A RAND NOTE

The Army Military Occupational Specialty Database

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Prepared for the
United States Army

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PREFACE

This Note was prepared as part of a research project entitled "Future Individual Training Strategies." The overall project is designed to analyze, across a range of occupations, alternative training approaches that may be more affordable and flexible than current techniques for conducting Army individual skill training.

This Note documents the Army Military Occupational Specialty Database (MOS-D), which was prepared as part of the research. MOS-D contains data describing training-relevant characteristics of Army Military Occupational Specialties (MOS) as of FY90. The dataset contains information describing entry prerequisites, characteristics of job-holders and entry-level training courses, and the nature of the work performed. The dataset can be analyzed to compare and contrast enlisted entry-level occupations in a number of ways related to how training is conducted. Such analyses can be used to guide more intensive research on alternative training strategies and methods for specific and related occupations.

This research is being conducted in the Manpower and Training Program of the RAND Arroyo Center, sponsored by the Office of the Deputy Chief of Staff for Training, U.S. Army Training and Doctrine Command. This document may be of interest to Army training managers concerned with the design and implementation of training programs for specific occupational specialties, as well as to researchers and policymakers concerned with military personnel planning and force management.

THE ARROYO CENTER

The Arroyo Center is the U.S. Army's federally funded research and development center (FFRDC) for studies and analysis operated by RAND. The Arroyo Center provides the Army with objective, independent analytic research on major policy and organizational concerns, emphasizing mid- and long-term problems. Its research is carried out in four programs: Strategy and Doctrine; Force Development and Technology; Military Logistics; and Manpower and Training.

Army Regulation 5-21 contains basic policy for the conduct of the Arroyo Center. The Army provides continuing guidance and oversight through the Arroyo Center Policy Committee (ACPC), which is co-chaired by the Vice Chief of Staff and by the Assistant Secretary for Research, Development, and Acquisition. Arroyo Center work is performed under contract MDA903-91-C-0006.

The Arroyo Center is housed in RAND's Army Research Division. RAND is a private, nonprofit institution that conducts analytic research on a wide range of public policy matters affecting the nation's security and welfare.

Lynn E. Davis is Vice President for the Army Research Division and Director of the Arroyo Center. Those interested in further information about the Arroyo Center should contact her office directly:

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THE ARMY FELLOWS PROGRAM

Lieutenant Colonel Stephen Kirin is an Army Research Fellow at RAND. The U.S. Army established the RAND Army Fellows program in 1985. The purpose of the program is to allow Army officers to broaden their perspective of Army policy and technology issues by exposure to diverse attitudes and perspectives embodied in the RAND work force. Furthermore, the program supports Army Fellows in learning advanced analytical techniques to study policy and acquisition issues.

Annually, several branch qualified officers are selected by the Arroyo Center Policy Committee (ACPC) to conduct one year of research at the RAND Arroyo Center. These officers are selected for their strong analytical skills, academic ability, service experience, and demonstrated career potential to assume Army command and senior staff assignments.

SUMMARY

BACKGROUND

The U.S. Army will face demanding challenges to maintain a well-trained and ready force in the face of shrinking defense budgets. Given the extensive resources used to conduct individual training (i.e., personnel, facilities, and consumables), current training methods are facing especially intensive scrutiny. In response, the Army is developing several new training concepts that could reduce the cost of individual training. Such concepts include, for example, expanding the use of new training technologies, "distributing" training to field units, and substituting civilian for military training where this may be applicable.

Current RAND research is developing and applying new analytical tools for assessing alternative training approaches. Our objective is to assess new strategies that modify current training approaches, considering resource inputs, costs, and consequences of training changes. Because major costs are incurred during specialized skill training, especially for enlisted personnel, our research focuses most heavily on alternative strategies for training enlisted entry-level Military Occupational Specialties (MOS).

A key problem is determining the suitability of the "match" between new training concepts and specific MOS, which requires in-depth analysis of personnel, training, and job characteristics of the various occupational specialties.[1] To support this analysis, we compiled a new source of data, entitled the Military Occupational Specialty Database (MOS-D), which is described in this Note. This database integrates information about Army MOS from a variety of different sources. MOS-D provides a comprehensive snapshot of the Army *enlisted* occupational structure at the start of FY90, including data on 317 MOS. This document focuses on those 242 MOS considered entry-level active-Army occupations.

This Note has two objectives. The first is to document the variables compiled for each MOS in the database. Second, it describes Army enlisted occupations and training by illustrating selected data using descriptive statistics.

STRUCTURE OF MOS-D

We have organized the variables contained in MOS-D in six different groups, which are described in separate sections of this Note. The first group includes basic descriptive information about each military occupation. Variables include the title and code of each MOS, the military component in which the MOS can be found, and whether the particular

[1]This analysis is described in a companion report (Winkler, Kirin, and Uebersax, forthcoming).

occupation is an entry-level specialty or available to women. The 23 variables in this section also depict the expected career progression for each occupation and identify MOS-specific enlistment and reenlistment options and incentives.

The second group includes enlistment prerequisites for each MOS. The 16 variables in this section identify specific physical and aptitude requirements the recruit must possess to be considered a qualified applicant.

The third group characterizes the specialized skill training provided in the MOS. The 15 variables in this section identify the length and location of training, the number and size of training classes conducted, and the attrition and no-show rates for those courses. Other data define tasks performed by soldiers in the occupation—specifically, whether the required tasks of the occupation are primarily manipulative or procedural, as opposed to cognitive or information-processing.

The 54 variables in the fourth group provide demographic information about each MOS. Data include numbers of personnel in each MOS at the end of FY89 and the expected composition at the end of FY90 (by paygrade within each MOS). In addition, we identify the number of accessions in each MOS by fiscal year and the programmed number of training seats reserved for those individuals.

The fifth group of variables includes estimates of training costs by MOS, including data obtained from the U.S. Army Training and Doctrine Command (TRADOC) Deputy Chief of Staff for Resource Management (ATRM-159 reports) and from the Army Manpower Cost System (AMCOS) model. The data include 12 variables that measure the cost of training a recruit, covering military pay and allowances (MPA), operations and maintenance account (OMA), and other costs.

The final group of variables links the MOS to other military and civilian occupations. We describe taxonomies and measures that link the MOS to military-oriented classification schemes, general occupational classifications, and instructional programs. The 27 variables in this section are drawn primarily from the Standard Occupational Classification (SOC) system, the Dictionary of Occupational Titles (DOT), the Department of Defense (DoD) Occupational Code, and the Civilian Instructional Program (CIP) data system.

USE OF MOS-D

MOS-D supports research designed to address new Army individual training strategies. In particular, it provides an overall architecture and means for identifying training-relevant characteristics of enlisted occupations. Analyses of such data can suggest training approaches suitable to specific MOS and groups of MOS. For example, by

identifying MOS with many similarities to civilian occupations, the MOS that might be amenable for civilian-based training or lateral entry programs could be identified.

Other uses of the database are also possible. For example, the data could be used to identify common characteristics of occupations that might suggest candidates for MOS consolidation. Other information, particularly the demographic data, may support analysis of potential alterations in the force structure. Finally, the linkages of civilian occupations and education programs to Army MOS might support other analyses of possible interest to researchers and policymakers concerned with education, training, and labor force issues relevant to military service.

ACKNOWLEDGMENTS

The authors acknowledge the support and encouragement provided by our project sponsor, Mr. Tom Edwards, Assistant Deputy Chief of Staff for Training, U.S. Army Training and Doctrine Command. We also appreciate the support of additional members of TRADOC's Office of the Assistant Deputy Chief of Staff for Training, including our action officers Colonel (Ret.) Robert Seger and LTC (Ret.) Gary Cumpson, along with LTC Bill Samuelson, Dr. Diana Tierney, Mr. John Buckley, and Ms. Marta Bailey. We also received helpful input from the current and former Deputy Chief of Staff for Training, Major General Dennis Malcor and Major General Craig Hagan.

We also owe a debt of gratitude to other offices within the Army and the Office of the Secretary of Defense which provided data used in this research. They include the Office of the Deputy Chief of Staff for Personnel (Directorate of Military Personnel Management, Training Requirements Office), the Total Army Personnel Command, the U.S. Army Recruiting Command, TRADOC's Office of the Deputy Chief of Staff for Resource Management, and the Office of the Assistant Secretary of Defense, Force Management and Personnel (Defense Manpower Data Center).

We also acknowledge important contributions made by our RAND colleagues. Harry Thie provided a very helpful technical review of an earlier draft. Jan Hartman and Bob Young provided valuable programming assistance, and Jean Wilbourn and Velda DeCosentine prepared the manuscript in a tireless manner. The authors are solely responsible for any shortcomings.

CONTENTS

FIGURES

TABLES

ACRONYMS

ACASP	Army Civilian Acquired Skills Program
ACE	American Council on Education
ACF	Army College Fund
AFQT	Armed Forces Qualification Test
AHS	Academy of Health Sciences
AIT	Advanced Individual Training
AMCOS	Army Manpower Cost System
APFT	Army Physical Fitness Test
ARPRINT	Army Program for Individual Training
ASI	Additional Skill Identifier
ASVAB	Armed Services Vocational Aptitude Battery
ATRRS	Army Training Requirements and Resources System
BEAR	Bonus Extension and Reenlistment Program
BT	Basic Training
CA	Combat Arms
CIP	Classification of Instructional Programs
CMF	Career Management Field
CS	Combat Support
CSS	Combat Service Support
CTT	Common Task Test
DA	Department of the Army
DCSOPS	Deputy Chief of Staff for Operations
DCSPER	Deputy Chief of Staff for Personnel
DoD	Department of Defense
DOL	Department of Labor
DOT	Dictionary of Occupational Titles
EMF	Enlisted Master File
ENTNAC	Entrance Level National Agency Check
EPMD	Enlisted Personnel Management Directorate
EW	Electronic Warfare
FORSCOM	United States Army Forces Command
GOES	Guide for Occupational Exploration
HQDA	Headquarters, Department of the Army
IET	Initial Entry Training
IRR	Individual Ready Reserve
MOS	Military Occupational Specialty
MOSC	Military Occupational Specialty Code
MOS-D	Military Occupational Specialty Database
MOTD	Military Occupational and Training Data
MPA	Military Pay and Allowances
NCO	Noncommissioned Officer
NG	National Guard
NGB	National Guard Bureau
NOICC	National Occupational Information Coordinating Committee
OCAR	Office of the Chief of Army Reserve
OMA	Operations and Maintenance Account
OSUT	One Station Unit Training
PERSCOM	Total Army Personnel Command

PMAD	Personnel Management Authorization Document
PMOS	Primary Military Occupational Specialty
PULHES	Physical Profile Serial
RC	Reserve Component
SIGINT	Signal Intelligence
SMDR	Structure Manning Decision Review
SMOS	Secondary Military Occupational Specialty
SOC	Standard Occupational Classification
SQI	Special Qualification Identifier
SQT	Skill Qualification Test
SR	Selected Reserve
SRB	Selective Reenlistment Bonus
TRADOC	United States Army Training and Doctrine Command
TRAP	Training Resource Arbitration Process
USAPIC	United States Army Personnel Integration Command
USAREC	United States Army Recruiting Command

1. INTRODUCTION

BACKGROUND

The U.S. Army is one of the largest providers of vocational education and training in the world. To support entry-level occupational training, the U.S. Army manages numerous academic facilities located at various training installations. The Army's formal course catalog identifies over 2000 courses designed to train individual soldiers in particular skills. To support those courses, the Army employed 84,000 military and civilian personnel and spent approximately $5 billion, or 7 percent, of its annual budget as of FY90.

The Army faces a significant challenge, however, as ever-increasing constraints affect its ability to conduct this training. Reductions in training budgets, increased environmental and political constraints on the use of ranges and maneuver areas, and increased skill requirements associated with continuing technological advances will force the Army to exercise creative training management.

To meet this challenge, the Army is exploring new concepts and strategies for providing individual training. Such concepts include (but are not limited to) using civilian vocational training courses in lieu of military courses or increasing individual training in field units through the use of distributed technologies. In developing strategies for implementing such concepts, policymakers need to know whether a given concept will prove feasible and affordable. In addition, policymakers need to know which concepts are most suitable for particular occupations and families of occupations. To make such decisions, policymakers must define key attributes of Army occupations related to training options, identify groups of occupations sharing common training-related characteristics, and "match" these occupations to training concepts under consideration.

Current RAND research is assisting the Army in this analysis. The overall objective of this research is to develop and apply new methods for assessing innovative approaches for conducting individual training, and for considering resource inputs, costs, and consequences of training changes. The initial task defines and analyzes key attributes of Army occupational specialties related to the design of training programs. Because most of the Army's individual training workload is associated with specialized skill training of enlisted personnel, and given the number and variety of enlisted occupations in the Army's inventory, we focus our attention on Army entry-level enlisted occupational specialties while seeking to identify groups of occupations sharing common characteristics.

This document describes a dataset created for this research that characterizes Army enlisted occupations. This dataset, entitled the Army Military Occupational Specialty Database (MOS-D), consolidates information from a variety of sources on training-related characteristics of Army Military Occupational Specialties (MOS). These include relationships to civilian occupations and educational preparatory programs, prerequisites for enlistment in each MOS, and the nature of required skill training and expected duties within the occupation. Figure 1.1 illustrates both the composition and structure of the dataset. This dataset should provide researchers with a unique and comprehensive data source on the training-relevant characteristics of Army MOS.

