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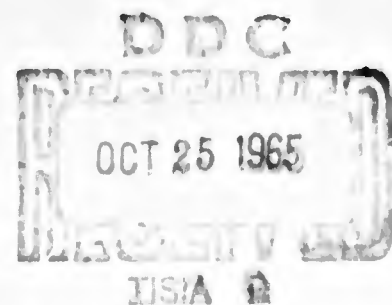
**PRL-TR-65-12**

June 1965

# **Development and Preliminary Validation of the Electronic Data Processing Test-63**

By  
William B. Lecznar  
John K. Klesch, 2d Lt USAF

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**PERSONNEL RESEARCH LABORATORY  
AEROSPACE MEDICAL DIVISION  
AIR FORCE SYSTEMS COMMAND  
Lackland Air Force Base, Texas**

## **FOREWORD**

As part of Project 7717, Selection, Classification, and Evaluation Procedures for Air Force Personnel; Task 771705, Selection and Classification Instruments for Airman Personnel Programs, the Electronic Data Processing Test (EDPT) Form 63 was assembled and standardized by Dr. Ralph S. Kaplan. Dr. Kaplan left the staff of the Personnel Research Laboratory prior to report preparation and preliminary validation of the instrument.

The cooperation extended by the Sheppard Technical Training Center was a necessary part of the validation phase. The assistance provided by TSgt Homer Ray of the Sheppard AFB Test Control Office in administering EDPT to students entering 685XX and 687XX training and by Mr. C.E. White of the Measurement Section, Sheppard Technical Training Center, in obtaining criterion data for the validation is most appreciated. The project could not have been completed without their participation.

This technical report has been reviewed and is approved.

John Patterson, Col USAF  
Commander

Edward H. Kemp  
Technical Director

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## ABSTRACT

As a result of increasing automation of Air Force records, it is necessary to identify airmen who can be trained to handle new electronic data processing equipment. The Electronic Data Processing Test-63 (EDPT-63) was developed to meet this need. The test is composed of 4 subtests: Arithmetic Reasoning, Figure Analogies, Number Series, and Verbal Analogies. This report covers the development and initial validation of EDPT-63 for technical courses 685X0 and 687X0. The test's effectiveness was compared to other possible predictors such as the aptitude indexes of the Airman Qualifying Examination, education, and the Armed Forces Qualification Test (AFQT). EDPT-63 was found to have substantial validity for all of the samples available. In many instances, it was the best single predictor and when its 4 subtests were optimally weighted, they yielded a substantially higher multiple correlation than all other predictors combined. The next most effective predictor was the General Aptitude Index of the Airman Qualifying Examination.

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## DEVELOPMENT AND PRELIMINARY VALIDATION OF THE ELECTRONIC DATA PROCESSING TEST -63

### I. INTRODUCTION

As the electronic computer and its applications broadened in scope, the Air Force naturally became one of the prime users of such equipment. An early use was, of course, in programming the trajectory of our ballistic missiles. The data processing field, however, was expanding in its automation. The Air Force had no formal training course in-house and Air Force personnel obtained their training through the customer service departments of electronic data processing equipment manufacturers. Selection for such training sometimes involved a particular test used by the manufacturer, but no common instrument or qualifying score was available Air Force wide.

In late 1961, the Strategic Air Command indicated its desire for a test in Air Force inventory that could be used for selecting Air Force personnel for computer programmer training. This need led to a requirement for development and standardization of the Electronic Data Processing Test - 63 (EDPT-63). By mid-1964, the Air Force established a formal course of training in this field and data were obtained for an early validation of the test. This report describes the EDPT and presents some early results of its use in the Air Force.

### II. TEST DEVELOPMENT AND STANDARDIZATION

Because there were no Air Force technical training courses in operational at the time of EDPT development, the first form of the test was patterned after, and normed to, the IBM Programmer Aptitude Test (IBM PAT).

Items were selected from inventory for the subtests designated as Arithmetic Reasoning, Figure Analogies, and Verbal Analogies; items for the Number Series section were constructed specifically for the EDPT. In a trial administration of these 120 items, 30 per subtest, the Figure Analogies were patently too difficult for the intended population. Statistics for the items selected had been based originally on a group of college sophomores. A new set of Figure Analogies items was selected and the EDPT was recast and administered for norming purposes. As compared with IBM PAT, the EDPT differed in two basic ways:

1. it contained verbal analogies items;
2. it was in spiral omnibus form administered as a power test rather than in separately timed discrete subtests.

For the standardization, Air Force enlistees in basic military training were used as the base sample. The nature of the programmer task and the selection criteria used for entry to customer training programs indicated that only enlistees in Armed Forces Qualification Test Categories I and II (percentiles 65-100) would be appropriate. Testing was done in June 1962 by giving the IBM PAT (according to the manual for its administration) in counterbalanced order with EDPT as a 90-minute power test to approximately 1,150 airmen. After processing there were 1,144 complete data cases. Comparison of the two groups determined by the order of test administration indicated they could be combined for further work (see Appendix).

For lack of Air Force training course data, qualifying scores on EDPT were set equivalent to the B and C level cutoffs on the IBM PAT by determining the cumulative percentage of airmen scoring 50 (the B level) and above on IBM PAT and locating the EDPT raw score which had an equivalent cumulative percentage of cases at that score. The C level was similarly determined. A table of equivalents is in the Appendix (Table 4). The B cutoff was to be applied for selection to the programmer area, AFSC 687XX, and the C level for the EDP equipment operator field, AFSC 685XX. In the standardization sample, the correlation between the IBM and Air Force programmer tests was .73; the distribution of scores on the two tests verified the notion that only AFQT Category I and II airmen had sufficient ability to handle the test content.

