0.97949 | XXXXX |
| 27.4 | 77 | 0.01173 | 0.99128 | XXX |
| 27.9 | 34 | 0.00520 | 0.99648 | X |
| 28.4 | 8 | 0.00122 | 0.99770 | |
| 28.9 | 11 | 0.00163 | 0.99939 | |
| 29.4 | 2 | 0.00031 | 0.99969 | |
| 29.9 | 2 | 0.00031 | 1.00000 | |

BUTTOCK-KNEE LENGTH

| | | | | |
|------|-----|---------|---------|--|
| 32.5 | 2 | 0.00031 | 0.00031 | |
| 33.0 | 1 | 0.00015 | 0.00046 | |
| 33.5 | 1 | 0.00015 | 0.00061 | |
| 34.0 | 1 | 0.00015 | 0.00077 | |
| 34.5 | 0 | 0.00000 | 0.00077 | |
| 35.0 | 1 | 0.00015 | 0.00092 | |
| 35.5 | 0 | 0.00000 | 0.00092 | |
| 36.0 | 2 | 0.00031 | 0.00122 | |
| 36.5 | 0 | 0.00000 | 0.00122 | |
| 37.0 | 1 | 0.00015 | 0.00138 | |
| 37.5 | 3 | 0.00046 | 0.00184 | |
| 38.0 | 11 | 0.00168 | 0.00352 | X |
| 38.5 | 21 | 0.00321 | 0.00673 | X |
| 39.0 | 51 | 0.00781 | 0.01454 | XXXX |
| 39.5 | 55 | 0.00842 | 0.02296 | XXXX |
| 40.0 | 132 | 0.02020 | 0.04316 | XXXXXXXXXX |
| 40.5 | 136 | 0.02081 | 0.06397 | XXXXXXXXXXXX |
| 41.0 | 322 | 0.04928 | 0.11325 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 41.5 | 370 | 0.05663 | 0.16988 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 42.0 | 530 | 0.08111 | 0.25099 | XX |
| 42.5 | 497 | 0.07606 | 0.32706 | XX |
| 43.0 | 610 | 0.09336 | 0.42042 | XX |
| 43.5 | 563 | 0.08616 | 0.50658 | XX |
| 44.0 | 678 | 0.10376 | 0.61035 | XX |
| 44.5 | 534 | 0.08173 | 0.69207 | XX |
| 45.0 | 535 | 0.08188 | 0.77395 | XX |
| 45.5 | 376 | 0.05755 | 0.83150 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 46.0 | 365 | 0.05586 | 0.88736 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 46.5 | 250 | 0.03826 | 0.92562 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 47.0 | 208 | 0.03183 | 0.95745 | XXXXXXXXXXXXXXXXXXXX |
| 47.5 | 111 | 0.01699 | 0.97444 | XXXXXXXXX |
| 48.0 | 73 | 0.01117 | 0.98561 | XXXXX |
| 48.5 | 37 | 0.00566 | 0.99128 | XXX |
| 49.0 | 29 | 0.00444 | 0.99571 | XX |
| 49.5 | 15 | 0.00230 | 0.99801 | X |
| 50.0 | 12 | 0.00184 | 0.99985 | X |
| 50.5 | 1 | 0.00015 | 1.00000 | |