OBJECTIVES

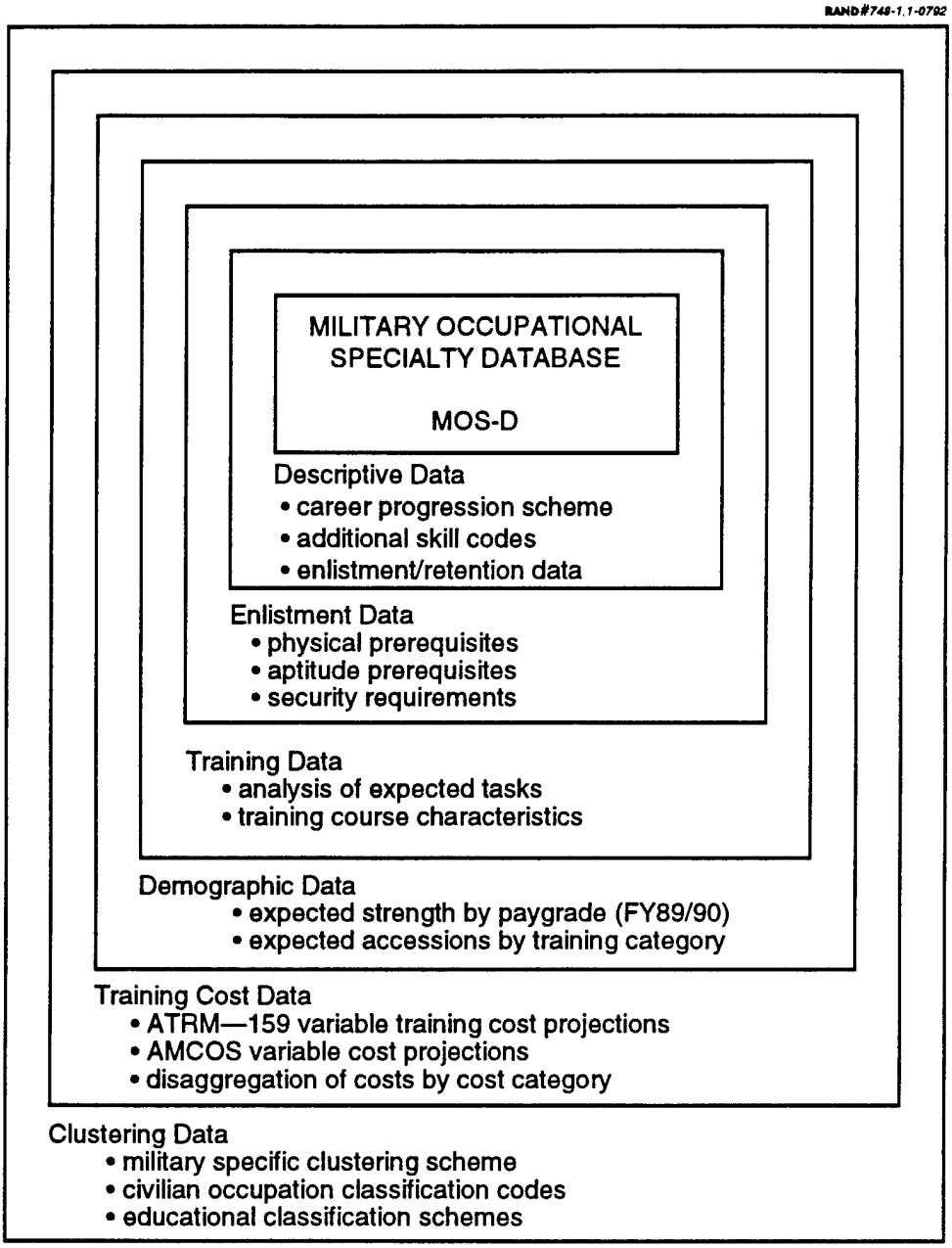
This Note has two objectives. The first is to document the dataset and provide a codebook. We have organized the dataset in a Statistical Analysis System (SAS) computer file with one record per observation. Each observation corresponds to a specific MOS, and each record includes 147 separate variables that describe the MOS.[1] MOS-D contains 317 enlisted MOS codes authorized as of May 1991, of which 242 are considered initial, entry-level active-duty MOS requiring specialized skill training.[2] As indicated in Figure 1.1, the 147 associated variables contain a wealth of information, which will be described in detail in subsequent sections of the report.

The focus of MOS-D is on entry-level MOS. Consequently, most information contained in MOS-D is keyed to the junior paygrades of a particular MOS. For example, as a soldier progresses in a particular MOS from paygrade E-1 to paygrade E-7, the nature of his duties changes and associated civilian-equivalent occupations may change. However, only those occupational codes that correspond to the junior grades (E-1 to E-4) of an MOS are coded into MOS-D.

The second objective of this Note is to describe Army occupational structure through illustrations drawn from the database. We touch on several issues, including the average term of enlistment for different MOS; the average length, cost, and location of specialized skill training; and the number of MOS that are available to women. In addition, we present

[1]Some of the variables contain multiple fields, as needed. Thus the potential number of data fields is 277 per MOS.

[2] Army Regulation (AR) 611-201, *Enlisted Career Management Fields and Military Occupational Specialties*, (November 1989) identifies 337 active enlisted MOS. That total includes six MOS entitled "Special Reporting Codes and Duty Assignments" that are reserved for unique training assignments, including college trainees, commissioned officer candidates, and warrant officer candidates. These MOS codes are not included in MOS-D. The regulation also identifies 15 musical specialties, to include Special Band Member and 14 unique codes associated with each type of musician. These musician codes have been consolidated into one MOS code in MOS-D.



AMCOS=Army manpower cost system.

Figure 1.1—The Military Occupational Specialty Database—MOS-D

a rudimentary analysis of various topics, for example, the nature of the tasks associated with each occupational specialty.

STRUCTURE OF THE DOCUMENT

Sections 2 through 7 describe the contents of the database in greater detail. Each section includes an overview of that segment of the dataset, a listing and abbreviated

description of the variables in the segment, a review of the data sources used, and illustrative data and descriptive statistics concerning the information in that segment of the database. A final section briefly discusses possible analytical uses of these data. Finally, a listing of MOS and titles contained in MOS-D, as well as an alphabetical listing of all variables in the database, are provided in the appendices.

2. GENERAL DESCRIPTIVE DATA

The variables described in this section provide general background information on Army military occupational specialties. Data include, for example, the MOS title, whether the MOS is found in the active or reserve components, and if the occupation is available to female soldiers. In addition, this section will familiarize the reader with a variety of associated topics, including:

- The expected initial term of service in each MOS;
- The career progression scheme for each MOS; and
- MOS-specific enlistment and reenlistment options and incentives.

Below, we discuss the MOS as a broad occupational category and review variables that describe its general nature. We then describe the nine-digit MOS code (MOSC), which identifies particular qualifications of the soldier awarded that MOS, and we review those variables in MOS-D that provide insight into the components of that code. We also discuss those variables containing information about enlistment and reenlistment options.

VARIABLES

Table 2.1 presents the variables discussed in this section.

DATA SOURCES

Several sources were used to develop this segment of MOS-D. Army Regulation 611-201, *Enlisted Career Management Fields and Military Occupational Specialties*,[1] served as the primary data source. This reference provides a wealth of information about each MOS, including MOS title, major duties, physical demands, necessary qualifications, career progression schemes, expected tasks at each skill level, and both Special Qualification Identifiers (SQI) and Additional Skill Identifiers (ASI). A second major source of information was the "QUALS" files[2] maintained by the Accession Management Branch of the Training Division for the Enlisted Personnel Management Directorate of the U.S. Total Army Personnel Command (PERSCOM). These files codify much of the descriptive information

[1]Update Issues 1 and 2, entitled, *Military Occupational Classification and Structure*, which contains AR 611-201 as well as other personnel regulations, were available to support the development of MOS-D.

[2]An extract of the "QUALS" dated 13 April 1990 was used as a source for information contained in MOS-D.

Table 2.1

General Descriptive Data

Variable	Description
MOS	Identifies the military occupational specialty.
MOSACTV	Indicates if MOS is currently in the active inventory.
MENTRLVL	Indicates if initial entry-level training is offered in the MOS.
MSTITLE	Provides a truncated occupational title.
MSTOPRK	Indicates the highest paygrade possible in the MOS.
MSNRMOS	Identifies follow-on MOS once soldier achieves grade in MSTOPRK.
MSAA	Indicates if the MOS is available in the active Army.
MSAR	Indicates if the MOS is available in the Army Reserve.
MSNG	Indicates if the MOS is available in the National Guard.
MSFEM	Identifies whether MOS is open to women.
MCUTSC5/6	Indicates points necessary for promotion to E-5 or E-6.
MSASICD	Indicates additional skill identifiers (ASI) available to MOS.
MSASINO	Counts the ASI codes identified in the variable MSASICD.
CLCMF	Identifies the career management control field for the MOS.
CLBRANCH	Indicates if MOS is combat arms, combat support arms, or combat service support.
MRCPRI	Code used to identify accession priority.
MBEARCD	Indicates if MOS is in Bonus Extension & Reenlistment (BEAR) program.
MENLBNS	October 89 cash value of enlistment bonus for the MOS.
MRENLBNS	The selective reenlistment bonus (SRB) multiplier used to compute the cash value of reenlistment bonus.
MSACOLFD	Identifies if enlistee can participate in the Army College Fund.
MSAPPROG	Identifies if MOS is recognized by Department of Labor as the equivalent of apprenticeship in a civilian occupation.
MCASTP	Identifies if MOS is in Army Civilian Acquired Skills Program (ACASP).
MCASCNT	The number of accessions for each MOS under the ACASP.

contained in AR 611-201 for entry-level MOS and are updated to mirror changes in that regulation.

A third data source in this segment is the *1990 Military Occupational and Training Data* file (MOTD), created by the Defense Manpower Data Center, Office of the Assistant Secretary of Defense (Force Management and Personnel). This file is designed to "provide military occupational information . . . that is intended to increase youth and counselor awareness of the military as a significant source of training and career opportunities" (MOTD, 1990, p. 1). The MOTD identifies special requirements for military occupations, helpful attributes, physical demands, working environment, training provided, civilian counterparts, and required aptitudes. It codifies much of the information concerning military occupations currently available in the two 1990 publications prepared by the U.S. Military Entrance Processing Command, entitled *The Military Career Guide* and *Military Career Paths*.

The primary source of information concerning reenlistment incentives used in compiling this database is the *Force Management Book FY89* prepared by the United States

Total Army Personnel Command.[3] Specifically, data concerning the Bonus Extension and Reenlistment program and enlistment/reenlistment bonuses were derived from that text.

Information concerning the various enlistment incentive programs is found in AR 601-210, *Regular Army and Army Reserve Enlistment Program*. Reenlistment incentive options are outlined in AR 601-280, *The Army Reenlistment Program*. A listing of MOS that qualify for the Army College Fund or the Army Apprenticeship Program was derived from *Exploring Careers in the Military Service* (MacDonald, 1986).

THE MILITARY OCCUPATIONAL SPECIALTY (MOS)

The MOS is a three-digit code of the form "XYA," where X and Y are numerical entries and A is an alphabetical entry. Specific examples include 11B (Infantryman), 00B (Diver), and 51K (Plumber). The MOS code is recorded under the variable MOS. The title of the MOS is contained in the variable MSTITLE. These titles are designed to act as a "short summary of the full scope of the specialty" (AR 611-201, 1989, p. 8). Like a civilian job title, they provide limited insight into whether the job-holder is an apprentice, journeyman, or senior worker and they do not identify the nature or level of difficulty of the skills associated with the job. Rather, the titles imply a broad group of tasks and skills that comprise a particular military occupation. These titles can be very terse, particularly when the skills implied by the task are easily recognized, for example, Plumber (51K) or Firefighter (51M). They can also be more specific as in the case of MOS 45N, M60A1/A3 Tank Turret Mechanic, or 33Q, Electronic Warfare/Intercept Strategic Systems Analyst and Command and Control Subsystem Repairer. A full title listing of the MOS in the database is included in Appendix A.[4]

The number of MOS in the current inventory can vary due to a number of factors. For example, the introduction of a new item of equipment may require a new MOS for soldiers trained to operate or repair those items. As older weapon systems are retired from service, the MOS defining the operators and repairers of that equipment may be rescinded. In 1944, the Army managed over 840 different military specialties. Figure 2.1 depicts the trend in the number of MOS since 1950. The number of occupations reflects a compromise between a desire to enhance personnel management and the need to create additional occupations that can service and operate equipment and systems that change over time.

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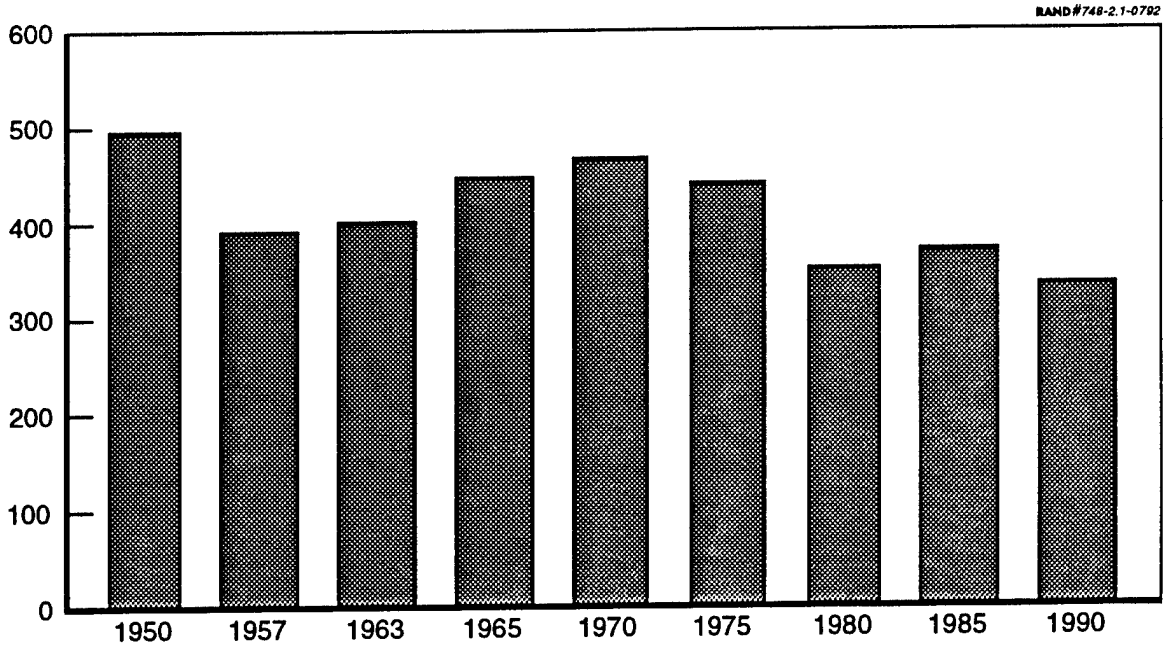
[3]This document is published yearly.