### III. PRELIMINARY VALIDATION

Prior to actual field use of the test for selection, it was possible to give it to enlisted personnel entering the ABR 68530A course, Data Processing Machine Operator, but the ABR 68730 course, Programming Specialist, was not established until after EDPT-63 was announced for operational use in January 1964. Therefore the data which follow involve unselected samples on EDPT for the 685XX field, but samples screened on EDPT for the 687XX training.

During the period in 1963 in which EDPT was administered, the 685XX course went through a content revision. The earlier course was covered by five blocks of training and the later version by four blocks; the first three blocks were common to both versions.

| <u>Block</u> | <u>Old Course Title</u>                             | <u>New Course Title</u>            |
|--------------|-----------------------------------------------------|------------------------------------|
| I            | Basic Operation & Wiring of Data Processing Machine | Same                               |
| II           | Collator - 089                                      | Same                               |
| III          | Accounting Machine - 407                            | Same                               |
| IV           | Reproducing Punch - 514                             | Electronic Data Processing Machine |
| V            | Calculating Punch - 602                             |                                    |

A second complicating feature in the validation was lack of data on some cases; that is, some cases did not have the Airman Qualifying Examination (AQE) aptitude indexes (AIs) and some cases lacked EDPT. This led to validation for several separate samples identified and defined as follows:

- Sample 1 - Course 685XX - Old with EDPT and AIs, N = 65
- Sample 2 - Course 685XX - New with EDPT and AIs, N = 60
- Sample 3 - Course 685XX - Old with EDPT only, N = 65
- Sample 4 - Course 685XX - New with EDPT only, N = 66
- Sample 5 - Course 685XX - Old with AIs only, N = 66
- Sample 6 - Course 685XX - New with AIs only, N = 355
- Sample 7 - Course 687XX - Data provided by Air Training Command, N = 98
- Sample 8 - Course 687XX - Graduates matched to EDPT answer sheets, N = 143

Nearly all of the cases in Sample 7 are a part of Sample 8, but Sample 7 data were provided in a form which did not permit identification of individuals.



The validation process first involved scoring the EDPT by its individual item types; this made available four subtest raw scores plus a total raw score for Samples 1 through 4 and 8. Aptitude indexes were recorded where available. Block grades and final school grade in the course of training were also recorded; these variables were the criteria to be predicted. Intercorrelational and multiple regression analyses were run on Samples 1, 2, 3, 4, and 8 with means and standard deviations reported; only intercorrelations were obtained for Samples 5 and 6.

#### IV. RESULTS AND CONCLUSIONS

A summary of the EDPT and AI validities by sample are shown in Table 1; more complete data are given in the Appendix. EDPT has substantial correlations for both the 685X0 and 687X0 courses. Notice also that it compares favorably to the AIs as a predictor. Furthermore, Table 6 shows that EDPT is consistently the best composite predictor, compared with AIs, for

*Table 1. Validities of Electronic Data Processing Test - 63 and Airman Qualifying Examination Aptitude Indexes for Courses ABR685X0 and 687X0*

| Sample  | N   | EDPT             | Mech | Admin | Gen | Elec |
|---------|-----|------------------|------|-------|-----|------|
| 1 685X0 | 65  | .66              | .32  | .21   | .51 | .39  |
| 2 685X0 | 60  | .31              | .32  | .14   | .30 | .30  |
| 3 685X0 | 65  | .55              | --   | --    | --  | --   |
| 4 685X0 | 66  | .45              | --   | --    | --  | --   |
| 5 685X0 | 66  | --               | .08  | .03   | .11 | .08  |
| 6 685X0 | 355 | --               | .33  | .10   | .30 | .39  |
| 7 687X0 | 98  | .44 <sup>a</sup> | --   | --    | --  | --   |
| 8 687X0 | 143 | .36 <sup>a</sup> | .25  | .09   | .11 | .24  |

<sup>a</sup> Not corrected for restriction resulting from selection to training using minimum EDPT score. Corrected values are .60 and .50, respectively, using SD from EDPT standardization sample as the unrestricted group. SD for AIs in the standardization sample are not available so that corrected validity of EDPT in Sample 8 cannot be compared directly with AI validities which are uncorrected.

each of the block grades in the two technical courses. It should be noted, however, that in Tables 6 (Block grades) and 8-14 (Intercorrelations) the Arithmetic Reasoning subtest of EDPT often has a higher validity than EDPT total score. This is an indication that improvement in EDPT effectiveness might be accomplished by reweighting the subtests, since they now are equally weighted.

From Table 1 it can also be seen that the General AI has substantial validities compared to the other AIs and this point is reinforced when validities for block grades are seen in Table 6. From the intercorrelations in Tables 8-14, the General AI is seen to correlate as high as .53 with EDPT. This value suggests the General AI might be used as an initial screening device for airmen who are to take the EDPT.

Comparisons of regression equations based on optimal weighting of all predictors versus equations derived from selected subsets of predictors are reported in Table 2 and in Table 7. These results are expressed in terms of differences in squared multiple correlations ( $R^2$ ).



