DOCUMENT RESUME

ED 109 258 TM 004 727

AUTHOR Bower, George L.; And Others
TITLE A Concurrent Validity Study Relating the Armed Services Vocational Aptitude Battery to Success in High School Vocational-Technical Courses. Final Report.
INSTITUTION Armed Forces Vocational Testing Group, Randolph AFB, Tex. Research Div.
REPORT NO AFVTG-TRN-74-4
PUB DATE Jan 75
NOTE 15p.; For related documents, see TM 004 728 and 733

EDRS PRICE MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS Academic Achievement; Armed Forces; *High School Students; *Occupational Tests; *Predictive Ability (Testing); Predictive Validity; Secondary Education; Secondary School Counselors; Test Interpretation; *Test Validity; *Vocational Aptitude; Vocational Education
IDENTIFIERS *Armed Services Vocational Aptitude Battery

ABSTRACT

This Technical Research Note is designed for reference by high school counselors, service test administrators, and educational specialists as a supplemental guide to the interpretation of Armed Services Vocational Aptitude Battery (ASVAB) results in local guidance and counseling programs. This study examined the validity of specific ASVAB composites for a sample of 6,130 students in 25 high schools offering vocational-technical curricula. School samples were obtained through voluntary participation. (Author)

TECHNICAL RESEARCH NOTE 74-4

AN ABSTRACT FROM:

"A CONCURRENT VALIDITY STUDY RELATING THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY TO SUCCESS IN HIGH SCHOOL VOCATIONAL-TECHNICAL COURSES"

GEORGE L. BOWER, LTC, USA
JOHN R. LEWIS, Ed. D.
BERNARD J. KROCKOVER

RESEARCH DIVISION
ARMED FORCES VOCATIONAL TESTING GROUP
RANDOLPH AIR FORCE BASE, TEXAS

JANUARY 1975

Armed Forces Vocational Testing Group Technical Research Reports and Technical Research Notes are designed for primary use and reference by secondary school counselors and Department of Defense Armed Services Vocational Aptitude Battery (ASVAB) test administrators. Conclusions and recommendations are solely those of the primary authors and in no way represent either official policy of the military services or the Department of Defense.

APPROVED BY

HARRY D. WILFONG, Ph.D
Technical Advisor
Research Division
Armed Forces Vocational Testing Group

RALPH S. HOGGATT
Colonel, USAF
Commander
Armed Forces Vocational Testing Group

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Technical Research Note 74-4	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): An Abstract from "A Concurrent Validity Study Relating the Armed Services Vocational Aptitude Battery to Success in High School Vocational-Technical Courses."	5. TYPE OF REPORT & PERIOD COVERED: Final Apr 74 - Jan 75
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): GEORGE L. BOWER, LTC, USA John R. Lewis, Ed.D. Bernard J. Krockover	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Research Division Armed Forces Vocational Testing Group Randolph AFB TX	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: AFVTG-117
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE: January 1975 13. NUMBER OF PAGES: 12
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE: Not Applicable

16. DISTRIBUTION STATEMENT (of this Report)

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Armed Services Vocational Aptitude Battery
Aptitude Testing
Psychological Measurement
High School Vocational Technical Courses
Predicting Performance
Vocational Areas

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This Technical Research Note is designed for reference by high school counselors, service test administrators, and educational specialists as a supplemental guide to the interpretation of Armed Services Vocational Aptitude Battery (ASVAB) results in local guidance and counseling programs. This study examined the validity of specific ASVAB composites for a sample of 6,130 students in 25 high schools offering vocational-technical curricula. School samples were obtained through voluntary participation. The investigators are indebted to all

participating counselors, administrative personnel, and principals.

This technical research note is an abstract of a more comprehensive treatment of the data, contained in Armed Forces Vocational Testing Group (AFVTG) Technical Research Report 74-5 (January 1975). Work performed in support of this research was conducted as a subpart of AFVTG research project unit 117; under guidelines prescribed through Department of Defense Instruction 1304.12 (December 1972).

PREFACE

This Technical Research Note is designed for reference by high school counselors, service test administrators, and educational specialists as a supplemental guide to the interpretation of Armed Services Vocational Aptitude Battery (ASVAB) results in local guidance and counseling programs.

This study examined the validity of specific ASVAB composites for a sample of 6,130 students in 25 high schools offering vocational-technical curricula. School samples were obtained through voluntary participation. The investigators are indebted to all participating counselors, administrative personnel, and principals.

