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AN INTRODUCTION TO RELAXED HAND ANTHROPOMETRY

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13. ABSTRACT

Anthropometric data comparing the length of the relaxed hand with the flat, straightened hand are presented. The correlation coefficient between the hand length in the two positions is not high. A forthcoming comprehensive research program on the anthropometry of the hand is revealed.

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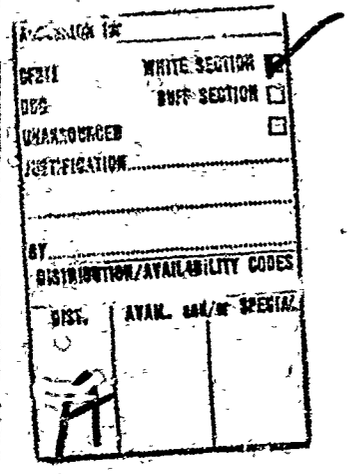

FOREWORD

This work was performed by members of the Anthropology Branch, Human Engineering Division of the Aerospace Medical Research Laboratory, in support of project 7184, "Human Engineering for Air Force Systems," task 718408.

This technical report has been reviewed and is approved.

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As an adjunct to the recent anthropometric survey of Air Force flying personnel[1], four additional measurements were taken on the final 71 subjects to secure some data on the position and configuration of the relaxed or curved hand versus the flat, straightened hand of conventional anthropometry.

The demand for such information has become evident as hand-ware and hand operated controls become more sophisticated and necessitate greater conformity to the user's hand. For example, a full pressure protective glove will enable the operator to work with greater efficiency and less fatigue if patterned to the naturally relaxed hand than a glove designed to a flat hand.

The four additional dimensions (stylion and dactylion heights of both the straightened and relaxed hand) secured on the 71 subjects were taken while the subject was standing on a measuring table. An anthropometer was used to measure from the table top to specified anatomical landmarks. The subjects were told to "let your arm hand naturally," and measurements from the table top to stylion and dactylion were taken. Then the subject was told "now point your fingers towards the ground," and the height of the same two landmarks was measured again. In this way we hoped to avoid as much shoulder and elbow movement as possible.

Table I presents selected comparative statistics for the subsample of 71 and the entire US Air Force survey sample of 2420.

Table II presents data on the additional measurements taken on the subsample of 71 subjects.

Note that our effort to hold the arm and shoulder constant for both hand positions was fairly successful, with stylion height from the floor varying only 3.3 mm.

The correlation coefficient between the two derived measurements, Hand Length and Hand Length, Relaxed, is 0.506. This points up the limitations of predicting one from the other for a given individual. The regression equation for such a prediction is:

$$\text{Relaxed HL} = \text{HL} \times 0.569 + 38.376, \text{ S.E.} = 11.7 \text{ mm.}$$

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[1] Conducted in January-March 1967 by the Anthropology Branch, Behavioral Sciences Laboratory, Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio 45433 and Anthropology Research Project, Antioch College, Yellow Springs, Ohio 45387.

This study reveals a difference in hand length from a straightened to a relaxed position of 45.5 mm (1.79 inches). This refines the tentative figure of 2.0 inches presented by Damon, Stoudt and McFarland, page 118 (1966).

The few data reported here will be supplemented in the future by a program conducted by the Anthropology Branch to provide a rather comprehensive anthropometric description of the adult human hand. This program will include the molding and casting of approximately 100 male and female hands, both stretched flat and relaxed, plus x-rays of each.

TABLE I

	USAF N = 2420		Subsample N = 71	
	$\bar{X}$	SD	$\bar{X}$	SD
Age in Years	30.03	6.31	36.45	4.46
Stature in Centimeters	177.34	6.19	177.92	6.37
Weight in Pounds	173.60	21.44	176.34	21.22
Hand Length (Stylion Height Minus Dactylion Height in Centimeters)[2]	19.40	1.27	19.46	1.21

[2] The values for the direct measurement of Hand Length (stylion to dactylion) on the 1967 US Air Force (USAF) Survey, N=2420, are as follows: $\bar{X}$ = 19.11 cm; S. D. = 0.82 cm.

TABLE II

	$\overline{X}$	SD
A - Stylion Height, Relaxed Hand	86.41 cm	4.13 cm
B - Dactylion Height, Relaxed Hand	71.50 cm	4.01 cm
C - Stylion Height, Straightened Hand	86.74 cm	4.08 cm
D - Dactylion Height, Straightened Hand	67.29 cm	3.50 cm
--Derived Dimensions--		
E - Hand Length	19.46 cm	1.21 cm
F - Hand Length, Relaxed	14.91 cm	1.36 cm

REFERENCE

Damon, Albert, Howard W. Stoudt and Ross A. McFarland, 1966, The Human Body in Equipment Design, Harvard University Press, Cambridge, Massachusetts.

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