Table 2. Comparison of Efficiency of Total Score and Optimally Weighted Subtests of the Electronic Data Processing Test-63

| Sample | Model  | Predictors              | R   | R <sup>2</sup> | F <sup>a</sup> | Significance Level |
|--------|--------|-------------------------|-----|----------------|----------------|--------------------|
| 1      | Full   | EDPT Total + 4 Subtests | .72 | .52            | --             | --                 |
|        | Subset | EDPT Total              | .66 | .44            | 3.3            | .05                |
| 2      | Full   | EDPT Total + 4 Subtests | .37 | .14            | --             | --                 |
|        | Subset | EDPT Total              | .31 | .10            | .81            | NS                 |
| 3      | Full   | EDPT Total + 4 Subtests | .62 | .39            | --             | --                 |
|        | Subset | EDPT Total              | .55 | .30            | 3.00           | .05                |
| 4      | Full   | EDPT Total + 4 Subtests | .53 | .28            | --             | --                 |
|        | Subset | EDPT Total              | .45 | .20            | 2.21           | NS                 |
| 8      | Full   | EDPT Total + 4 Subtests | .49 | .24            | --             | --                 |
|        | Subset | EDPT Total              | .36 | .13            | 6.1            | .01                |

<sup>a</sup> F test computed as described by: Bottenberg, R. A. & Ward, J. H. Jr. *Applied multiple linear regression*. PRL-TDR-63-6, AD-413 128. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, March 1963.

The first series of multiple regression problems was done to see if any predictive efficiency could be gained by reweighting<sup>1</sup> the subtests of EDPT. Table 2 shows that some significant differences were obtained between the R<sup>2</sup>s of EDPT total score alone *versus* optimal weighting of its subtests in both the 685X0 samples (.05 level) and 687X0 sample (.01 level). Cross validations have not been carried out thus far and shrinkage in the R<sup>2</sup>s can be expected to occur. Since the amount of shrinkage will depend on how seriously the sample fluctuations affected the correlations of the predictors, no definite conclusions as to the validity of the findings can be made. Table 15 contains the summary statistics for the samples which show (along with the validities in Table 1) that the samples were fairly stable. The consistency of the efficiency gained, even though not significant in two of the samples, favors reweighting of the EDPT subtests.

The second series of multiple regression problems was done for three reasons: (1) to test the usefulness of EDPT; (2) to see if adding other predictors would improve the efficiency of EDPT; and (3) to further test the usefulness of reweighting the four subtests.

To test the usefulness of EDPT as it is now used, various other predictors were combined with EDPT total (full model) and without it (restricted model). This was done only in Sample 8 where, in addition to the AQE aptitude indexes and education, AFQT (highly loaded on Arithmetic Reasoning) was available. Table 7 shows that when EDPT is dropped from a combination of it with AIs, AFQT, and education the R<sup>2</sup> differs by .06; this difference is significant beyond the .01 level. Thus EDPT is shown as a very effective single predictor. When in the above regression problem, the restricted model is EDPT total, a difference significant at the .05 level is found between the R<sup>2</sup>s. This means that by adding the weighted scores of these other predictors, it is possible to improve predictive efficiency of EDPT.

<sup>1</sup> Currently each test receives a weight of 1.

Also in Sample 1 when the General AI is added to EDPT the combination is seen to be significantly better than EDPT alone.

While the above results show that some improvement can be made by adding various predictors, notice in samples 2 and 8 that the addition of General AI to EDPT did not increase the prediction of final grades. All of the samples in Table 7 show that when the subtests of EDPT are reweighted, the  $R^2$ s are so improved that adding all other possible predictors does not result in significantly greater  $R^2$ s. Thus from a predictive efficiency point of view, the best procedure available is to reweight the subtests. Also when consideration is given as to how to make any changes in the present system, reweighting of the subtests is more practical. To add other predictors to EDPT total would involve supplying all the various scores of the predictors and their respective weights to the field processors, who would become overburdened with unnecessary paper work. On the other hand, reweighting the subtests would involve only applying the equations as given below. Using integral weights and dropping the constant, the equations would be as follows:

For 685X0

$$\text{EDPT total} = \text{AR} (5) + \text{FA} (3) + \text{NS} (1) + \text{VA} (1)$$

For 687X0

$$\text{EDPT total} = \text{AR} (5) + \text{FA} (1) + \text{NS} (1) + \text{VA} (2)$$

The similarity of the two equations suggests use of the equation for the 687X0 course for both courses to simplify field processing of EDPT. Any loss in validity of EDPT for the 685X0 course would be negligible in terms of the saving from decreased scoring time required. If such weights hold up under cross validation, they can be built into subsequent versions of EDPT by either adding or subtracting items for each of the subtests, as appropriate, in order to achieve the desired ratio of subtest standard deviations. Then the field processor would only have to score the test as a unit. An alternative would be to score by subtest, multiply each score by its appropriate integral weight, and add to obtain a total score. Since Arithmetic Reasoning items take so much testing time per unit, this might be the preferred choice.

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**APPENDIX. INTERCORRELATIONS AND DESCRIPTIVE STATISTICAL DATA**

**Table 3. Descriptive Statistics for Standardization  
Samples by Order of Test Administration**

|                                   | <b>IBM PAT</b> |           | <b>EDPT</b> |           |
|-----------------------------------|----------------|-----------|-------------|-----------|
|                                   | <b>M</b>       | <b>SD</b> | <b>M</b>    | <b>SD</b> |
| <b>PAT First<br/>(N = 572)</b>    | 34.85          | 12.59     | 53.89       | 14.12     |
| <b>EDPT First<br/>(N = 572)</b>   | 35.38          | 12.23     | 51.52       | 14.88     |
| <b>Total Group<br/>(N = 1144)</b> | 35.09          | 12.51     | 52.75       | 14.74     |