This technical research note is an abstract of a more comprehensive treatment of the data, contained in Armed Forces Vocational Testing Group (AFVTG) Technical Research Report 74-5 (January 1975). Work performed in support of this research was conducted as a subpart of AFVTG research project unit 117; under guidelines prescribed through Department of Defense Instruction 1304.12 (December 1972).

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

AN ABSTRACT FROM:

"A CONCURRENT VALIDITY STUDY RELATING THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY TO SUCCESS IN HIGH SCHOOL VOCATIONAL-TECHNICAL COURSES"

I. INTRODUCTION

Previous studies with the Armed Services Vocational Aptitude Battery (ASVAB) have demonstrated its usefulness in predicting success in various military technical training courses. In these studies, ASVAB showed validity in predicting performance for various courses, i.e., Personnel Specialists, Aircraft Maintenance Specialists, Jet-Engine Mechanics, etc. (Vitola, Mullins & Croll, 1973) and Communications Technician, Electrician's Mate, Basic Electricity and Electronics, etc. (Thomas, 1970).

The potential of the ASVAB for predicting performance in civilian vocational-technical courses has not been demonstrated. The validity of the battery has been inferred from results obtained from the above studies and from the inferred commonality between military and civilian jobs. Recently, there has been an upsurge of interest on the part of high school counselors for empirical data substantiating the ability of ASVAB to predict civilian vocational-technical course success.

The study reported here investigated the use of Form 2 of the ASVAB for predicting civilian vocational-technical school success. The results should be of assistance to the counselor when counseling students for specific vocational and academic classes.

The ASVAB consists of nine paper-and-pencil tests which are purported to measure five factors: General-Technical (GT), Clerical (CL), Electronics (EL), General Mechanical (GM), and Motor Mechanics (MM). The composition of these five composites as well as the nine paper-and-pencil tests are shown in Appendix 1. The overall time required to take the battery is 2½ hours. The battery was developed by the Army, Navy, and Air Force research laboratories to be used by all of the Armed Services for selection and classification purposes.

The development of ASVAB may be considered to be predicated upon a concept of general ability. This concept implies some amount of previous learning in a variety of areas which enhances the overall performance of an individual. A problem with such a concept is whether or not a test, (viz. ASVAB), can predict success across vocational areas as identified by the US Office of Education (USOE). The main purpose of this study was to determine how well the battery differentiates special abilities and makes differential predictions. Success (i.e., as measured by student grades) in courses taught in civilian vocational-technical high schools was used as the criterion of how well the ASVAB shows differential predictive ability in different settings.

II. METHOD

A sample of 6,130 students attending 25 schools offering curricula in vocational-technical courses was used for the study. Distribution of the student sample by state is shown by the numbers in Figure 1.

To be included in this sample, a student must have taken Form 2 of ASVAB (first administered Sep 73) and have been enrolled in a high school vocational-technical course. The various vocational-technical course grades were collected by service test administrators and converted to a common 4.0 scale using the conversion factors as shown in