[4]Full titles were coded into the database; however, SAS only permits a 20-character truncated display.



SOURCES: *The Military Specialist* (Wool, 1968); Director, Military Occupational Development, U.S. Army Personnel Integration Command (USAPIC).

Figure 2.1—Number of Occupational Specialties Since 1950

The database variable entitled MOSACTV is a nominal scale variable for which the entry "1" indicates that the MOS is in the current inventory, while "0" indicates that the MOS has been removed from the current occupational inventory. This variable allows the database to be updated and to remain responsive to changes in the active MOS inventory. As of this writing, there were 317 MOS in the current inventory; these are included in MOS-D.[5]

As the structure of the Army is continually reviewed and revised, certain capabilities are transferred to the Reserve Component (RC), while others are retained solely in the active force. This transfer of capability implies that certain MOS will exist in all three components while others will only exist in some subset of components. The variables MSAA (Active Army), MSAR (Army Reserve) and MSNG (National Guard) are nominal scale variables for which the value "1" indicates that the MOS is found within that component while the value "0" indicates that the MOS is not contained within that component. MOS 62F, Crane Operator, for example, is found in all three components and has a value of "1" for each variable. MOS 52G, Transmission and Distribution Specialist, for example, exists only in the

[5]Three additional MOS are currently coded in MOS-D as inactive. They include 13T, Remotely Piloted Vehicle Crewmember; 16N ADA, "Operations and Intelligence Assistant"; and 39T, Tactical Computer Systems Repair. These represent active-duty, entry-level MOS that were initially coded into MOS-D but rescinded as this document was prepared.

Reserve Component and has a value of "0" for MSAA but a value of "1" for MSNG and MSAR. Over 90 percent of the MOS defined in MOS-D are found in all components.

Similar MOS are grouped within a Career Management Field (CMF). Career Management Fields are identified by a two-digit numerical code that may match the first two digits of the MOS contained within the CMF, although that is not a requirement. The two-digit CMF codes are recorded in the MOS-D under the variable CLCMF. A CMF is constructed so that "the MOS in any CMF are so related that soldiers serving in one specialty have the potential abilities and aptitudes for training in most of the other specialties in that field" (AR 611-201, 1989, p. 7). CMF serve as the basis for the management, distribution, and counseling for enlisted personnel. Currently, there are 33 Army CMF. The number of MOS within CMF varies; some CMF contain only one MOS, while others contain over 30 MOS. This distribution of MOS within CMF is depicted in Table 2.2.

One example of a CMF and its subordinate occupations is CMF 76, Supply and Services, which contains:

43E	Parachute Rigger
43M	Fabric Repair Specialist
57E	Laundry and Bath Specialist
57F	Graves Registration Specialist
76C	Equipment Records and Parts Specialist
76P	Materiel Control and Accounting Specialist
76V	Materiel Storage and Handling Specialist
76X	Subsistence Supply Specialist
76Y	Unit Supply Specialist
76Z	Senior Supply/Service Sergeant

CMF and MOS are often discussed in terms of the battlefield responsibilities of the soldiers holding those MOS. Those discussions often group occupations as combat arms, combat support arms, or combat service support. Combat arms are those specialties "whose primary missions are to participate in combat" (AFSC Pub 1, 1991, p. I-6) while combat support arms are those specialties "whose primary missions are to furnish operational assistance for the combat forces" (AFSC Pub 1, 1991, p. I-6). Combat service support specialties are those designed to provide assistance to the force as a whole "primarily in the fields of administrative services, chaplain services, civil affairs, finance, legal services, health services, military police, supply, maintenance, transportation, construction, troop

Table 2.2

Distribution of MOS by CMF

CLCMF	CMF Title	Number of MOS
11	Infantry	5
12	Combat Engineering	4
13	Field Artillery	15
16	Air Defense Artillery	9
18	Special Forces	6
19	Armor	4
23	Air Defense System Maintenance	8
25	Visual Information	5
27	Land Combat & Air Defense Systems Intermediate Maintenance	18
29	Signal Maintenance	23
31	Signal Operations	17
33	Electronic Warfare/Intercept Systems Maintenance	7
35	Electronic Maintenance and Calibration	1
46	Public Affairs	3
51	General Engineering	19
54	Chemical	1
55	Ammunition	6
63	Mechanical Maintenance	29
67	Aircraft Maintenance	23
71	Administration	14
74	Automatic Data Processing	3
76	Supply and Services	10
77	Petroleum and Water	3
79	Recruitment and Reenlistment	3
81	Topographic Engineering	6
88	Transportation	16
91	Medical	32
93	Aviation Operations	4
94	Food Service	1
95	Military Police	3
96	Military Intelligence	10
97	Bands	16
98	Signal Intelligence/Electronic Warfare Operations	7

construction, acquisition and disposal of real property, facilities engineering, topographic and geodetic engineering, food service, graves registration, laundry, dry cleaning, bath, property disposal, and other logistic services" (AFSC Pub 1, 1991, p. I-6).

While these definitions are available from doctrinal sources, no source has been found that assigns each MOS to a particular category. The Enlisted Personnel Management Directorate (EPMD) of the U.S. Total Army Personnel Command has established divisions for the management of both CMF and MOS and has designated those divisions the Combat Arms Career Division, Combat Support Career Division, and the Combat Services Support Career Division. Under the nominal variable CLBRANCH, we have coded each MOS by its

controlling EPMD division and assigned the value of "1" if the MOS is managed by the Combat Arms Division, "2" if the MOS is managed by the Combat Support Career Division, and "3" if the MOS is managed by the Combat Service Career Support Division. While this categorization does, for the most part, parallel the doctrinal definitions, there are some notable deviations. Military Police, for example, is considered a combat service support activity by JCS Pub 1-02 but is controlled by the Combat Support Career Division of EPMD. Because the MOS are assigned to these EPMD divisions based on their parent CMF, certain MOS are grouped into seemingly inappropriate divisions. MOS 93F, Field Artillery Meteorological Crewmember, is contained in CMF 13, which EPMD manages through the Combat Arms Division. That MOS, however, furnishes operational assistance for the combat forces and does not exercise combat power. The distribution of MOS by these branch divisions is depicted in Table 2.3.

An issue of increasing interest is the number of military occupations available to women. The variable MSFEM is a nominal scale variable for which the value "0" indicates that women are not currently assigned to the MOS; the value "1" indicates that women can be assigned to that MOS. Currently, there are 47 MOS in which women may not be assigned; of these, 35 are combat MOS, 4 are combat support occupations, and 8 are combat service support occupations. These 47 MOS represent approximately 14 percent of the MOS in the current inventory. This percentage does not, however, consider the number of positions authorized in a particular MOS. MOS-considered Combat Arms in MOS-D require the greatest number of soldiers, but women may be assigned to only 31 percent of those occupations. Using available accession and retention data, we estimate that 66 percent of the authorized positions in the Army in FY89 were available to women.

THE MILITARY OCCUPATIONAL SPECIALTY CODE (MOSC)

While the MOS provides a very broad definition of the military job, the nine-digit MOS Code (MOSC) provides more specific information about occupational characteristics and

Table 2.3

Distribution of Entry-Level, Active-Army MOS by CLBRANCH

CLBRANCH	Entry-Level MOS
Combat Arms	33
Combat Support Arms	104
Combat Service Support Arms	105

requirements of the specialty. A sample nine-digit MOSC is 76P3PT8AN. The first three digits of the MOSC identify the primary MOS (PMOS). The fourth digit indicates the skill level and is a numeric entry from 0 to 5. An entry of "0" indicates that the soldier is undergoing initial entry training in that particular occupation. Skill levels 1 through 5 are directly related to paygrade based on the assumption that selection for promotion implies the ability to perform duties commensurate with the higher rank. The association between skill level and pay grade is shown in Table 2.4. Those MOS that are available to a soldier at the initiation of active duty and in which initial entry-level training is offered are considered "entry-level MOS," identified in MOS-D by the nominal scale variable MENTRLVL. These are the only MOS in which the soldier can hold a skill level designator of "0" or "1" in the fourth digit of the MOSC. An MENTRLVL value of "1" indicates it is an entry-level MOS, while a value of "0" indicates that it is not available at initial enlistment. MOS-D identifies 242 occupations as entry-level, active-duty MOS as of the end of FY89. Our discussion throughout this Note will focus on these entry-level MOS.

Many MOS terminate at a particular skill level, and soldiers then transition into a different occupational specialty, normally within the same CMF. These so-called "topper" MOS usually coincide with the rank at which the soldier may be expected to supervise subordinates who are trained in a variety of MOS. Every MOS has a career progression that defines how a soldier may transition from E1 to E9. For example, four MOS (27E, 27B, 27L, and 27M) are "feeder" MOS for MOS 27B at skill level 4. An E7 noncommissioned officer (NCO) who is awarded MOS 27B is expected to supervise subordinates who work in these other occupations, regardless of his initial MOS. MOS 00Z, Command Sergeant Major, is the topper MOS for every Army enlisted occupation. The variable MSTOPRK indicates the highest paygrade an individual can achieve in a particular MOS before the soldier transitions to a topper MOS. The variable MSNRMOS identifies the topper MOS for each MOS. These variables can be used to trace the normal career progression for any

Table 2.4

Skill Levels and Associated Paygrades

Skill Level	Paygrade
1	E1–E4
2	E5
3	E6
4	E7
5	E8–E9

occupational specialty. Table 2.5 indicates the career path of a soldier who enlists in MOS 63J and eventually achieves the rank of Command Sergeant Major.

Current promotion policies control progression through various skill levels and MOS. Promotions through grade E4 are controlled by the local commander, who can promote soldiers who satisfy minimum time in service and time in grade requirements.

Promotion to the rank of E5 or E6 is a semicentralized process. Eligible soldiers must be recommended by both their commander and a local promotion board. As of this writing, each nominee receives promotion points based on approved awards and decorations, military and civilian education, military training, the commander's evaluation of the soldier's duty performance, and a numerical rating generated by the promotion board. The soldier must achieve 450 points of a possible 1,000 to be eligible for promotion to E5 and 550 points to be eligible for promotion to E6. If the soldier accrues the minimum number of points, his name is then added to the recommended list for promotion. Once on this list, the soldier is controlled by Headquarters, Department of the Army (HQDA). By adjusting the "cut-off score" for promotion, HQDA controls the number of soldiers promoted and can adjust quotas for overpopulated or understrength MOS. Periodically, guidance is published by PERSCOM, that defines the promotion cut-off score and which authorizes promotion of those soldiers who possess scores above the cut-off. For comparative purposes, the scores published in May 1990 are included in the database under the variables MCUTSC5 and MCUTSC6. These understandably transitory data show, for example, that a soldier in MOS 11B requires 803 points for promotion to E5, while a soldier in MOS 46R requires 998 points for promotion to E6.

Promotion to the grade of E7, E8, and E9 is a centralized process in which promotion boards convened by HQDA review the records of all eligible soldiers and select a certain number for advancement. The names of those selected are published on a promotion list in order of merit. Based on Army needs and budgetary constraints, given numbers of soldiers on the promotion lists are periodically promoted until the list is exhausted.

Table 2.5

A Possible Career Progression Scheme

MOS	MSTOPRK	MSNRMOS
63J	5	52C
52C	6	52X
52X	7	63Z
63Z	9	00Z

The fifth digit of the MOSC contains Special Qualification Identifiers. These identifiers are used to either highlight special requirements of a particular duty position or to identify special capabilities of the soldier awarded the SQI. If used to code duty positions, the code alerts the personnel community to the fact that a soldier possesses a specialized skill needed in a given position. An SQI is granted upon completion of specific training. SQI are not MOS-specific and most training is available to the entire force regardless of occupational specialty. There are currently 22 SQI outlined in Chapter 5 of AR 611-201, including the entry "0," which implies "no special qualifications." Other possible SQI include M (First Sergeant), G (Ranger), X (Drill Sergeant), and 2 (Training Development). Since an SQI can be associated with any MOS or skill level, we have not coded this information into MOS-D.

The sixth and seventh digits of the MOSC contain two-digit Additional Skill Identifiers. ASI are used to identify those skills requiring formal institutional training and which are required to support validated unit mission requirements. These missions or tasks are not, however, expected to be performed by every soldier on a routine basis; therefore, the training is not included in standard MOS training. Each ASI is associated with a specific MOS and can be awarded only to qualified soldiers. For example, ASI J4 is only awarded to soldiers in MOS 13B. ASI J4, entitled Nuclear Cannon Assembly, identifies those soldiers trained in the employment of atomic artillery projectiles. While this is a critical task for a nuclear-capable field artillery unit, only small teams within a battalion are actually involved in the employment procedures. Therefore, few soldiers need to be trained in the particular skills of this ASI.

Currently, 161 ASI exist, including such wide-ranging skills as bread baking, photojournalism, and TEMPEST data analysis. This total includes three ASI that are temporary indicators of reclassification actions and transition training, and two ASI, P5 (Master Fitness Trainer) and 3S (Senior NCO Operations/Intelligence Sergeant), that can be awarded regardless of MOS. It is not clear why these latter ASI are not, in fact, Special Qualification Identifiers.