**Table 4. Equivalence of IBM Programmer Aptitude Test Scores and Electronic Data Processing Test-63 Scores**

*(N = 1,144 basic airmen, Category I and II)*

| IBM PAT<br>Score <sup>a</sup> | Cumulative<br>N | EDPT<br>Cumulative % | EDPT<br>Equivalent |
|-------------------------------|-----------------|----------------------|--------------------|
| 80                            | 1               | .09                  | 105                |
| 72                            | 3               | .26                  | 103                |
| 69                            | 7               | .61                  | 97                 |
| 68                            | 8               | .61                  | 96                 |
| 67                            | 9               | .87                  | 95                 |
| 66                            | 11              | 1.14                 | 94                 |
| 65                            | 16              | 1.31                 | 92                 |
| 64                            | 18              | 1.57                 | 91                 |
| 63                            | 20              | 2.01                 | 90                 |
| 62                            | 27              | 2.19                 | 88                 |
| 61                            | 31              | 2.88                 | 86                 |
| 60                            | 34              | 3.15                 | 85                 |
| 59                            | 41              | 3.50                 | 84                 |
| 58                            | 43              | 3.85                 | 83                 |
| 57                            | 51              | 4.63                 | 81                 |
| 56                            | 56              | 5.16                 | 80                 |
| 55                            | 67              | 5.77                 | 78                 |
| 54                            | 77              | 6.21                 | 77                 |
| 53                            | 86              | 7.26                 | 76                 |
| 52                            | 98              | 8.65                 | 74                 |
| 51                            | 107             | 9.35                 | 73                 |
| 50                            | 126             | 11.28                | 71                 |
| 49                            | 144             | 12.41                | 70                 |
| 48                            | 166             | 15.30                | 68                 |
| 47                            | 190             | 16.52                | 67                 |
| 46                            | 213             | 19.06                | 65                 |
| 45                            | 247             | 22.20                | 63                 |
| 44                            | 280             | 24.39                | 62                 |
| 43                            | 310             | 26.31                | 61                 |
| 42                            | 343             | 30.77                | 59                 |
| 41                            | 383             | 32.69                | 58                 |
| 40                            | 419             | 35.40                | 57                 |
| 39                            | 455             | 38.64                | 56                 |
| 38                            | 501             | 44.49                | 54                 |
| 37                            | 535             | 47.03                | 53                 |
| 36                            | 572             | 49.74                | 52                 |
| 35                            | 600             | 52.45                | 51                 |
| 34                            | 635             | 55.24                | 50                 |
| 33                            | 667             | 58.30                | 49                 |
| 32                            | 701             | 60.49                | 48                 |
| 31                            | 736             | 63.81                | 47                 |
| 30                            | 765             | 65.91                | 46                 |

<sup>a</sup>IBM PAT scores are grouped into A (60 and above), B (50-59), C (40-49), and D (39 and below) levels.

Table 5. Bivariate Distribution for IBM Programmer Aptitude Test  
and Electronic Data Processing Test-63

(N = 1,144 NPS Male Basic Airmen, AFQT Category I and II)

|                                 |     | IBM PAT |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |                                       |  |  |  |  |
|---------------------------------|-----|---------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------------------------------|--|--|--|--|
| EDPT                            | 0-3 | 4-7     | 8-11 | 12-15 | 16-19 | 20-23 | 24-27 | 28-31 | 32-35 | 36-39 | 40-43 | 44-47 | 48-51 | 52-55 | 56-59 | 60-63 | 64-67 | 68-71 | 72-75 | 76-79 | 80-83 | Total |                                       |  |  |  |  |
| 103-109                         |     |         |      |       |       |       |       |       |       |       |       |       |       |       |       |       | 1     | 1     |       |       |       | 1     | 3                                     |  |  |  |  |
| 96-102                          |     |         |      |       |       |       |       |       |       |       |       |       |       |       |       |       | 2     | 2     | 1     | 1     |       |       | 4                                     |  |  |  |  |
| 89-95                           |     |         |      |       |       |       |       |       |       |       | 1     |       | 1     | 2     | 2     | 5     | 4     | 2     |       |       |       | 17    |                                       |  |  |  |  |
| 82-88                           |     |         |      |       |       |       |       |       |       | 1     | 1     | 2     | 4     | 6     | 3     | 4     | 1     | 1     | 1     |       |       | 24    |                                       |  |  |  |  |
| 75-81                           |     |         |      |       |       |       |       |       |       | 1     | 2     | 15    | 7     | 7     | 7     | 1     |       |       |       |       |       | 42    |                                       |  |  |  |  |
| 68-74                           |     |         |      |       |       |       | 1     | 1     | 1     | 9     | 16    | 25    | 11    | 11    | 5     | 3     |       |       | 1     |       |       | 83    |                                       |  |  |  |  |
| 61-67                           |     |         |      |       |       |       | 3     | 5     | 13    | 19    | 28    | 22    | 20    | 10    | 3     | 2     | 2     |       |       |       |       | 128   |                                       |  |  |  |  |
| 54-60                           |     |         | 1    |       |       |       |       |       | 9     | 15    | 26    | 32    | 34    | 56    | 43    | 24    | 12    | 3     |       |       |       | 208   |                                       |  |  |  |  |
| 47-53                           |     |         | 1    |       |       |       |       |       | 7     | 10    | 26    | 32    | 34    | 56    | 24    | 16    | 11    | 2     |       |       |       | 219   |                                       |  |  |  |  |
| 40-46                           |     |         |      |       |       |       |       |       | 2     | 7     | 17    | 23    | 35    | 35    | 23    | 20    | 9     | 2     |       |       |       | 212   |                                       |  |  |  |  |
| 33-39                           | 5   | 4       | 2    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 142   |                                       |  |  |  |  |
| 26-32                           | 1   | 1       | 5    |       |       |       |       |       | 14    | 19    | 23    | 33    | 21    | 14    | 7     | 3     | 1     |       |       |       |       | 45    |                                       |  |  |  |  |
| 19-25                           |     | 5       | 1    |       |       |       |       |       | 4     | 5     | 19    | 12    | 4     | 3     | 1     |       |       |       |       |       |       | 12    |                                       |  |  |  |  |
| 12-18                           | 1   | 2       | 3    |       |       |       |       |       | 1     | 1     |       |       |       |       |       |       |       |       |       |       |       | 4     |                                       |  |  |  |  |
| 5-11                            |     | 2       |      |       |       |       |       |       |       | 1     |       |       |       |       |       |       |       |       |       |       |       | 1     |                                       |  |  |  |  |
| Total                           | 7   | 14      | 14   | 29    | 55    | 76    | 120   | 129   | 129   | 153   | 138   | 114   | 68    | 42    | 22    | 16    | 10    | 5     | 2     | 0     | 1     | 1144  |                                       |  |  |  |  |
| IBM PAT Mean = 35.09 SD = 12.51 |     |         |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | EDPT Mean = 52.75 SD = 14.74 r = .728 |  |  |  |  |