BUTTOCK-HEEL LENGTH

| | | | | |
|------|-----|---------|---------|------------------------------|
| 0.6 | 13 | 0.00199 | 0.00367 | XX |
| 1.1 | 7 | 0.00107 | 0.00474 | X |
| 1.6 | 21 | 0.00321 | 0.00790 | XXX |
| 2.1 | 29 | 0.00444 | 0.01240 | XXXX |
| 2.6 | 30 | 0.00459 | 0.01699 | XXXX |
| 3.1 | 37 | 0.00566 | 0.02265 | XXXXX |
| 3.6 | 52 | 0.00796 | 0.03061 | XXXXXX |
| 4.1 | 69 | 0.01056 | 0.04117 | XXXXXXXXXX |
| 4.6 | 61 | 0.00934 | 0.05051 | XXXXXXXXXX |
| 5.1 | 90 | 0.01377 | 0.06428 | XXXXXXXXXXXX |
| 5.6 | 103 | 0.01576 | 0.08004 | XXXXXXXXXXXXXX |
| 6.1 | 109 | 0.01668 | 0.09672 | XXXXXXXXXXXXXXXX |
| 6.6 | 147 | 0.02250 | 0.11922 | XXXXXXXXXXXXXXXXXX |
| 7.1 | 173 | 0.02648 | 0.14570 | XXXXXXXXXXXXXXXXXXXX |
| 7.6 | 121 | 0.01652 | 0.16422 | XXXXXXXXXXXXXXXXXX |
| 8.1 | 186 | 0.02877 | 0.19299 | XXXXXXXXXXXXXXXXXXXX |
| 8.6 | 222 | 0.03398 | 0.22697 | XXXXXXXXXXXXXXXXXXXXXX |
| 9.1 | 229 | 0.03505 | 0.26201 | XXXXXXXXXXXXXXXXXXXXXXXX |
| 9.6 | 239 | 0.03658 | 0.29959 | XXXXXXXXXXXXXXXXXXXXXXXX |
| 10.1 | 276 | 0.04224 | 0.34083 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 10.6 | 260 | 0.03979 | 0.38062 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 11.1 | 314 | 0.04806 | 0.42868 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 11.6 | 310 | 0.04744 | 0.47612 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 12.1 | 287 | 0.04392 | 0.52005 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 12.6 | 297 | 0.04545 | 0.56550 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 13.1 | 337 | 0.05158 | 0.61708 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 13.6 | 312 | 0.04775 | 0.66483 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 14.1 | 254 | 0.03887 | 0.70370 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 14.6 | 286 | 0.04408 | 0.74778 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 15.1 | 243 | 0.03719 | 0.78497 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 15.6 | 231 | 0.03535 | 0.82032 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 16.1 | 213 | 0.03260 | 0.85292 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 16.6 | 223 | 0.03413 | 0.88705 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 17.1 | 167 | 0.02556 | 0.91261 | XXXXXXXXXXXXXXXXXXXXXXXX |
| 17.6 | 184 | 0.02816 | 0.94077 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 18.1 | 150 | 0.02418 | 0.96495 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 18.6 | 118 | 0.01806 | 0.98301 | XXXXXXXXXXXXXXXXXXXX |
| 19.1 | 54 | 0.00826 | 0.99128 | XXXXXXXXXX |
| 19.6 | 27 | 0.00413 | 0.99541 | XXXX |
| 20.1 | 9 | 0.00138 | 0.99679 | X |
| 20.6 | 4 | 0.00061 | 0.99740 | X |
| 21.1 | 3 | 0.00077 | 0.99816 | X |
| 21.6 | 4 | 0.00061 | 0.99878 | X |
| 22.1 | 4 | 0.00061 | 0.99939 | X |
| 22.6 | 2 | 0.00031 | 0.99969 | |
| 23.1 | 1 | 0.00015 | 0.99985 | |
| 23.6 | 1 | 0.00015 | 1.00000 | |

% BODY FAT

| | | | | |
|-------|-----|---------|---------|---------------------------------|
| 113.4 | 3 | 0.00046 | 0.00107 | |
| 115.4 | 18 | 0.00275 | 0.00383 | XX |
| 117.4 | 24 | 0.00367 | 0.00750 | XXX |
| 119.4 | 52 | 0.00796 | 0.01546 | XXXXXX |
| 121.4 | 66 | 0.01010 | 0.02556 | XXXXXXXX |
| 123.4 | 102 | 0.01561 | 0.04117 | XXXXXXXXXXXX |
| 125.4 | 131 | 0.02005 | 0.06122 | XXXXXXXXXXXXXX |
| 127.4 | 153 | 0.02342 | 0.08463 | XXXXXXXXXXXXXXXXXX |
| 129.4 | 232 | 0.03551 | 0.12014 | XXXXXXXXXXXXXXXXXXXXXXXXXX |
| 131.4 | 245 | 0.03750 | 0.15764 | XXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 133.4 | 297 | 0.04545 | 0.20309 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 135.4 | 337 | 0.05158 | 0.25467 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 137.4 | 333 | 0.05096 | 0.30563 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 139.4 | 372 | 0.05693 | 0.36257 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 141.4 | 396 | 0.06061 | 0.42317 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 143.4 | 409 | 0.06260 | 0.48577 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 145.4 | 398 | 0.06091 | 0.54668 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 147.4 | 401 | 0.06137 | 0.60805 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 149.4 | 378 | 0.05785 | 0.66590 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 151.4 | 343 | 0.05249 | 0.71840 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 153.4 | 324 | 0.04959 | 0.76798 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 155.4 | 254 | 0.03887 | 0.80686 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 157.4 | 215 | 0.03290 | 0.83976 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 159.4 | 220 | 0.03367 | 0.87343 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 161.4 | 195 | 0.02984 | 0.90328 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 163.4 | 145 | 0.02219 | 0.92547 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 165.4 | 147 | 0.02250 | 0.94796 | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| 167.4 | 83 | 0.01270 | 0.96067 | XXXXXXXXXXXX |
| 169.4 | 83 | 0.01270 | 0.97337 | XXXXXXXXXXXX |
| 171.4 | 54 | 0.00826 | 0.98163 | XXXXXX |
| 173.4 | 24 | 0.00367 | 0.98531 | XXX |
| 175.4 | 32 | 0.00490 | 0.99020 | XXXX |
| 177.4 | 24 | 0.00367 | 0.99388 | XXX |
| 179.4 | 13 | 0.00199 | 0.99587 | XX |
| 181.4 | 7 | 0.00107 | 0.99694 | X |
| 183.4 | 5 | 0.00077 | 0.99770 | X |
| 185.4 | 7 | 0.00107 | 0.99878 | X |
| 187.4 | 4 | 0.00061 | 0.99939 | |
| 189.4 | 1 | 0.00015 | 0.99954 | |
| 191.4 | 3 | 0.00046 | 1.00000 | |

LEAN BODY WEIGHT