The variable MSASICD identifies those ASI that are available to each MOS. The entries for MSASICD are the two-character ASI designators. MOS-D does not contain a full title entry for each ASI. A soldier in MOS 13B, for example, can be awarded ASI J4 and U6. The variable MSASINO counts the number of ASI available to each MOS and, as expected, the entry for MOS 13B is 2. Table 2.6 illustrates the distribution of ASI codes across MOS. As depicted, near half of the MOS in the inventory are not authorized any ASI while 1 MOS

Table 2.6

Distribution of ASI Across MOS

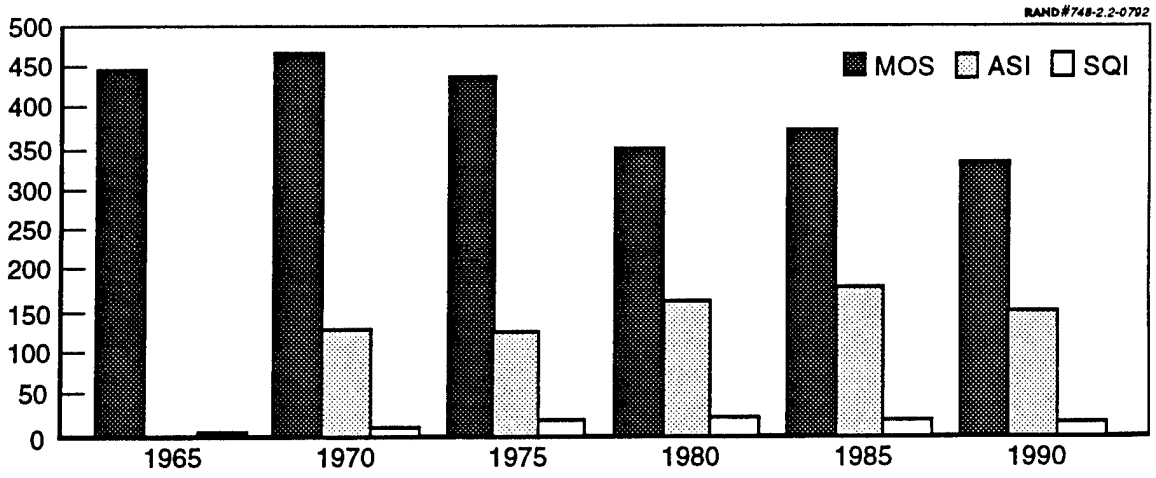
Number of ASI codes	% of MOS
0	46.0
1	25.0
2	16.0
3	7.0
4	4.0
5	1.0
6	0.4
7	0.4
8	0.0
9	0.4

(11B—Infantryman) is authorized 9 ASI codes. ASI that are available to all MOS were not included in these counts.

Certain restrictions apply to the management of ASI. For example, the aptitude requirements for the ASI can be no more restrictive than the aptitude requirements for the associated MOS. If the length of training for the ASI exceeds the length of training for the associated MOS, then a new MOS should be considered. If more than half of the duty positions in a particular MOS require the soldier to be awarded the ASI, then consideration should be given to creating a new MOS or incorporating the training associated with the ASI into the current MOS.

Some have argued that as the Army reduces the number of MOS, there is countervailing pressure to increase the number of ASI and SQI. This tends to work against any effort to streamline the training base and to minimize the difficulty associated with identifying the best-trained soldier for a particular position. The data in Figure 2.2 display the relationship between the number of MOS and the number of ASI and SQI. The figure indicates support for this argument through 1985, but since then, there has been some reduction in both MOS and ASI.

The last two digits of the MOSC are used to indicate language requirements of a duty position or the soldier's language qualification. These two-letter codes are defined in AR 611-6. The entry "AN," for example, identifies a soldier qualified in Arabic. Since these codes are awarded regardless of MOS, there has been no attempt made to code this information into the MOS database.



SOURCE: Military Occupational Development Directorate U.S. Army Personnel Integration Command.

Figure 2.2—Trends in Use of Enlisted Occupational Identifiers

ENLISTMENT AND REENLISTMENT INCENTIVES

The variables in this portion of MOS-D describe incentives designed to encourage applicants to enlist or soldiers to reenlist in a particular occupation. These incentives are management tools that allow recruiters and career counselors to satisfy both the needs of the Army and the personal goals and objectives of the potential recruit/reenlistee.

Enlistment Incentives

Recruitment priority codes are established by the United States Army Recruiting Command (USAREC) as a tool for focusing the efforts of guidance counselors on certain MOS. Each MOS is assigned a number between 1 and 20 with the lower number indicating a higher recruiting priority. An MOS may be assigned a high priority for a variety of reasons, including an increase in accessions needed to accommodate a change in force structure or because the MOS may be difficult to fill. These priorities have been included in MOS-D under the variable MRCPRI. Although the professed range of values for this variable is 1 to 20, the source document listed values only between 0 and 9, with 0 indicating that the MOS is either not an entry-level MOS or is being considered for elimination or consolidation with some other occupation.

Several incentive programs encourage enlistment in particular MOS. These programs are outlined in AR 601-210 and include the following:

- The training enlistment option, which guarantees a specific MOS or CMF and access to Airborne, Language, and/or Intelligence training;
- The station, command, unit, or area option, which guarantees first assignment to a particular location for a minimum of 12 months;
- The officer/warrant officer option, which guarantees enrollment in Officer Candidate School or Warrant Officer Flight Training upon completion of basic training; and
- The enlistment incentive program, which guarantees the soldier an enlistment bonus or participation in the Army College Fund or the Loan Repayment Program.

MOS-D contains information concerning selected enlistment incentives. In particular, it identifies those MOS that offer an enlistment bonus as well as the amount of the bonus. In addition, it also identifies those MOS that were participating in the Army College Fund as of 1986.

As of October 1989, lump-sum enlistment bonuses have been established for some 62 MOS. The minimum bonus is $1500 and the maximum bonus is $8000. The payment of this enlistment bonus is dependent upon completion of both initial entry-level training and the contracted term of enlistment. The variable MENLBNS identifies the dollar value of the bonus available to each of the 62 MOS as of October 1989.[6]

Upon completion of initial entry-level training, the soldier can receive an initial lump-sum payment up to $5000 with any remaining amount to be paid in four equal installments beginning three months after the first payment. If a soldier fails to complete initial entry-level training either voluntarily or because of misconduct, he or she can be retrained in another MOS with no bonus payment. If he fails to complete training due to conditions beyond his control (e.g., injury), the soldier is allowed to select another MOS or be released from service.[7] If the alternate MOS selected offers a bonus, then the soldier is eligible for the bonus only if he completes the training and is awarded the MOS. If the soldier fails to complete his term of enlistment in the MOS due to misconduct or voluntary actions, then he is required to pay back a percentage of the bonus that corresponds to the length of time remaining on the term of enlistment.

[6]This information is similar to cut-off score values in that it is very responsive to the needs of the Army and, hence, can change frequently. The initial data were included for exploratory, comparative reasons.

[7]We use the terms "he" and "his" for convenience to refer to male and female soldiers.

A review of the data indicates that approximately 40 percent of the combat arms MOS offer a bonus, while 13 percent of the combat support MOS and 19 percent of the combat service support MOS offer bonuses. Four combat arms MOS offer the maximum bonus of $8000 and include the infantry series MOS, such as 11B, 11C, 11H, and 11M.

The Army College Fund (ACF) offers the soldier additional educational assistance beyond that earned under the Montgomery GI Bill.[8] Under this option, the soldier must volunteer for and remain enrolled in the GI Bill and must serve a minimum of 20 months on a two-year enlistment or 30 months for all other enlistments. In return, the Army deposits funds in the soldier's Veteran's Administration account. The amount deposited is based on the soldier's term of enlistment. If the soldier enlists for two years, then up to $8000 is deposited at an accrual rate of $333.33 per month served. If the term of enlistment is three years, then up to $12,000 is deposited at the same monthly rate. If the soldier enlists for four years, then up to $14,000 is deposited at a rate of $300 per month. Once the soldier departs the service and is enrolled in an approved program of education, the funds are dispersed from the account in 36 equal monthly payments. Selection of an MOS for inclusion in the program is a HQDA decision in response to recruitment needs and priorities. The data indicate that 65 entry-level MOS participated in the ACF as of 1986. The nominal variable MSACOLFD contains a value of "1" if the MOS allows the soldier to participate in the ACF; a value of "0" indicates that the soldier cannot participate. Approximately 40 percent of the combat arms MOS are in the ACF, 11 percent of the combat support MOS are participants in the program, and about 23 percent of the combat service support MOS offer the incentive.

The Army Apprenticeship Program, which is not discussed in AR 601-210, could also encourage enlistment in particular occupations. Coded in the database under the nominal variable MSAPPROG, these occupations are similar to civilian occupations and are recognized by the Department of Labor (DOL) as the equivalent of satisfactory civilian apprenticeship. In fact, DOL will award the individual a certificate of journeyman status, which is recognized by both civilian employers and trade unions. The majority of the MOS that qualify for this program are in the combat support and combat service support branches. For example, both MOS 51R, Interior Electrician, and MOS 94B, Food Service Specialist, are included in this program. Of the 64 military occupations in the Apprenticeship Program, only 4 are combat MOS, while 32 are combat support occupations and 28 are combat service support MOS.

[8]Under the Montgomery GI Bill, the soldier contributes $1200 during the first year of service. Based on this contribution, the soldier can accrue $10,800 for future educational needs.

A program that is similar to the Apprenticeship Program is the Army Civilian Acquired Skills Program (ACASP) (AR 601-210, 1990, p. 79). This program is designed to exploit certain civilian-acquired skills that the recruit may possess that are readily usable within the Army environment. The program identifies a group of MOS for which civilian experience can be substituted for formal military training. Currently, there are over 100 entry-level MOS in the ACASP that are identified in MOS-D by the nominal variable MCASTP. Examples of the MOS included in this program are Food Service Specialist (MOS 94B) and Dental Specialist (MOS 91E). Under this program, if the recruit can satisfy certain criteria, he attends basic training, is exempt from the follow-on AIT, and completes an eight-week period of proficiency training during which the gaining commander evaluates whether or not the soldier has the necessary skills to justify awarding the MOS. If the MOS is awarded, the soldier is also granted an accelerated promotion to the rank of E4. An example of the criteria for enlistment under this program is as follows:

- MOS 57E, Laundry and Bath Specialist: two years of experience in laundry working, dryer operation, or washer operation;
- MOS 93C, Air Traffic Controller: meet Army Class II medical fitness standards and have FAA control tower operator's certificate and control tower facility training.

There are currently no combat arms MOS in the ACASP. Those MOS enrolled in the program are approximately 50 percent combat support MOS and 50 percent combat service support occupations.

Under the variable MCASCNT, MOS-D lists the total number of soldiers who enlisted under the ACASP during FY 89 as derived from the Army's REQUEST database.[9] For approximately 51 percent of the MOS in the program, no soldiers enlisted under the ACASP. In only 7 MOS did enlistments under the ACASP account for more than 10 percent of the total recruits in that occupation. Those MOS include Biological Sciences Assistant (MOS 01H; 25 percent), Machinist (MOS 44E; 20 percent), Firefighter (MOS 51M; 12 percent), Programmer/Analyst (MOS 74F; 12 percent), Technical Drafting Specialist (MOS 81B; 28 percent), Practical Nurse (MOS 91C; 39 percent), and Respiratory Specialist (MOS 91V; 67 percent).

[9]The REQUEST database is maintained by the U.S. Army Recruiting Command and serves primarily as the recruiter's "reservation" system for matching recruits to occupations and options.

While this program may provide significant savings in training costs, it does not seem to attract a significant number of soldiers. In fact, our data show that only 640 individuals entered the Army under this program, with 201 of those entering as bandsmen and 128 entering as light wheel vehicle mechanics. However, these 128 mechanics represent only 3 percent of the total enlistees in MOS 63B for FY 89. It could be argued that some prerequisites are excessive, e.g., that two years of civilian laundry operation might over-qualify an individual for an MOS that only requires 38 days of AIT. It has also been suggested that individuals who possess the prerequisites may be able to demand a salary in the civilian sector that far exceeds any potential military earnings. For example, a civilian FAA-certified air traffic controller probably earns more than an E4. Expansion of this program warrants further consideration. For example, concentrating effort within certain MOS might permit significant reductions in training dollars.

Reenlistment Incentives

Two incentives for reenlistment are included in MOS-D. The first is the Selective Reenlistment Bonus (SRB) program and the second is the Bonus Extension and Reenlistment (BEAR) program.

The SRB program is designed to encourage reenlistments in MOS that are failing to retain enough personnel to support the career force. In order to be eligible for a reenlistment bonus, the soldier must be at least an E3, he must be qualified in a PMOS that offers the bonus, and he must reenlist for a minimum of three years. The amount of the bonus is defined as the product of the soldier's monthly base pay at the time of reenlistment, the number of years for which he reenlists, and the appropriate SRB multiplier that is announced in periodic Department of the Army (DA) messages.

Reenlistment bonuses are offered in three so-called "zones of eligibility:"

- 21 months of service to 6 years of active service (Zone A)
- 6 to 10 years of active service (Zone B)
- 10 to 14 years of active service (Zone C)

There are no provisions for reenlistment bonuses after the 14th year of service.

For each MOS, the current multipliers by zone are published periodically. Table 2.7 indicates the multipliers that were in effect for MOS 29M in October 1989.

Under the variable MRENLBNS, the database contains the multipliers in effect as of October 1989 for soldiers in paygrade E3–E4 and Zone A. MOS-D reflects 82 entry-level MOS in which soldiers are eligible for a selective reenlistment bonus upon completion of the

first term of service. Table 2.8 indicates the distribution of reenlistment bonuses by MOS category for those entry-level MOS.

Consider a soldier in MOS 13F who decides to reenlist at the completion of his first term of service. If we assume that he has four years of service and has reached the rank of E4, his monthly base pay is $1122.90. MRENLBNS for this MOS is 2, and if the soldier reenlists for three years, his bonus would be:

$$2 \times 3 \times \$1122.90 = \$6737.40$$

The Bonus Extension and Reenlistment Program permits a soldier to extend his enlistment to receive formal retraining in a shortage MOS that is presently in the SRB program. Normally, MOS included in the BEAR program are those for which specialized skill training is considered quite difficult or costly. Consequently, the Army would prefer to retrain a soldier of proven potential than to attempt to train a new, unproved recruit. Upon completion of formal training in the shortage MOS, the soldier can reenlist and receive the expected bonus. If he fails to complete that training, then he can either terminate his service or apply to reenlist in a different MOS. A value of "1" for nominal variable MBEARCD indicates that the MOS is included in the BEAR program as of October 1989. The data in MOS-D indicate that only seven MOS were included in the BEAR program as of that date. MOS 24T, PATRIOT Operator and System Mechanic, is an example of an MOS in this program.

Table 2.7

SRB Multipliers for MOS 29M

Zone	E3–4	E5	E6–7
A	3.0	3.0	0.0
B	0.0	1.0	0.0
C	0.0	0.0	0.0

Table 2.8

Relative Frequency of MOS with SRB, by Category

Branch	Percent of MOS in Branch with SRB	Average Value of Multiplier
Combat Arms	72%	1.89
Combat Support Arms	41%	2.27
Combat Service Support	18%	1.44

3. ENLISTMENT PREREQUISITES

This section provides an overview of the various prerequisites for enlistment in each MOS. These prerequisites fall into two categories: basic requirements that every applicant must satisfy regardless of MOS, and requirements necessary to satisfy the expected job demands in specific occupations. Below we discuss each of these prerequisites in detail and provide numerous illustrations of the data contained in MOS-D.