IBM PAT Mean = 35.09 SD = 12.51

EDPT Mean = 52.75 SD = 14.74 r = .728

Table 6. Validities of Various Predictors for Block Grades <sup>a</sup>

| Sample | Block | Description            | Predictors <sup>b</sup> |    |    |     |     |     |     |     |     |      |
|--------|-------|------------------------|-------------------------|----|----|-----|-----|-----|-----|-----|-----|------|
|        |       |                        | EDPT                    | AR | FA | NS  | VA  | M   | A   | G   | E   | Educ |
| 1      | 1     | Operation & Wiring     | 22                      | 35 | 16 | 16  | 01  | 05  | 26  | 33  | 09  | 15   |
|        | 2     | Collator 089           | 38                      | 33 | 34 | 27  | 23  | 38  | 19  | 37  | 31  | 07   |
|        | 3     | Accounting Machine     | 59                      | 56 | 55 | 47  | 23  | 32  | 17  | 45  | 44  | -13  |
|        | 4     | Reproducing Punch      | 59                      | 64 | 40 | 48  | 30  | 17  | 14  | 39  | 23  | 13   |
|        | 5     | Calculating Punch      | 62                      | 57 | 59 | 40  | 36  | 21  | -03 | 31  | 39  | 01   |
| 2      | 1     | Operation & Wiring     | 08                      | 08 | 11 | 07  | -03 | 16  | 11  | 18  | 19  | 16   |
|        | 2     | Collator 089           | 36                      | 33 | 28 | 27  | 22  | 25  | 05  | 13  | 24  | 08   |
|        | 3     | Accounting Machine     | 32                      | 31 | 25 | 17  | 29  | 28  | 12  | 29  | 26  | 16   |
|        | 4     | Electronic Data        | 29                      | 36 | 18 | 19  | 18  | 27  | 18  | 33  | 23  | -03  |
|        |       | Processing Machine     |                         |    |    |     |     |     |     |     |     |      |
| 3      | 1     | Operation & Wiring     | 35                      | 34 | 31 | 23  | 28  | --  | --  | --  | --  | 18   |
|        | 2     | Collator               | 39                      | 38 | 44 | 16  | 30  | --  | --  | --  | --  | 07   |
|        | 3     | Accounting Machine     | 59                      | 60 | 51 | 42  | 42  | --  | --  | --  | --  | 09   |
|        | 4     | Reproducing Punch      | 45                      | 47 | 50 | 19  | 32  | --  | --  | --  | --  | 13   |
|        | 5     | Calculating Punch      | 42                      | 46 | 35 | 27  | 29  | --  | --  | --  | --  | 12   |
| 4      | 1     | Operation & Wiring     | 21                      | 25 | 24 | 14  | 05  | --  | --  | --  | --  | -04  |
|        | 2     | Collator               | 32                      | 39 | 23 | 22  | 22  | --  | --  | --  | --  | -03  |
|        | 3     | Accounting Machine     | 51                      | 52 | 45 | 34  | 33  | --  | --  | --  | --  | 13   |
|        | 4     | Electronic Data        | 41                      | 45 | 33 | 35  | 20  | --  | --  | --  | --  | -01  |
|        |       | Processing Machine     |                         |    |    |     |     |     |     |     |     |      |
| 5      | 1     | Operation & Wiring     | --                      | -- | -- | --  | --  | -20 | -07 | -08 | -19 | 04   |
|        | 2     | Collator               | --                      | -- | -- | --  | --  | 06  | -03 | 03  | 06  | 04   |
|        | 3     | Accounting Machine     | --                      | -- | -- | --  | --  | 18  | 05  | 10  | 15  | -07  |
|        | 4     | Reproducing Punch      | --                      | -- | -- | --  | --  | 08  | 03  | 11  | 08  | 03   |
|        | 5     | Calculating Punch      | --                      | -- | -- | --  | --  | 00  | -01 | 10  | 02  | 10   |
| 6      | 1     | Operation & Wiring     | --                      | -- | -- | --  | --  | 25  | 03  | 17  | 27  | 18   |
|        | 2     | Collator               | --                      | -- | -- | --  | --  | 15  | 09  | 18  | 23  | 12   |
|        | 3     | Accounting Machine     | --                      | -- | -- | --  | --  | 35  | 08  | 28  | 38  | 12   |
|        | 4     | Electronic Data        | --                      | -- | -- | --  | --  | 31  | 14  | 31  | 35  | 22   |
|        |       | Processing Machine     |                         |    |    |     |     |     |     |     |     |      |
| 8      | 1     | Intro to Data Process. | 32                      | 42 | 10 | -02 | 26  | 23  | 12  | 18  | 21  | 28   |
|        | 2     | Basic Programming      | 40                      | 46 | 14 | 07  | 28  | 25  | 07  | 12  | 25  | 26   |
|        | 3     | Input/Output Routines  | 28                      | 37 | 09 | 01  | 19  | 20  | 11  | 11  | 17  | 27   |
|        | 4     | Program Language       | 18                      | 21 | 09 | 09  | 06  | 06  | -02 | -07 | 12  | 02   |

<sup>a</sup> Decimal points omitted.