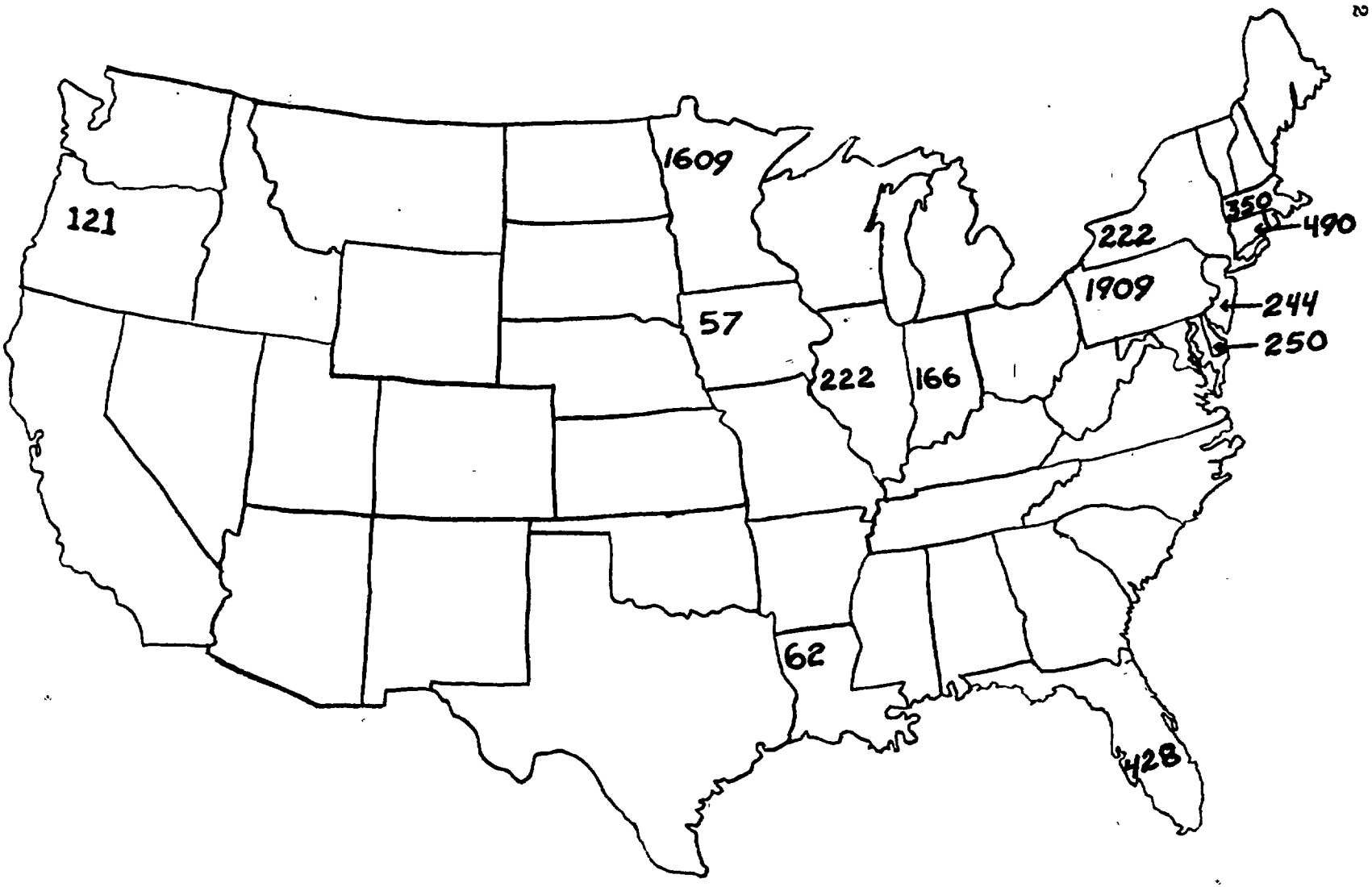

Figure 1. Distribution of Student Sample by State

Table 1. The ASVAB scores were retrieved from the ASVAB historical file at the US Air Force Human Resources Laboratory. Means and standard deviations were computed for the sample on each of the ASVAB Subtests, composites, and the course grade for each course within the study. The time frame for collecting data was April through July 1974.

A multiple linear regression was performed using each student's nine subtest scores on Form 2 of the ASVAB as the independent variables and the student's grade in each specific vocational-technical course as the dependent variable. The Pearson "r" for the current composite (r_{cc}) was computed for each course. The multiple correlation coefficients (R) resulting from the regression were tested (F ratio, $p \leq .05$) to determine if the battery could predict course success. Where R indicated the battery could predict success, the significance of the difference between R and r_{cc} was tested (F ratio, $p \leq 05$). For those courses where there was a significant difference between R and r_{cc}, a new composite with its associated correlation coefficient (r_{nc}), was formed that could predict success with the same degree of confidence as R. The difference between the new and current composites was tested (t test, $p \leq .05$) for significance.

Table 1

CONVERSIONS FOR GPA TO LETTER GRADES

Common 4 Point Scale	Percent I	Percent II	10 Point Scale
A - 4	A-91-100	A-93-100	A+=10
B - 3	B-81-90	B-85-92	A=9
C - 2	C-71-80	C-78-84	A-=8
D - 1	D-61-70	D-70-77	B+=7
F - 0	F-0-60	F-0-69	B=6
			B-=5
			C+=4
			C=3
			C-=2
			D=1
			F=0

III. SOME FINDINGS

Tables 2, 3, and 4 list the 50 specific courses studied, the sample size (N), the multiple correlation coefficient (R), the composites (Selector Composite), and their correlation coefficients (r_{cc} and r_{nc}). For 28 of 50 courses studied, which comprised 85% of the sample, the battery did predict course success. For 12 of the 28 courses (Table 2), the current composite was found to predict as well as the battery. This means the current composite is the best group of ASVAB subtests for predicting course success.