PRINCIPAL VARIABLES

Table 3.1 presents the variables discussed in this section.

DATA SOURCES

The primary sources of the data in this section include AR 611-201 and the QUALS files. Several other references were also employed. These included AR 601-210, entitled *Regular Army and Army Reserve Enlistment Program*, which provides a detailed discussion of enlistment options and requirements for enlistment. AR 40-501, entitled *Standards for Medical Fitness*, discusses medical requirements for enlistment, retention, and separation.

Table 3.1

Enlistment Prerequisite Variables

Variable	Description
MSTRM	The expected term of enlistment in years for the MOS.
MSECCLR	The security clearance required for enlistment in the MOS.
PCLRVSN	The color vision requirement for enlistment in the MOS.
PHYCOD	Upper body strength requirements for the MOS.
PULHES	A six-digit physical profile serial that identifies the broad physical demands of the MOS and the physical ability required of the individual to perform satisfactorily within the MOS.
PHYSCx	A disaggregation of the PULHES rating by component score.
ACAT1-3A	FY89 target accession percentage in aptitude categories I-IIIA.
ACAT3B	FY89 target accession percentage in aptitude category IIIB.
ACAT4	FY89 target accession percentage in aptitude category IV.
AFQTDOD	Mean AFQT percentile score per MOS (September 1984).
AFQTREQ	Average AFQT score from REQUEST datafile (FY89).
AFRMED	Code indicating educational prerequisites for each MOS.
ASVAB	Percent of accessions capable of achieving published ASVAB composite qualifying score.
ASVAx	ASVAB aptitude area qualifying composite. If x=1, composite is primary qualifying area. If x=2, composite is secondary qualifying area.
ASVAyzx	A dummy variable designed to identify the ASVAB qualifying area composite. "yz" indicates the composite, "x" identifies the primary (1) or secondary (2) composite.
ASVSx	Minimum score required in the applicable aptitude area. If x=1, score is for primary ASVAB requirement. If x=2, score is for secondary ASVAB requirement.

Eitelberg (1988) provides the average Armed Forces Qualification Test (AFQT) scores for each MOS and the expected percentage of soldiers who could achieve the Armed Services Vocational Aptitude Battery (ASVAB) qualification scores. In addition, he discusses the development of the ASVAB and the AFQT and the utilization of these measures of trainability.

GENERAL REQUIREMENTS

Certain elementary requirements for enlistment must be satisfied by all nonprior service recruits. Each entrant to active duty service must be between the ages of 17 and 35, with parental consent required for enlistment by individuals who have not yet reached their 18th birthday. In general, the applicant must be a citizen of the United States or an alien who has been admitted to the United States for permanent residence.[1] The applicant must meet certain moral standards that are designed to preclude an individual with criminal tendencies from entering active duty.[2] Applicants must provide evidence that dependent support requirements will not interfere with their duties as soldiers or their availability for worldwide assignment, mobilization, and deployment. For example, an applicant who is a single parent with custody of one or more dependents under the age of 18 is not considered eligible for entry to active duty.[3] There are also other trainability and physical prerequisites that we will discuss later in this section.

All applicants for active duty are required to initiate an Entrance-level National Agency Check (ENTNAC) as a preliminary personnel security verification. In addition, many MOS require a more comprehensive security clearance investigation ranging from the confidential to the top secret level. The specific clearance requirement by MOS is coded under the variable MSECCLR. Approximately 57 percent of the MOS have no specific security requirement other than the enlistment requirement, while the remaining 43 percent of the MOS have more stringent security requirements; specifically, 12 percent require a confidential clearance, 23 percent require a secret clearance, and 8 percent require a top secret clearance or eligibility for access to compartmentalized information.

MOS that require higher-level security clearances are primarily responsible for intelligence functions or operation of sophisticated electronic warfare equipment. For example, all six MOS in CMF 98, SIGINT/EW Operations, require the soldier to possess a top

[1]Certain other persons are also eligible, for example, citizens of the Federated States of Micronesia and the Republic of the Marshall Islands.

[2]The specific moral disqualifiers in terms of number, nature, and frequency of convictions that will preclude active military service are outlined in Chapter 4 of AR 601-210.

[3]A specific treatment of the rules for dependency is contained in Chapter 2 of AR 601-210.

secret clearance with the capability of becoming eligible for access to compartmentalized information. The requirement for a more stringent security classification imposes a significant constraint on the recruiter, who must be more selective in the recruit nominated for the occupation. In addition, the existence of such a requirement may preclude certain training options. For example, integrating an MOS with a strict security requirement into a generic training program may require all soldiers attending that training to also satisfy that security requirement.

If eligible for enlistment, all active Army recruits incur an eight-year minimum service obligation. That obligation is served through a combination of active duty service and service in some branch of the reserve component. The initial active duty portion of the service commitment varies from two to six years and varies by enlistment MOS. The remaining obligation is completed as a member of the Individual Ready Reserve (IRR) or in a unit in the Selected Reserve (SR).[4] The database identifies the initial term of active service by MOS under the variable MSTRM. This term of enlistment is negotiable based on the particular enlistment option selected by the recruit. However, all MOS have an associated minimum term of service if the soldier does not enlist under any special program. These values are coded into MOS-D and illustrated in Figure 3.1.

The majority of MOS require a four-year enlistment. While soldiers can enlist for two-year terms in many occupations that have been linked to a variety of educational incentive programs, we identify only three MOS that have a minimum enlistment term of two years. Those MOS are all related to the Pershing Missile system (MOS 15E, Pershing Missile Crewmember; MOS 21G, Pershing Electronic Materiel Specialist; MOS 46N, Pershing Electrical-Mechanical Repairer), which is being eliminated from the inventory. All soldiers qualified in those classifications are scheduled to be retrained by the end of FY92. At the other end of the spectrum, there are 41 MOS that require a term of enlistment of six years. These tend to be technical MOS with extensive specialized skill training. There are, for example, three Career Management Fields (CMF) in which all MOS require a six-year term of enlistment. Those CMF include CMF 33, Electronic Warfare/Intercept Systems Maintenance; CMF 67, Aircraft Maintenance; and CMF 74, Automatic Data Processing. While the correlation between the term of enlistment and the length of advanced individual

[4]The IRR (or ING in the National Guard) is a personnel pool of those soldiers who have completed their active duty commitment but have not fulfilled their total eight-year requirement. They may be required to perform annual training and are eligible for call-up during mobilization. They are not assigned to specific units in the RC. The SR is primarily composed of those troop program units in the USAR and units in the Army National Guard.

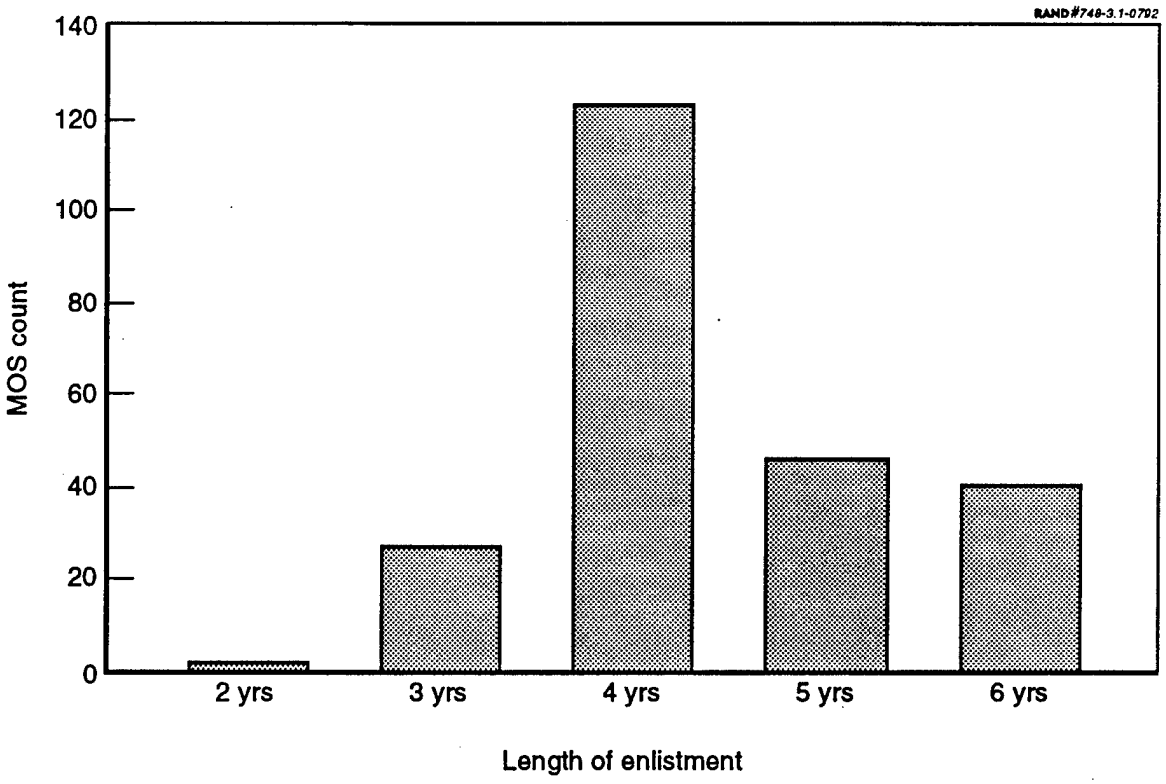


Figure 3.1—Distribution of MOS by Term of Enlistment

training (AIT) is relatively weak (r=0.20), the average length of AIT for those MOS with a six-year enlistment is 105 days, compared to 77 days (on average) for all MOS.

PHYSICAL REQUIREMENTS

Physical standards exist in two categories: those applicable to all soldiers (regardless of MOS) and requirements specific to a particular MOS.[5]

Every applicant for enlistment must meet certain medical fitness standards outlined in AR 40-501. In addition, the recruit must obtain negative results on both an HIV test and a drug and alcohol test. If the recruit passes these tests, then he is presumed to be medically fit. Throughout the course of the soldier's career, he is assumed to be physically fit unless evidence of a change in the fitness of the soldier is identified. Soldiers are periodically evaluated through medical examinations and physical fitness tests. Should the soldier fail

[5]"Physical profile serials associated with the various MOS are guides and are used to determine the initial selection of basic combat trainees (including enlistees for MOS options) for advanced individual training. The profile established at the Military Entrance Processing Station (MEPS) is the basis for determining initial training assignments for all personnel new to the service" (AR 611-201, p. 13).

these examinations or tests, his potential for continued active service is evaluated, and he may be considered for discharge.

Three MOS-specific physical requirements are coded in MOS-D. First, each MOS may specify a color vision requirement, which may require that a soldier possess normal color vision, or the ability to discriminate between red and green. The published option for each MOS is coded in the database under the variable PCLRVSN. Approximately 17 percent of the entry-level MOS do not specify a color vision requirement, 11 percent only require red-green discrimination, and 72 percent require normal color vision.

The second MOS-specific requirement is the physical profile serial or the PULHES code. This code is used in two ways: to identify the medical/physical condition of soldiers and to define the physical requirements of occupations. Each soldier is tagged with a PULHES serial code upon completion of his most recent medical examination. This code identifies the soldier's condition in each of six different physical factors:

P – Physical stamina
U – Upper extremities
L – Lower extremities
H – Hearing and ears
E – Eyes
S – Psychiatric

The most desirable score for a profile serial is "111111." AR 40-501 defines the profile serials according to the scheme depicted in Table 3.2.

Table 3.2

Profile Serials

Lowest Number in Serial	Example	Description
1	111111	No assignment limitations. Considered medically fit for duty in any MOS.
2	121111 122222	May have assignment limitations that are intended to protect against further physical damage. Combat fit. May be disqualified for certain MOS.
3 or 4	121311 131242	Possesses impairments that limit functions or assignments but within which the individual is capable of performing military duty.

To define physical requirements in the occupation, each MOS has an associated physical profile serial that is designed to serve as a guide for classifying recruits into occupations. These ratings, coded in the MOS database under the variable PULHES, cannot be used to disqualify or reclassify soldiers; instead they indicate the physical requirements of the occupation. For example, an MOS with a published physical serial of "111111" is a demanding occupation; however, a soldier in the MOS with a PULHES score of "111231" is not automatically considered for a change in MOS. He may be referred to a medical review board, which will review his condition and determine his potential for continued service in the MOS. Only one MOS (13F, Fire Support Specialist) has a physical serial of "111111." Most MOS allow from one to six entries of "2" as the lowest numerical designator, and 30 MOS allow one or more entries of "3" as the lowest designation in the serial. Of these latter occupations, nine are from the Medical CMF (91) and nine are from the Administration CMF (71). One occupation (MOS 25Q, Graphics Documentation Specialist) has a proposed physical serial of "323332," which is the least restrictive serial published.

For analytical purposes, the variable PULHES has been disaggregated into six different variables entitled PHYSCx, which contain the specific one-digit scores for each factor. The "x" identifies which factor is contained in the variable and the possible values for "x" match the entries in the acronym PULHES. The variable PHYSCU, for example, contains the factor rating for "upper extremities" for each MOS.

Along with the PULHES code, a physical-demands analysis has been included in AR 611-201 that classifies each MOS according to the nature of the work expected of that occupation. These work requirements are then translated into "upper body strength" codes for each MOS. The categories were derived from those used by the Department of Labor and rate the maximum expected lift (in pounds) required of the occupation and the constant expected lift (in pounds). This information is coded in MOS-D under the nominal variable PHYCOD. The possible categories and the associated variable values are shown in Table 3.3.

Table 3.3

Physical Demand Categories

Category	Max Lift	Constant Lift	PHYCOD
Light	20	10	1
Medium	50	25	2
Heavy	80	40	3
Moderately heavy	100	50	4
Very heavy	>100	>50	5

Based on the expected rigors of the work environment, 43 percent of the MOS in the database are contained in the "very heavy" physical-demands category. Figure 3.2 displays the distribution of MOS by physical demand categories.