<sup>b</sup> Identification of predictors listed above.

EDPT - Total score

AR - Arithmetic Reasoning subtest

FA - Figure Analogies subtest

NS - Number Series subtest

VA - Verbal Analogies subtest

M - Mechanical AI

A - Administrative AI

G - General AI

E - Electronics AI

Educ - Education in years



Table 7. Comparisons of Efficiency of  
Various Combinations of Predictors

| Sample | Model  | Predictors <sup>a</sup>                            | R   | R <sup>2</sup> | F <sup>b</sup> | Significance Level |
|--------|--------|----------------------------------------------------|-----|----------------|----------------|--------------------|
| 1      | Full   | EDPT Total + 4 Subtests + Education + 4 AIs        | .76 | .58            | --             | --                 |
|        | Subset | 4 Subtests of EDPT                                 | .72 | .52            | 1.60           | NS                 |
|        | Full   | 4 Subtests + 4 AIs                                 | .75 | .57            | --             | --                 |
|        | Subset | 4 AIs                                              | .56 | .31            | 8.43           | .01                |
|        | Full   | EDPT Total + General AI                            | .69 | .48            | --             | --                 |
|        | Subset | EDPT Total                                         | .66 | .44            | 4.76           | .05                |
| 2      | Full   | EDPT Total + 4 Subtests + Education + 4 AIs        | .45 | .20            | --             | --                 |
|        | Subset | 4 Subtests of EDPT                                 | .37 | .14            | .76            | NS                 |
|        | Full   | 4 Subtests + 4 AIs                                 | .44 | .19            | --             | --                 |
|        | Subset | 4 AIs                                              | .36 | .13            | .95            | NS                 |
|        | Full   | EDPT Total + General AI                            | .35 | .12            | --             | --                 |
|        | Subset | EDPT Total                                         | .31 | .10            | 1.30           | NS                 |
| 3      | Full   | EDPT Total + 4 Subtests + Education                | .62 | .39            | --             | --                 |
|        | Subset | 4 Subtests of EDPT                                 | .62 | .39            | 0              | NS                 |
| 4      | Full   | EDPT Total + 4 Subtests + Education                | .56 | .31            | --             | --                 |
|        | Subset | 4 Subtests of EDPT                                 | .53 | .28            | 2.65           | NS                 |
| 8      | Full   | EDPT Total + 4 Subtests + Education + 4 AIs + AFQT | .54 | .29            | --             | --                 |
|        | Subset | 4 Subtests of EDPT                                 | .49 | .24            | 1.57           | NS                 |
|        | Full   | 4 Subtests + 4 AIs                                 | .51 | .26            | --             | --                 |
|        | Subset | 4 AIs                                              | .28 | .08            | 8.18           | .01                |
|        | Full   | EDPT Total + 4 AIs + Education + AFQT              | .48 | .23            | --             | --                 |
|        | Subset | 4 AIs + Education + AFQT                           | .41 | .17            | 10.00          | .01                |
|        | Full   | EDPT Total + 4 AIs + Education + AFQT              | .48 | .23            | --             | --                 |
|        | Subset | EDPT Total                                         | .36 | .13            | 2.91           | .05                |
|        | Full   | EDPT Total + General                               | .36 | .13            | --             | --                 |
|        | Subset | EDPT Total                                         | .36 | .13            | 0              | NS                 |

<sup>a</sup> Only samples 1, 2, and 8 have the AIs considered in the regression problems and only sample 8 has AFQT scores considered. The variable "Education" was years of formal education completed.

<sup>b</sup> F test computed as described by Bottenberg & Ward (1963, Ch. 2).

**Table 8. Intercorrelations of Predictor and Criterion Variables for Sample 1**

(N = 65)

| Variable       | 1 | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  | 11 |
|----------------|---|----|----|----|----|----|----|----|----|-----|----|
| 1 EDPT Total   |   | 80 | 85 | 77 | 70 | 27 | 23 | 49 | 29 | -07 | 66 |
| 2 Arith Reas   |   |    | 54 | 58 | 36 | 20 | 18 | 47 | 22 | -01 | 68 |
| 3 Fig Anal     |   |    |    | 48 | 60 | 22 | 11 | 38 | 44 | -11 | 55 |
| 4 No Series    |   |    |    |    | 29 | 25 | 27 | 48 | 20 | -02 | 49 |
| 5 Verbal Anal  |   |    |    |    |    | 18 | 17 | 19 | 00 | -08 | 32 |
| 6 Mech AI      |   |    |    |    |    |    | 13 | 49 | 26 | -17 | 32 |
| 7 Adm AI       |   |    |    |    |    |    |    | 51 | 09 | 10  | 21 |
| 8 Gen AI       |   |    |    |    |    |    |    |    | 37 | 07  | 51 |
| 9 Elec AI      |   |    |    |    |    |    |    |    |    | -07 | 39 |
| 10 Education   |   |    |    |    |    |    |    |    |    |     | 07 |
| 11 Final Grade |   |    |    |    |    |    |    |    |    |     |    |