Table 2

COURSES PREDICTED BY CURRENT COMPOSITE

Course	N	R	Selector Composite	r_{cc}
Appliance Repair	62	0.62	GM	0.42
Body & Fender Repair	129	0.42	MM	0.24
Carpentry	258	0.33	GM	0.22
Cosmetology	159	0.46	GT	0.37
Diesel Mechanics	51	0.56	MM	0.36
Horticulture	64	0.54	GT	0.33
Maintenance Mechanic	56	0.66	GM	0.40
Metal Working	124	0.38	GM	0.25
Nursing	31	0.79	GT	0.56
Small Engine Repair	86	0.51	MM	0.34
Welding	147	0.56	GM	0.49
Wood & Metal Working	185	0.34	GM	0.22

Selector Composites:
General Technical (GT) = AR +WK
General Mechanical (GM) = SP + 2SI
Motor Mechanical (MM) = MC + 2AI

For the 16 courses (Table 3) where the current composite failed to predict success as well as the battery, new composites were formed that could predict success. Success in the Auto service course, for example, can be predicted with the composite (AI + TK + 1/3 CS).

Table 3

COURSES PREDICTED BY PROPOSED COMPOSITE

Course	N	R	Current Selector Composite	r_{cc}	Proposed Selector Composite	
Auto Service	476	0.46	MM	0.38	AI+TK+1/3CS	0.44
Business Occupation	265	0.43	CL	0.36	AR+WK+1/5CS	0.42
Clerical Practices	340	0.43	CL	0.31	AR+WK+1/5CS	0.39
Data Processing	159	0.41	EL	0.27	SP+MC+EI	0.33
Drafting	373	0.44	GT	0.33	AR+SP	0.40
Electrical Trades	468	0.41	EL	0.34	AR+TK+EI	0.37
Electronic Trades	431	0.31	EL	0.14	AR+TK+EI	0.28
Food Service	250	0.43	GT	0.25	CL	0.37
Graphic Art	159	0.45	GT	0.20	AR+SP	0.34
Health Occupation	170	0.55	GT	0.30	CL	0.51
Journalism	36	0.80	GT	0.48	SP+MC+EI	0.71
Machine Shop	345	0.36	GM	0.22	TK+AI	0.33
Masonry	116	0.43	GT	-0.06	TK+SP+1/3CS	0.23
Painting & Decorating	26	0.78	GM	0.05	GT	0.66
Plumbing	101	0.48	GM	0.28	AI+SP+1/3CS	0.43
Tailor	148	0.68	GT	0.56	AR+SP+1/5CS	0.64

Selector Composites:

General Technical (GT) = AR+WK
Clerical (CL) = WK+1/3CS
General Mechanical (GM) = SP+2SI
Electronic (EL) = MC+2EI
Motor Mechanics (MM) = MC+2AI

The predictive ability of the ASVAB was not demonstrated for 22 courses (Table 4). It is to be noted the sample sizes in these are relatively small. Their sum represents only 15% of the overall sample.

Table 4

COURSES FOR WHICH PREDICTIVE ABILITY OF ASVAB WAS NOT DEMONSTRATED

Course	N	R	Selector Composite	r_{cc}
Agriculture	23	6-	GT	0.25
Air Conditioning	97	0.35	GM	0.19
Aviation Mechanics	37	0.55	MM	0.29
Building Maintenance	33	0.43	GM	0.24
Building Trades	83	0.34	GM	0.27
Cabinet Making	17	0.89	GM	-0.60
Child Care	79	0.39	GT	0.22
Civil Technology	18	0.89	GT	0.23
Commercial Art	40	0.62	GT	0.39
Conversation	23	0.55	GT	0.36
Cook	20	0.76	GT	0.68
Distributive Education	89	0.37	GT	0.24
Fashion Design	23	0.79	GT	0.31
Household Arts	64	0.35	GT	0.22
Industrial Chemistry	29	0.55	GT	-0.03
Jewelry & Ceramics	29	0.69	GT	0.20
Laboratory Technician	18	0.70	GT	-0.07
Oil Burner Repair	17	0.86	GM	-0.04
Printing	102	0.33	GM	0.09
Restaurant Mgt	39	0.63	GT	0.25
Steam Engineering	14	0.70	GM	0.27
Transportation	21	0.69	MM	0.14