APTITUDE REQUIREMENTS

The trainability of enlistees is defined primarily through aptitude examinations and formal education levels. Although high school graduation is predictive of success in the military, and the Army has greatly increased the proportion of enlistees with high school diplomas, a diploma is not a prerequisite for active duty service. In fact, the "trainability" requirements for enlistment (detailed in AR 601-210) combine formal education and performance on the ASVAB. High school graduates must score 85 on at least one of the composite tests of the ASVAB. Non–high school graduates must score 85 on at least two of the composite tests of the ASVAB. In addition, every recruit must be able to read, write, and comprehend sufficient English to understand the oath of enlistment and the questions contained on the questionnaire for the Entrance National Agency Check. Each MOS has, however, specific aptitude prerequisites that may include more stringent educational

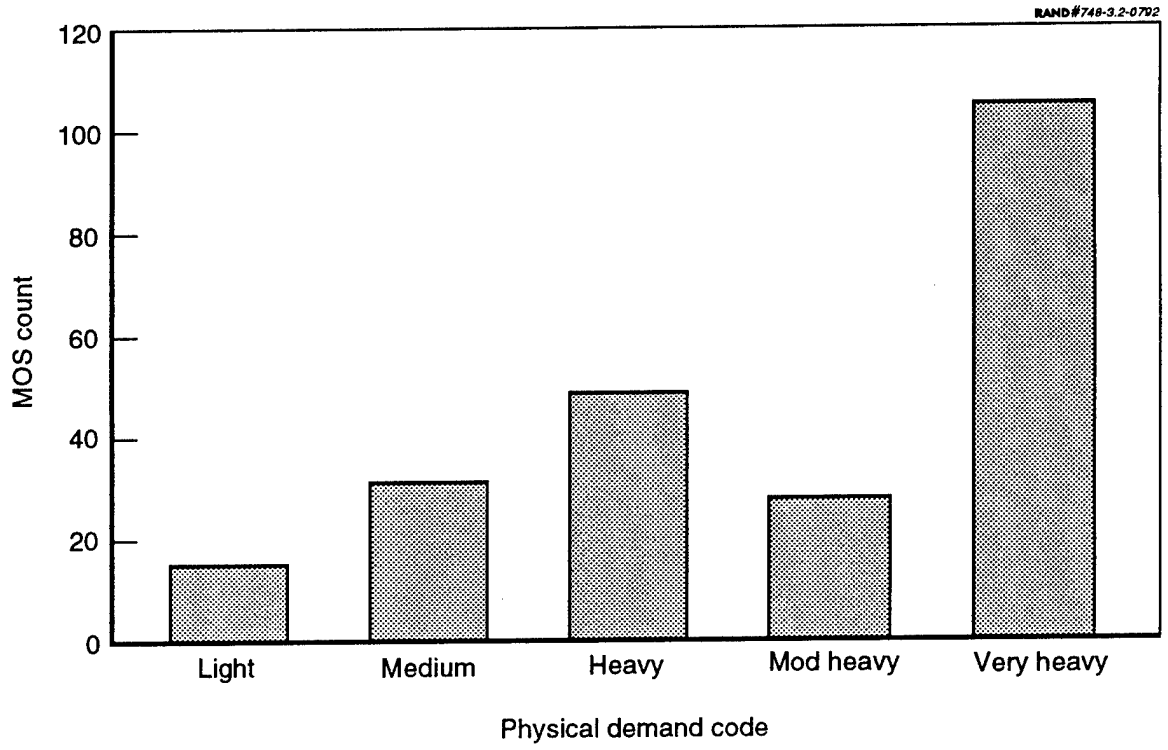


Figure 3.2—Distribution of MOS by Physical Demand Codes

requirements and minimum scores on one or more specific composites of the ASVAB. These additional requirements have been coded into MOS-D.

Formal Education Requirements

The formal education requirements vary among MOS and are established by the proponent for the MOS. Nearly 79 percent of the MOS accept enlistment educational standards, but the remaining occupations require recruits to possess a high school diploma or a higher level of education. This information has been coded into MOS-D under the ordinal variable AFRMED. The possible values for that variable are depicted in Table 3.4.

Table 3.4

Possible Values for AFRMED

AFRMED Value	Educational Requirement
0	No formal requirement other than enlistment standards
1	High school diploma
2	HS diploma with evidence of one specific academic subject
3	HS diploma with evidence of two specific academic subjects
4	HS diploma with evidence of three specific academic subjects
5	College work required

All MOS considered as combat arms occupations accept the enlistment standards without any additional educational attainment. Only one (MOS 92E, Cytology Specialist) has a value of "5" for AFRMED and requires completion of 60 semester hours or 90 quarter hours at an accredited university or college to include a minimum of 14 semester hours or 21 quarter hours of biology. Only one occupation (MOS 29V, Strategic Microwave Systems Repairer) has a value of "4" for AFRMED, requiring a high school diploma plus evidence of completion of one year of trigonometry, one year of algebra, and one year of science.

The Armed Services Vocational Aptitude Battery

The ASVAB contains a series of subtests designed to measure vocational aptitude in a number of areas. These tests are administered during the enlistment process and are designed to help the guidance counselor identify the most appropriate occupational match for each potential enlistee. These subtests comprise a series of 30-minute examinations that include:

Subtest	Content Area
GS	General Science
AR	Arithmetic Reasoning
WK	Word Knowledge
PC	Paragraph Comprehension
NO	Numerical Operations
CS	Coding Speed
AS	Auto and Shop Information
MK	Mathematics Knowledge
MC	Mechanical Comprehension
EI	Electronics Information
VE	Sum of Word Knowledge & Paragraph Comprehension

These subtests are then combined to form a variety of "composites," which are used to define the prerequisites for enlistment in each occupation.[6] The composites are formed from the subtests as follows:

Composite	Definition
GT (General Technical)	VE + AR
GM (General Mechanical)	MK + EI + AS + GS
EL (Electronic)	AR + MK + EI + GS
CL (Clerical)	AR + MK + VE
MM (Mechanical Maintenance)	NO + AS + MC + EI
SC (Surveillance Communications)	AR + AS + MC + VE
CO (Combat)	CS + AR + MC + AS
FA (Field Artillery)	AR + CS + MC + MK
OF (Operators and Foods)	NO + AS + MC + VE
ST (Skilled Technical)	VE + MK + MC + GS

Every applicant who completes the ASVAB during the enlistment process receives a score in each composite area. As mentioned earlier, if the applicant is not a high school graduate, he must achieve a score of 85 in two of the composites to be eligible for active duty. The composite scores define the recruit's eligibility for particular MOS. For example, to qualify for enlistment in MOS 13M (MLRS Crewman), the enlistee must achieve a minimum score of 105 in composite OF. To qualify for enlistment in MOS 62F (Crane Operator), a recruit must achieve a score of 90 in composite GM. Finally, in order to qualify for MOS 43E (Parachute Rigger), a recruit must achieve a score of 90 in composite GM and a score of 90 in composite CO.

[6]Considerable research has been conducted by the Army Research Institute and others examining the predictive value of these composites for estimating job performance. There are, in fact, several ongoing research efforts designed to develop more comprehensive predictors, and there is currently underway a pilot program to include manipulative tests in the ASVAB.

This information has been coded into MOS-D using several variables. ASVAx is a character variable containing the label for the qualifying composite for the MOS. If "x" equals "1," then the composite identified is the primary aptitude area and if "x" equals "2," then the composite identified is the secondary aptitude area. In the case of MOS 43E, for example, ASVA1 is "GM" and ASVA2 is "CO." The actual qualifying score is coded in the variable ASVSx; again, the x is used to discriminate primary and secondary qualifying scores. These qualifying scores are defined in multiples of five with a typical range between 85 and 110. For MOS 43E, ASVS1 equals "90" and ASVS2 equals "90." For analytic purposes, a series of nominal 0–1 variables has been created that identifies the qualifying composite. ASVAyzx is the key for this set of variables in which yz can assume the two-letter designators of the qualifying composite and x identifies the primary or secondary qualifying aptitude area. In the example of MOS 43E, the variable ASVAGM1 has a value of "1" and ASVACO2 has a value of "1" while all other variables of this type, i.e., ASVAMM2, ASVACL1, and ASVAST1, equal "0."

Examination of these variables reveals some interesting distinctions. While all entry-level MOS except Bandsmembers are required to have a primary qualifying ASVAB composite, 21 occupations require a secondary qualifying ASVAB. A significant relationship exists between ASVAB qualifying composites and Career Management Fields. This should not be surprising, because each CMF is designed so that soldiers serving in one CMF specialty could potentially train in most other specialties in the CMF. Of 30 CMF with entry-level MOS and primary qualifyng ASVAB composites identified in the MOS-D, 16 use the same qualifying ASVAB composite for all subordinate MOS. Six CMF identify two qualifying ASVAB composites while the remaining eight identify two or more. Two CMF (13, Field Artillery; 91, Medical) identify five different qualifying ASVAB composites for their subordinate MOS. Moreover, the distribution of MOS by qualifying ASVAB composites indicates that EL and ST are the most frequent ASVAB qualifying composites, accounting for approximately half of the MOS in the database. Table 3.5 illustrates this distribution as well as the modal value and range of the qualifying scores for MOS by each composite.

Eitelberg (1988) tabulates the percentage of the general Army population that would be eligible for every possible combination of qualifying ASVAB composite and qualifying scores. This information is coded in MOS-D under the variable ASVAB. As Eitelberg argues, these percentages can be used "to estimate the similarity between various cutting scores by using population qualification rates as a point of reference" (p. 187). Because 85 percent of the general Army population would qualify for a cut score of 95 in GM and 76.4 percent would qualify for a cut score of 100 in ST, the latter may be considered the more demanding

Table 3.5

Distribution of MOS Qualifying Scores by ASVAB Composites

Composite	# of MOS	Mode	Minimum	Maximum
None	1			
CL	20	95	85	110
CO	10	90	90	90
EL	60	110	85	120
FA	5	95	85	100
GM	31	90	85	105
GT	2	110	110	110
MM	30	105	90	105
OF	13	100	90	105
SC	7	100	90	100
ST	63	95	85	115

prerequisite. Using these qualification rates, a rank ordering of the entry-level MOS can be developed that indicates the degree of difficulty for qualification.

The Defense Manpower Data Center provided means and standard deviations for the ten composite tests. These data, reflected in Table 3.6, were based on a sample of 35,332 nonprior service Army recruits tested through March 1990.

ASVAB subtest scores are also used to determine the soldier's AFQT score. This score is a combination of arithmetic reasoning, mathematics knowledge, word knowledge, and paragraph comprehension. The exact formula for determining the AFQT is

$$AFQT = WK + PC + AR + NO/2.$$

The AFQT is designed as a screening device to identify those individuals who possess the requisite training aptitude to acquire military skills. The Army sets overall recruiting goals using AFQT distributions, but the AFQT is not used to screen candidates into specific MOS. However, estimates do exist of the average AFQT score for each MOS. The REQUEST database records the AFQT score for every enlistee and can be used to determine the mean AFQT score by MOS. We derived these values for FY89, which are coded under the variable AFQTREQ. Eitelberg (1988) includes the mean AFQT percentile scores of male personnel assigned to each MOS as of September 1984. This information is included in MOS-D under the variable AFQTDOD. Table 3.7 displays overall descriptive statistics for these variables, showing that the average AFQT across MOS in the database rose between 1984 and 1989.

Table 3.6

Sample Means and Standard Deviations for Composites

Composite	Mean	Standard Deviation
CO	105.93	13.59
FA	106.45	12.95
MM	105.32	13.78
GM	104.02	14.23
CL	106.03	11.84
GT	105.91	11.53
EL	104.37	13.37
SC	105.65	13.53
ST	105.96	12.81
OF	106.81	11.98

Table 3.7

Descriptive Statistics for AFQTREQ & AFQTDOD

Variable	Mean	Minimum	Maximum
AFQTREQ	61.4	37.6	97.0
AFQTDOD	54.2	31.0	76.0

The AFQT distribution is also used to create "test categories" of AFQT scores. The categories are composed as follows:

Category	AFQT Score
I	93–100
II	65–92
IIIA	50–64
IIIB	31–49
IVA	16–31
IVB	10–15
V	0–9

Periodically, DA publishes guidance that defines overall target AFQT distributions by MOS. There are also congressional limitations on the number of individuals in lower AFQT categories (IIIB–V) who can be accepted for active service. Category V applicants, for example, are not eligible for military service. The target AFQT distribution by MOS is coded in the database under the variables ACAT1_3A, ACAT3B, and ACAT4 and is derived from

the *PERSCOM Force Management Book* for January 1989. The entries for these variables are the United States Army Recruiting Command mission for recruiting as of January 1989. For MOS 27M, for example, the target distribution is:

Category		
I-IIIA	**IIIB**	**IV**
50%	38%	12%

Table 3.8 shows the average AFQT score derived from Eitelberg (1988) and the REQUEST datafile, delineated by occupational branches. The target distribution by test category, averaged across each of the entry-level, active Army MOS in each of the three branch categories, is also shown.

Table 3.8

AFQT Scores by MOS Branches

Branches	AFQTREQ	AFQTDOD	ACAT1-3A	ACAT3B	ACAT4
Combat Arms	59.7	52.9	68.1	25.7	6.2
Combat Support Arms	63.9	56.8	74.5	20.5	5.0
Combat Service Support	59.8	52.7	63.6	30.6	5.9

4. TRAINING DATA

This section discusses two distinct data groups contained in MOS-D. Both are concerned with individual training, but each has a separate and unique focus. First, we attempt to measure the degree to which the tasks expected of a soldier in a particular MOS are primarily manipulative or procedural as opposed to cognitive or information-processing oriented. Those results are coded into the database, and some preliminary analysis is presented in this section. Second, we obtained descriptive data that define the location and length of MOS training, the number and size of training classes conducted, and the expected attrition levels. This information is coded in MOS-D, and sample descriptive statistics are presented.

PRINCIPAL VARIABLES

Table 4.1 presents the variables discussed in this section.