**Note.** — Decimal points are omitted.

**Table 9. Intercorrelations of Predictor and Criterion Variables for Sample 2**

(N = 60)

| Variable       | 1 | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  | 11 |
|----------------|---|----|----|----|----|----|----|----|----|-----|----|
| 1 EDPT Total   |   | 73 | 79 | 82 | 77 | 40 | 41 | 53 | 54 | 14  | 31 |
| 2 Arith Reas   |   |    | 34 | 46 | 55 | 25 | 35 | 53 | 51 | 09  | 35 |
| 3 Fig Anal     |   |    |    | 55 | 49 | 45 | 30 | 36 | 43 | 04  | 24 |
| 4 No Series    |   |    |    |    | 46 | 27 | 27 | 41 | 34 | 07  | 20 |
| 5 Verbal Anal  |   |    |    |    |    | 26 | 40 | 38 | 42 | 28  | 19 |
| 6 Mech AI      |   |    |    |    |    |    | 33 | 56 | 71 | -03 | 32 |
| 7 Adm AI       |   |    |    |    |    |    |    | 69 | 58 | -09 | 14 |
| 8 Gen AI       |   |    |    |    |    |    |    |    | 76 | 06  | 30 |
| 9 Elec AI      |   |    |    |    |    |    |    |    |    | 16  | 30 |
| 10 Education   |   |    |    |    |    |    |    |    |    |     | 10 |
| 11 Final Grade |   |    |    |    |    |    |    |    |    |     |    |

**Note.** — Decimal points are omitted.

**Table 10. Intercorrelations of Predictor and Criterion Variables for Sample 3**  
(N = 65)

| Variable      | 1 | 2  | 3  | 4  | 5  | 6  | 7  |
|---------------|---|----|----|----|----|----|----|
| 1 EDPT Total  |   | 85 | 84 | 82 | 81 | 24 | 55 |
| 2 Arith Reas  |   |    | 65 | 57 | 58 | 27 | 57 |
| 3 Fig Anal    |   |    |    | 56 | 57 | 16 | 54 |
| 4 No Series   |   |    |    |    | 58 | 23 | 31 |
| 5 Verbal Anal |   |    |    |    |    | 12 | 41 |
| 6 Education   |   |    |    |    |    |    | 14 |
| 7 Final Grade |   |    |    |    |    |    |    |

**Note.** - Decimal points are omitted.

**Table 11. Intercorrelations of Predictor and Criterion Variables for Sample 4**  
(N = 66)

| Variable      | 1 | 2  | 3  | 4  | 5  | 6  | 7  |
|---------------|---|----|----|----|----|----|----|
| 1 EDPT Total  |   | 77 | 86 | 78 | 82 | 33 | 45 |
| 2 Arith Reas  |   |    | 54 | 45 | 51 | 33 | 50 |
| 3 Fig Anal    |   |    |    | 55 | 63 | 25 | 38 |
| 4 No Series   |   |    |    |    | 50 | 21 | 32 |
| 5 Verbal Anal |   |    |    |    |    | 29 | 24 |
| 6 Education   |   |    |    |    |    |    | 02 |
| 7 Final Grade |   |    |    |    |    |    |    |

**Note.** - Decimal points are omitted.

**Table 12. Intercorrelations of Predictor and Criterion Variables for Sample 5**  
(N = 66)

| Variable      | 1 | 2  | 3  | 4  | 5   | 6  |
|---------------|---|----|----|----|-----|----|
| 1 Mech AI     |   | 36 | 59 | 81 | -30 | 08 |
| 2 Adm AI      |   |    | 79 | 64 | 04  | 03 |
| 3 Gen AI      |   |    |    | 78 | -03 | 11 |
| 4 Elec AI     |   |    |    |    | -27 | 08 |
| 5 Education   |   |    |    |    |     | 03 |
| 6 Final Grade |   |    |    |    |     |    |

**Note.** - Decimal points are omitted.

**Table 13. Intercorrelations of Predictor and Criterion Variables for Sample 6**  
(N = 355)

| Variable      | 1 | 2  | 3  | 4  | 5   | 6  |
|---------------|---|----|----|----|-----|----|
| 1 Mech AI     |   | 17 | 56 | 66 | 04  | 33 |
| 2 Adm AI      |   |    | 48 | 37 | -16 | 10 |
| 3 Gen AI      |   |    |    | 57 | -01 | 30 |
| 4 Elec AI     |   |    |    |    | 01  | 39 |
| 5 Education   |   |    |    |    |     | 20 |
| 6 Final Grade |   |    |    |    |     |    |

**Note.** - Decimal points are omitted.

**Table 14. Intercorrelations of Predictor and Criterion Variables for Sample 8**  
(N = 143)

| Variable       | 1 | 2  | 3  | 4  | 5   | 6   | 7   | 8   | 9  | 10 | 11  | 12 |
|----------------|---|----|----|----|-----|-----|-----|-----|----|----|-----|----|
| 1 EDPT Total   |   | 78 | 60 | 56 | 57  | 32  | 19  | 33  | 21 | 33 | 26  | 36 |
| 2 Arith Reas   |   |    | 32 | 26 | 29  | 36  | 29  | 37  | 22 | 29 | 22  | 46 |
| 3 Fig Anal     |   |    |    | 15 | 18  | 29  | 15  | 36  | 12 | 30 | 27  | 13 |
| 4 No Series    |   |    |    |    | -04 | -06 | -14 | -13 | 08 | 00 | -07 | 03 |
| 5 Verbal Anal  |   |    |    |    |     | 21  | 17  | 26  | 09 | 27 | 26  | 25 |
| 6 AFQT         |   |    |    |    |     |     | 11  | 57  | 01 | 16 | 30  | 30 |
| 7 Education    |   |    |    |    |     |     |     | 18  | 08 | 17 | 18  | 28 |
| 8 Mech AI      |   |    |    |    |     |     |     |     | 14 | 44 | 53  | 25 |
| 9 Adm AI       |   |    |    |    |     |     |     |     |    | 59 | 25  | 09 |
| 10 Gen AI      |   |    |    |    |     |     |     |     |    |    | 40  | 11 |
| 11 Elec AI     |   |    |    |    |     |     |     |     |    |    |     | 24 |
| 12 Final Grade |   |    |    |    |     |     |     |     |    |    |     |    |