IV. SUMMARY AND CONCLUSIONS

A consideration of the findings which resulted from an analysis of the data resulted in the following conclusions:

1. It appears that, regardless of the significance of the aptitudes evaluated and the measures of attainment used as the criterion, less than half of the variance of the criterion will be associated with the independent variable. This is a finding one might expect in any validity study (Ghiselli, 1966) partially as a function of criterion contamination. Some reasons for this include:

a. Factors which contribute to success, as measured by the criterion, may not be found in the Form 2 of the ASVAB;

b. The degree of reliability of the Form 2 of the ASVAB would cause some of the variance difference; and

c. The secondary school's grading practices would cause the criterion variable to assume a degree of unreliability.

2. Form 2 of the ASVAB aptitudes may not be indigenous to the ability fields being measured. That is, various subtests may measure factors not indicated by their name.

3. In the categories where Form 2 of the ASVAB did not appear to predict success, further research is necessary to determine what confounding variables are contributing to the unknown variance.

For those 22 courses where the total battery did not predict course performance significantly, lack of prediction could have been for a number of reasons, and a contributory factor could have been small sample size. Additionally, the battery might not have been sensitive enough to discriminate in those courses that reflect a diversity of goals or in courses where a number of different aptitudes may be required. There also may be a lack of commonality of interest between what civilian educators think is basic to a particular job and what the military is looking for in a person to fulfill a similar job within the services. In other words, civilian vocational-technical courses may be more specific in a particular course, as compared to the military who are looking for people with a certain level of general ability.

In commenting on the results obtained in this study, it must be noted that they derive from a particular school setting and may not be generalized to other types of educational institutions. The results of the study emphasize the heuristic value of separating abilities into subcategories reflective of diverse demands. The present study indicates that for the most part the Form 2 of the ASVAB does do well in predicting success in a number of vocational courses. For those courses where the Form 2 of the ASVAB does not appear to predict as well in other areas, further exploration is needed to delineate those ability factors necessary for academic success.

REFERENCES

Ghiselli, E.E. **The Validity of Occupational Aptitude Tests**. New York: John Wiley & Sons, 1966.

Thomas, P. J. A Comparison Between the Armed Services Vocational Aptitude Battery and the Navy Basic Test Battery in Predicting Navy School Performance. **Technical Report STB 70-4**, Navy Personnel Research and Development Center, San Diego, California, January 1970.

Vitola, B. M., Mullins, C. V., and Croll, P. R. Validity of Armed Services Vocational Aptitude Battery, Form 1, to Predict Technical School Success. **AFHRL-TR-73-7**, Air Forces Human Resources Laboratory, AFSC, Lackland AFB, Texas, September 1973.

Appendix 1

DESCRIPTION OF ASVAB SUBTESTS

A. TESTS IN THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB)

1. **Coding Speed Test (CS).** In this test there is a key and 100 items. The key is a group of words with a code number for each word. Each item presents one word for which the examinee indicates the code number.

2. **Word Knowledge (WK).** Each item requires the examinee to select the correct synonym for a specific word.

3. **Arithmetic Reasoning (AR).** Each item is a reasoning problem involving application of the arithmetic process.

4. **Tool Knowledge (TK).** Each item presents five drawings of various tools or shop equipment. The examinee indicates which of the four alternative drawings goes best with the lead drawing.

5. **Space Perception (SP).** Each item consists of five drawings: a pattern and four boxes. The question to be answered is which one of the boxes can be made by folding the pattern.

6. **Automotive Information (AI).** Each item asks a question about the identification or operation of automobile parts.

7. **Shop Information (SI).** This test has questions about shop practices and the use of tools. Many of the items contain drawings.

8. **Mechanical Comprehension (MC).** Each item includes a drawing, or drawings, illustrating some physical principle and a question.

9. **Electronic Information (EI).** This test has questions about elementary principles of electricity and about electrical/electronic devices, drawings, and equipment.

B. CURRENT ASVAB COMPOSITES

General Technical (GT) = AR + WK

Clerical (CL) = WK + 1/3 CS

General Mechanical (GM) = SP + 2SI

Electronic (EL) = MC + 2EI

Motor Mechanics (MM) = MC + 2AI

U. S. GOVERNMENT PRINTING OFFICE 1975-671-164/283

ATC 283