Table 4.1

Training Variables

Variable	Description
TCMN	Number of common skills tasks included in AR 611-201 duty description.
TINFO	Number of "information processing" skill-level-10 tasks coded from AR 611-201 duty description.
TMAN	Number of "manipulative" skill-level-10 tasks coded from AR 611-201 duty description.
TTOT	Sum of the three different task types.
TMNIFRA	Derived variable measuring the ratio of information-processing tasks to manipulative tasks.
TOSUT	Indicates if the MOS is trained through one-station-unit-training.
TNGLOCN	Installation at which MOS training is conducted.
TNGCRSCD	The ATRRS code for the training installation.
TNGLGTH	Length of AIT training in days.
TATTRIT	Percentage of enlistees who fail to complete initial entry training (IET).
TNOSHO	Percentage of enlistees who fail to appear for IET.
TCLASS	The number of AIT classes conducted annually.
TCLMAX89	The maximum number of students that can be trained per class.
TCLMIN89	The minimum number of students required to support a class.
TCLOPT89	The optimal number of students per class based on student-instructor load.

DATA SOURCES EMPLOYED

AR 611-201 is the primary source of information for training data. The regulation contains a detailed listing for each occupation of the tasks expected of soldiers at all possible skill levels. Using the version of the regulation dated 30 November 1988, we analyzed the

tasks described as initial entry tasks. The results of that analysis will be discussed in the following paragraphs.

We also obtained training data from the Army Training Requirements and Resources System (ATRRS). This computer-based information system serves as the master "reservation system" for all Army-sponsored training. As stated in Volume I of the User's Manual, "the ATRRS data base maintains information at the course level of detail on all courses taught by or for Army personnel." ATTRS manages the information necessary to develop class schedules, creates the annual mission document that generates trainee and student inputs, monitors the flow of students through the training base, maintains records of formal school attendance by individual soldiers, and provides information necessary to determine resource requirements for training installations.

Three additional sources of information include the *TRADOC Primer;* DA Pamphlet 351-4, entitled *Army Formal Schools Catalog,* and the Department of Defense's *Military Manpower Training Report—FY 1989*. The *TRADOC Primer* serves as a comprehensive source of information concerning the operation of TRADOC, and it explains the operation of the training base. For example, the definitions of both "structure loads" and "budget loads" are derived from this source. DA Pamphlet 351-4 serves as a hard-copy reference for much of the information that is coded into the ATRRS system. The DoD's *Military Manpower Training Report* discusses the "average student load for each category of training for each active and reserve component of the armed forces."

DOMINANT TASKS

Measures that characterize the attributes of tasks performed by an occupation could provide valuable insight into selecting alternative training strategies and applying available technologies. One example is current U.S. Army Training and Doctrine Command (TRADOC) plans for "distributed training," which target occupations with a predominance of cognitive tasks because "industry and academia have proven that cognitive training can be effectively delivered" on distance learning technologies (TRADOC, 1989, p. 10).

AR 611-201 contains a list of tasks at each skill level for each MOS. For the purposes of this study, each task identified as a skill-level-10 task was reviewed and defined as primarily a manipulative/procedural task, an information-processing/cognitive task, or a common-skills task. This review rated 4,719 tasks. In an initial test of reliability of these ratings, three raters categorized a random sample of 387 tasks. The three reviewers agreed on 82 percent of the tasks. Based on that effort, we categorized the remaining tasks, employing the following rules:

1. Every task was understood to require both manipulative and information-processing skills. Our effort was aimed at capturing the dominant skill required for the successful completion of the task. Digging a foxhole, for example, requires the soldier to process certain information and determine the length, width, depth, and location of the fighting position; however, the dominant skill is a manipulative skill (digging).
2. "Common tasks" were identified and counted separately. The reference for common tasks is FM 21-2, *Soldier's Manual of Common Tasks, Skill Level 1*. For example, tasks such as map-reading or firing an individually assigned weapon are common tasks that every soldier is required to accomplish and that may be tested annually during the conduct of the Common Task Test (CTT). The task lists contained in AR 611-201 were generated by the appropriate TRADOC institution that has proponency for the particular MOS, and certain schools included more common tasks than others. The Infantry and Armor MOS, for example, contained more common tasks than any other MOS.
3. Safety-related tasks were counted as common tasks. Generic tasks, such as "applies safety precautions," are included in this category.
4. Certain key words were used to identify information-processing tasks, including "visually identifies," "inspects," "tests," "interprets," "troubleshoots," and "coordinates." Manipulative tasks were also associated with certain key words: "operates," "replaces," "installs," "maintains," and "performs."
5. Equipment testing was considered an information-processing skill, as were tasks that required the soldier to "determine shortcomings and malfunctions," "isolate and diagnose," or "interpret schematic." As a result of this rule, several maintenance-oriented MOS received a high cognitive-to-psychomotor ratio because their task lists were heavily weighted with such tasks.
6. "Completing forms" and "ordering parts," which were common entries throughout the task lists, were considered information-processing tasks.

A sample of the published tasks for MOS 77F, Petroleum Supply Specialist, and their associated ratings include:

Task	Category
• Assists in the construction of Petroleum, Oil, and Lubricant (POL) storage area by clearing underbrush, preparing rough access roads, and erecting identification signs.	Manipulative
• Digs trenches and firewalls to protect POL storage location.	Manipulative
• Inventories petroleum and water stocks.	Information processing
• Records daily filter pressure differential.	Information processing
• Adheres to fire and other safety procedures.	Common
• Interprets military map symbols.	Common

Once the tasks were categorized, the totals for each rating were included in MOS-D. TCMN includes the number of common skill and safety tasks. TINFO contains the number of information processing tasks, while TMAN contains the number of manipulative tasks. TTOT contains the sum of these three variables, which equals the total of skill-level-10 tasks included in the MOS description in AR 611-201. The number, range, and type of tasks identified for the occupations surveyed are depicted in Table 4.2.

Table 4.2

Distribution of Tasks by Type

Type Task	Average Task Count	Minimum Number	Maximum Number
Manipulative	9.2	0	60
Information processing	9.6	0	42
Common	1.4	0	22
Total tasks	20.1	4	81

We then calculated a ratio of the information-processing to manipulative tasks. This measure would allow us to develop a comparative ranking of the occupations, to cluster occupations with similar task orientation, and, perhaps, to link appropriate training options to families of MOS. The equation used to determine the cognitive-to-manipulative ratio for each occupation is:

$$TMNIFRA = (TINFO - TMAN)/ (TINFO + TMAN)$$

The distribution of this ratio ensures that the value of the ratio is bounded and provides a comparable measure between MOS. In addition, it suggests "cut-points" to determine MOS with high, medium, or low cognitive-to-psychomotor ratios. An MOS with twice as many information-processing tasks as manipulative tasks could be considered as having high cognitive demands. By similar logic, an MOS that has twice as many

manipulative tasks as information-processing tasks could be considered as low in cognitive demands (or high in psychomotor demands). Applying these conditions to the definition of TMNIFRA yields the following:

Condition 1: TINFO = 2*TMAN

Therefore: TMNIFRA = (2*TMAN – TMAN) / (2*TMAN + TMAN)

= (TMAN) / (3*TMAN)

= +0.3333

Condition 2: TMAN = 2*TINFO

Therefore: TMNIFRA = (TINFO – 2*TINFO) / (TINFO + 2*TINFO)

= (–1*TINFO) / (3*TINFO)

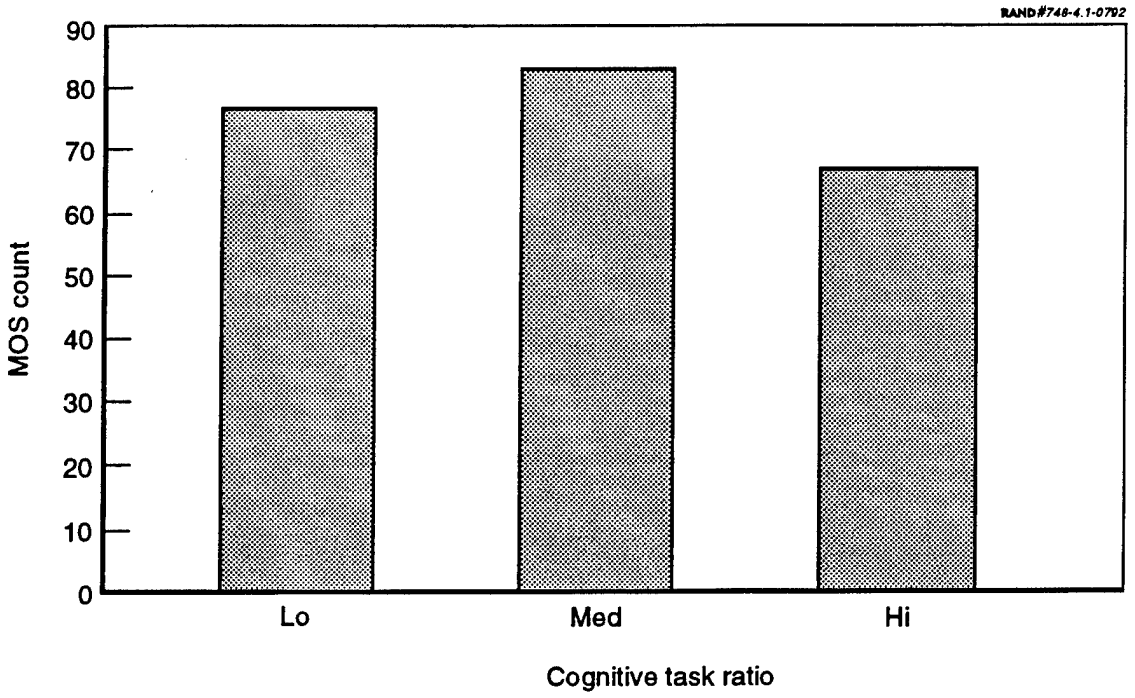
= –0.3333

Thus, a high cognitive ratio could be defined as one whose value was greater than or equal to +0.3333. A low cognitive ratio or high manipulative ratio could be defined as one whose value was less than or equal to –0.3333. All other ratios were defined as a medium value ratio.

Assuming these cut scores, the distribution of MOS among the three possible values is depicted in Figure 4.1. The data indicate that the average TMNIFRA for combat arms occupations is –0.3035, closely approximating the value for a manipulative dominant occupation. Those MOS labeled as combat support occupations have an average TMNIFRA of –0.049, approximately midrange, indicating a mix of cognitive and manipulative skills. MOS among the combat service support occupations have a mean value of 0.102, again indicating a mix of cognitive and procedural tasks, with a greater emphasis on cognitive tasks.

As a further means of illustration, Table 4.3 lists the Career Management Fields in order of increasing TMNIFRA or increasing cognitive requirements. MOS-D allows this to be done at the branch, CMF, or individual MOS level of detail.

Certain limitations are associated with this measure. Proponent agencies (schools and centers) prepare the task descriptions and may not use uniform criteria in preparing the task lists. Categorization of each task is subjective, although high levels of agreement were found among the raters. All in all, however, we think the measure has adequate validity, for purposes of comparison, because the task lists are a principal source of information used by the Army to describe and summarize the duties of the MOS.



NOTE: "LO" implies primarly procedural occupations while "HI" implies primarily cognitive jobs.

Figure 4.1—Distribution of MOS by TMNIFRA

DESCRIPTIVE TRAINING DATA

Our research focuses on Initial Entry Training (IET), the specialized skill training that qualifies a new Army recruit in an MOS. IET is normally conducted in two phases. Phase I consists of 48 calendar days of basic training designed to indoctrinate the recruit to the military and assist the transition from civilian to soldier. This training is then followed by Advanced Individual Training (AIT) in which the recruit learns the specific skills required of an MOS. The average training time includes 48 days of basic training and 78 days of AIT. The location for AIT may or may not be the same as the location for basic training. The length of AIT varies depending on the demands of the MOS, and it is usually conducted at only one location. There are, however, three MOS for which training can be received at one of several locations:

- MOS 63B is trained at Fort Leonard Wood, Fort Jackson, and Fort Lee;
- MOS 76Y is trained at Fort Lee and Fort Jackson;
- MOS 88M is trained at Fort Dix and Fort Leonard Wood.

Table 4.3

Rank Ordering of CMF By TMNIFRA Value

CMF	CMF Title	TMNIFRA
94	Food Service	−0.789
12	Combat Engineering	−0.565
11	Infantry	−0.479
33	Electronic Warfare/Intercept Systems Maintenance	−0.375
67	Aircraft Maintenance	−0.362
23	Air Defense System Maintenance	−0.345
51	General Engineering	−0.330
54	Chemical	−0.314
63	Mechanical Maintenance	−0.306
13	Field Artillery	−0.301
19	Armor	−0.276
35	Electronic Maintenance and Calibration	−0.200
16	Air Defense Artillery	−0.182
88	Transportation	−0.104
77	Petroleum and Water	−0.057
55	Ammunition	−0.015
76	Supply and Services	0.017
31	Signal Operations	0.033
29	Signal Maintenance	0.041
81	Topographic Engineering	0.068
95	Military Police	0.140
27	Land Combat & Air Defense Systems Intermediate Maintenance	0.146
91	Medical	0.184
93	Aviation Operations	0.497
96	Military Intelligence	0.500
97	Bands	0.529
98	Signal Intelligence/Electronic Warfare Operations	0.589
46	Public Affairs	0.667
74	Automatic Data Processing	0.682
71	Administration	0.854

The expected length of AIT in calendar days is coded under the variable TNGLGTH. The average training length for AIT courses is approximately 78 days, with the longest course requiring 380 days. This represents the amount of time, including weekends, that the recruit will spend at the AIT location and is an upper bound on the actual number of training days. The DoD's *Military Manpower Training Report* indicates that the average course length measured in "academic days in training" is 56 days. In order to translate TNGLGTH to an estimate of academic training days, we multiply the mean value for TNGLGTH by 5/7. The product is 56 academic days in training, which equals the DoD expected average course length. The three MOS requiring the longest training time at the AIT installation are:

- MOS 91C (Practical Nurse), which requires 310 days;
- MOS 91V (Respiratory Specialist), which requires 330 days;
- MOS 98G (Voice Interceptor), which requires 380 days.