**Note.** - Decimal points are omitted.

Table 15. Summary Statistics for Test Variables and School Grade for All Samples

| Variable     | Sample 1<br>N = 65 |       | Sample 2<br>N = 60 |       | Sample 3<br>N = 65 |       | Sample 4<br>N = 66 |       | Sample 5<br>N = 66 |       | Sample 6<br>N = 355 |       | Sample 7<br>N = 98 |      | Sample 8<br>N = 143 |       |
|--------------|--------------------|-------|--------------------|-------|--------------------|-------|--------------------|-------|--------------------|-------|---------------------|-------|--------------------|------|---------------------|-------|
|              | Mean               | SD    | Mean               | SD    | Mean               | SD    | Mean               | SD    | Mean               | SD    | Mean                | SD    | Mean               | SD   | Mean                | SD    |
| EDPT Total   | 47.40              | 15.77 | 44.93              | 14.00 | 49.08              | 16.06 | 45.38              | 15.72 | --                 | --    | --                  | --    | 83.43              | 9.70 | 84.48               | 10.12 |
| Arith Reas   | 8.29               | 4.81  | 7.97               | 4.26  | 8.66               | 5.09  | 7.39               | 4.40  | --                 | --    | --                  | --    | --                 | --   | 18.69               | 4.66  |
| Fig Anal     | 15.03              | 5.57  | 13.53              | 5.08  | 15.49              | 4.86  | 14.06              | 5.36  | --                 | --    | --                  | --    | --                 | --   | 24.85               | 3.22  |
| No Series    | 14.09              | 5.34  | 14.30              | 5.04  | 15.20              | 4.92  | 13.83              | 4.97  | --                 | --    | --                  | --    | --                 | --   | 22.41               | 4.12  |
| Verbal Anal  | 9.98               | 4.44  | 9.13               | 3.60  | 9.72               | 4.46  | 10.09              | 4.77  | --                 | --    | --                  | --    | --                 | --   | 18.54               | 3.96  |
| Mech AI      | 48.08              | 20.68 | 52.58              | 22.22 | --                 | --    | --                 | --    | 56.67              | 22.48 | 63.00               | 21.54 | --                 | --   | 85.10               | 13.36 |
| Adm AI       | 63.54              | 17.67 | 60.93              | 16.77 | --                 | --    | --                 | --    | 74.02              | 21.52 | 88.21               | 8.45  | --                 | --   | 89.65               | 7.40  |
| Gen AI       | 60.62              | 17.99 | 61.42              | 18.26 | --                 | --    | --                 | --    | 69.17              | 19.04 | 81.77               | 11.33 | --                 | --   | 92.17               | 5.90  |
| Elec AI      | 51.85              | 21.37 | 57.75              | 18.24 | --                 | --    | --                 | --    | 61.89              | 21.19 | 70.55               | 18.33 | --                 | --   | 89.34               | 11.38 |
| Education    | 12.06              | 0.55  | 12.07              | 0.31  | 12.25              | 0.63  | 12.11              | 0.65  | 12.14              | 0.87  | 11.97               | 1.05  | --                 | --   | 13.08               | 1.11  |
| AFQT         | --                 | --    | --                 | --    | --                 | --    | --                 | --    | --                 | --    | --                  | --    | --                 | --   | 90.27               | 8.56  |
| Final Tech   |                    |       |                    |       |                    |       |                    |       |                    |       |                     |       |                    |      |                     |       |
| School Grade | 86.46              | 3.43  | 85.62              | 2.95  | 86.82              | 3.73  | 86.18              | 3.59  | 85.89              | 3.09  | 85.50               | 3.29  | 86.07              | 2.96 | 85.60               | 3.16  |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------|--------------------------------|
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  | <b>2b. GROUP</b>                                                                                                 |                                |
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| <b>4. DESCRIPTIVE NOTES (Type of report and inclusive dates)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |                                                                                                                  |                                |
| <b>5. AUTHOR(S) (Last name, first name, initial)</b><br>Leczmar, William B.<br>Klesch, John K., 2d Lt USAF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                                                                                                                  |                                |
| <b>6. REPORT DATE</b><br>June 1965                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | <b>7a. TOTAL NO. OF PAGES</b><br>15                                                                              | <b>7b. NO. OF REFS</b><br>None |
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| <b>a. PROJECT NO</b><br>7717<br><b>c. Task</b><br>771705<br><b>d.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  | <b>8b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)</b>                               |                                |
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| <b>13. ABSTRACT</b><br><p>As a result of increasing automation of Air Force records, it is necessary to identify airmen who can be trained to handle new electronic data processing equipment. The Electronic Data Processing Test-63 (EDPT-63) was developed to meet this need. The test is composed of 4 subtests: Arithmetic Reasoning, Figure Analogies, Number Series, and Verbal Analogies. This report covers the development and initial validation of EDPT-63 for technical courses 685X0 and 687X0. The test's effectiveness was compared to other possible predictors such as the aptitude indexes of the Airman Qualifying Examination, education, and the Armed Forces Qualification Test (AFQT). EDPT-63 was found to have substantial validity for all of the samples available. In many instances, it was the best single predictor and when its 4 subtests were optimally weighted, they yielded a substantially higher multiple correlation than all other predictors combined. The next most effective predictor was the General Aptitude Index of the Airman Qualifying Examination.</p> |  |                                                                                                                  |                                |

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