An alternative training regimen exists in which basic training and AIT are conducted at the same installation in the same training unit. This option is entitled "one station unit training" (OSUT) and represents a consolidation of the program of instruction for basic training and AIT. This consolidation represents a potential time-savings of up to four weeks, if time required to move the trainee between training installations is considered. Any savings in time translates to a savings in salaries, travel allowances, and support costs. The DoD *Military Manpower Training Report* indicates that "about 28 percent of active Army entrants to initial skill enlisted training will be trained under OSUT in FY 1989. For the Reserve Components, about 29 percent of the Army entrants to initial skill training will receive OSUT."

MOS producing OSUT courses are identified by a value of "1" for the nominal variable TOSUT. For these MOS, the value of the variable TNGLGTH reflects the AIT portion of OSUT.[1] The total length of the OSUT training is the sum of TNGLGTH and the length of basic training or 48 days. Currently, MOS-D indicates that 12 courses are OSUT courses, including:

11B	Infantryman	11C	Indirect Fire Infantryman
11H	Heavy Antiarmor Infantryman	11M	Fighting Vehicle Infantryman
12B	Combat Engineer	12C	Bridge Crewmember
13B	Cannon Crewmember	19D	Cavalry Scout
19E	M60 Armor Crewman	19K	M1 Armor Crewman
54B	Chemical Operations Specialist	95B	Military Police

Most of the institutions identified in DA Pamphlet 351-4 are assigned a three-digit school code, which serves as a point of reference in the ATRRS system.[2] For example, the

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[1]The total length of OSUT courses can be obtained by adding 48 days to the value of TNGLGTH for this occupation.

[2]DA Pamphlet 351-4, entitled *Army Formal School Catalog*, provides a more specific listing of the various academic facilities operated by the Army and identifies these institutions which provide AIT, SQI qualification training, ASI qualification training, and professional development training of officers and NCOs. These include:

a. Five U.S. Army Schools, including institutions such as the U.S. Army Safety Center and the U.S. Army War College.

b. Twenty-seven TRADOC schools and centers.

c. Seventeen U.S. Army Health Services Command schools, which are located primarily at the major Army medical centers throughout the country.

d. Five U.S. Army Materiel Command Schools (e.g., the Logistics Management College).

e. Eleven U.S. Army Forces Command (FORSCOM) NCO academies, located at the major troop posts throughout the Continental United States (CONUS), Panama, Hawaii, and Alaska.

school code for the U.S. Army Armor School is 171, while the school code for the U.S. Air Force Air Ground Operations School is 886. The training location at which entry-level MOS training is conducted is entered in MOS-D as a character variable entitled TNGLOCN, while the associated school code is entered as TNGSCHCD. Currently, MOS-D reflects 26 different schools providing entry-level training.

Information on course attendance in FY89 for each MOS was obtained from the ATRRS system and coded into MOS-D. The number of classes per year (TCLASS), the maximum and minimum possible enrollment per class (TCLMAX89 and TCLMIN89) and the optimal class size (TCLOPT89) are included in MOS-D.

Each course experiences some level of attrition and no-shows. This information is also available from a variety of sources. The attrition rate that is included in MOS-D was derived from the QUALS files and is coded under the variable TATTRIT. These data indicate that the mean attrition rate in training for occupations in MOS-D is 9.16 percent, with a maximum attrition rate of 38 percent. The four courses with the highest attrition rates are:

- MOS 27L, LANCE System Repairer;
- MOS 35G, Medical Equipment Repairer;
- MOS 52E, Prime Power Production Specialist;
- MOS 55D, Explosive Ordnance Disposal Specialist.

The DoD's *Military Manpower Training Report* argues that the attrition rate may be "negligible for a reasonably routine course" but that attrition may "run much higher, up to one-third of the class entrants, in complex technical courses." This document reports an average attrition rate in IET courses of 9.0 percent, consistent with the information in MOS-D.

The expected no-show rate coded in MOS-D was derived from the REQUEST data files for FY89 and is included under the variable TNOSHO. The average no-show rate in training for entry-level occupations in MOS-D is 4.04 percent.

Many courses extend over one fiscal year in length, and many other courses are scheduled so that they may begin in one fiscal year and end in a second. This creates resource management complications, as most resources are allocated on a fiscal year basis. As a result, the concept of loads has been developed to measure the average number of trainees who are at a training site at any one time. The *TRADOC Primer* defines a "structure load" and a "budget load," while the DoD's *Military Manpower Training Report* defines a "training load." These loads are used to identify resource requirements to support planned training. The budget load, for example, is used to define nonpersonnel costs, while the structure load identifies the number of required instructors and other elements of the

"training structure" (*TRADOC Primer,* 1984, p. 41). Using the data stored in MOS-D, these different loads can be computed for initial, active-duty, entry-level enlisted specialized skill training offered at various installations.[3]

The definitions of the various loads are as follows:

a. Structure Load = (# input * course length in weeks)/ 50, where 50 = training weeks in a year

Using the variables contained in MOS-D, the value of the structure load for a given installation was determined as follows:

$$\text{Structure Load} = \sum_{i=1}^{n} \left(\text{F89FLTNG}_i * \left(\text{TNGLGTH}(i) / 7 \right) \right) / 50$$

where n = number of courses offered at installation

and F89FLTNG = the actual number of active duty recruits requiring training in each MOS (This variable is described in the following section.)

b. Budget Load = Structure Load * (1 – attrition rate)

Using the variables contained in MOS-D, the value of the budget load for a given installation was determined as follows:

$$\text{Budget Load} = \sum_{i=1}^{n} \left(\text{Structure Load} \times \left((100 - \text{TATTRIT}) / 100 \right) \right)$$

where n = number of courses offered at installation

c. Training Load = ((Entrants + Grads)/2) * Course length, where course length is a fraction of a training year

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[3]The loads for "specialized training" are published in the DoD's *Military Manpower Training Report.* If those values are compared to those generated using the data in MOS-D, several points must be emphasized. First, the DoD definition of "specialized training" includes not only IET but also includes enlisted leadership training (ANCOC and BNCOC), SQI and ASI training, and officer initial skill training for both active and reserve component. Second, the DoD figures will include civilians and students from other services training at these Army facilities. Finally, loads generated from MOS-D only reflect the AIT portion of OSUT courses. Consequently, the DoD load value will exceed the values generated from the data in MOS-D.

Using the variables contained in MOS-D, the value of the training load for a given installation was determined as follows:

1. ATTRIT = (100 – TATTRIT) /100
2. TNGYR = TNGLGTH / 365
3. ENTGRAD = ((F89FLTNG + (F89FLTNG * ATTRIT)) / 2

and

$$\text{Training Load} = \sum_{i=1}^{n} (\text{ENTGRAD}(i) \times \text{TNGYR}(i))$$

where n = number of courses offered at installation

Using these definitions and the data available in MOS-D, the structure load at Fort Benning is 1814, while the budget load is 1646 and the training load is 1659.

5. OCCUPATIONAL DEMOGRAPHICS

This section discusses those variables that describe the population of each MOS. Two types of demographic data are included in MOS-D. First, we include strength figures that reflect the composition of the MOS at the end of FY89 and the expected composition at the end of FY90. These data are recorded for each paygrade within the MOS. Second, we include data from the recruiting and training program for the two fiscal years. These data identify the number of expected accessions by category and the number of training seats reserved at the Structure Manning Decision Review (SMDR)[1] and revised by the Training Resource Arbitration Process (TRAP).[2]

PRINCIPAL VARIABLES

Table 5.1 presents the variables discussed in this section.

DATA SOURCES

The primary source of information regarding occupational demographics is the *Force Management Book FY89* compiled by the United States Total Army Personnel Command. This two-volume document contains three sections that provide personnel strength data for commissioned officers, warrant officers, and enlisted soldiers. The data contained in these references address enlisted MOS that were in the active inventory as of 30 September 1989 and for which MSAA = 1 (as defined in Section 2). The text is arranged by CMF with each section containing the subordinate MOS. The text is designed to "assist in the analysis of personnel force alignment at the skill and grade level of detail" *(Force Management Book,* FY89, p. i) and reflects current strengths for FY89 and projected strengths for FY90 and FY91 as of the date of publication. Certainly, the projections are a "snapshot in time" that reflects force strength projections prior to the events in Eastern Europe and Southwest Asia.

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[1]The SMDR is an annual "conference hosted by the DCSPER [Deputy Chief of Staff for Personnel] that includes PERSCOM [U.S. Army Total Personnel Command], DCSOPS [Deputy Chief of Staff for Operations], NGB [National Guard Bureau], OCAR [Office of Chief, Army Reserve], AHS [Academy of Health Sciences], HQ TRADOC, and TRADOC schools as the major participants. The purpose is to validate training, match those requirements with the schools' capabilities and apply available resources to increase the schools' capabilities" (*TRADOC Primer*, p. 41). The decisions reached at the SMDR are captured in the Army Training Requirements and Resources System (ATRRS), which generates the Army Program for Individual Training (ARPRINT). The ARPRINT is TRADOC's training mission and provides guidance on trainee and student inputs. The SMDR reviews three POM years; it fine-tunes the next year of training, it "validates" the second year, and it conducts a "first look" at the third year of training.

[2]The TRAP is a monthly conference conducted by DCSPER to review and revise the allocation of training seats for the execution year.

Table 5.1

Occupation Demographics Variables

	Description
FabOPRz	DCSPER strength figure by grade and MOS. Entries for FY89 are operating strengths; entries for FY90 are target strengths. Z indicates pay grade.
F89OPTOT	Total FY89 MOS operating strength.
F90TGTOT	Total FY90 MOS target operating strength.
F89ACT	Total accessions per MOS as derived from REQUEST database.
FISabxyz	Number of in-service transfers who require MOS training.
FNSabxyz	Number nonprior service accessions.
FPSabxyz	Number of prior service accessions requiring MOS training.
FabCROTH	Expected number of prior and nonprior service recruits who do not require MOS training.
FabCRTNG	Expected number of recruits who require MOS training.
FabCRTOT	Sum of FabCROTH + FabCRTNG (total expected accessions).
F89FLOTH	Actual number of FY89 recruits not requiring MOS training.
F89FLTNG	Actual number of FY89 recruits requiring MOS training.
F89FLTOT	Sum of F89FLOTH + F89FLTNG (total actual accessions).
FabSDTOT	Sum of FISabSMD + FNSabSMD + FPSabSMD (total programmed training seats).
FabRVTOT	Sum of FISabRVS + FNSabRVS + FPSabRVS (total revised training seats).

NOTE: The entry "ab" in each variable is a placeholder for the fiscal year designator (89 or 90).

The entry "xyz" is a placeholder for the following codes:

CUR	accession program
FILL	actual number of accessions
SMD	Number of training seats established by SMDR
VD	Number of training seats adjusted by TRAP

The enlisted strength figures for FY89 contained in the text, however, are based on the official data in the Enlisted Master File (EMF) and the Personnel Management Authorization Document (PMAD) and should prove useful.

STRENGTH FIGURES

As an example, Table 5.2 displays the actual strength figures for MOS 19K, M1 Armor Crewman, for FY89 and the projected inventory for that MOS for FY90. This table illustrates all the relevant strength data included in MOS-D.

Using the data in MOS-D, we can generate the total enlisted operating strength for FY89 by summing the variable F89OPTOT across all MOS. The result is a total strength figure of 568,870. Similar calculations using the variable F90TGTOT would estimate the projected strength for FY90 to be 570,503. The largest MOS is 11B with 43,390 soldiers. Several MOS, including 27K and 92E, are authorized less than 50 soldiers. In fact, the majority of MOS contain fewer than the average strength per MOS (1915 soldiers).

Table 5.2

Strength Management Figures for MOS 19K for FY89 and FY90

	FY89 Variable	Value	FY90 Variable	Value
E1–E3	F89OPR3	3633	F90TGT3	3735
E4	F89OPR4	3573	F90TGT4	4098
E5	F89OPR5	2943	F90TGT5	3563
E6	F89OPR6	2190	F90TGT6	2288
E7	F89OPR7	1246	F90TGT7	1479
E8	F89OPR8	0	F90TGT8	0
E9	F89OPR9	0	F90TGT9	0
Total	F89OPTOT	13585	F90TGTOT	15163

RECRUITING AND TRAINING PROGRAM

Soldiers who enter active duty military service can be classified into one of five training categories. Those categories and the code for each are as follows:

- Nonprior service soldiers who require training in the enlistment MOS (NPS);
- Nonprior service soldiers who do not require MOS training. These soldiers have less than six months prior active duty service and are qualified in the MOS, but, because of the short duration of their initial term of service, they are considered "nonprior service" (NPSWO);
- Soldiers with prior service experience who do not require training in the MOS of enlistment (PSW/O);
- Soldiers with prior service experience who are enlisting for an MOS different from that in which they served during their previous enlistment and, consequently, require training in the enlistment MOS (PSW);
- Soldiers who are "in-service transfers" and require skill training in the reenlistment MOS (IS).

Only those soldiers that are in the first, fourth, and fifth categories require specific MOS training. For each of those categories, we are able to determine:

1. The expected number of accessions for the MOS;
2. The actual number of accessions;
3. The number of training seats that were programmed at the appropriate TRADOC school through the SMDR process; and
4. The actual number of training seats used.

FY89 data for each of 12 possible categories (three types of soldiers requiring MOS training and four facts associated with each) are coded in MOS-D. Similar data are included in MOS-D for FY90 except for the actual number of accessions (which is unavailable). Table 5.3 shows the matrix of data available for each MOS. While FY89 variables are shown, corresponding variables containing FY90 data can be accessed by replacing the "89" in each variable name with "90." As an example, we show the available data for MOS 63B for FY89 in Table 5.4.

For comparative purposes, we obtained the number of accessions for FY89 from the REQUEST database. Those data are included in MOS-D under the variable F89ACT. A comparison of these accession figures is shown in Table 5.5. If the REQUEST-generated sum is corrected for an expected no-show rate of approximately 4 percent, the data are comparable. For our research, F89FLTOT has defined the actual number of training seats used and should, therefore, be a prime factor in the determination of training resources required.

Table 5.3

Matrix of Variable Names for Training Population Data

Category	Expected Accessions	Actual Accessions	SMDR Training Seats	TRAP Training Seats
NPS	FNS89CUR	FNS89FIL	FNS89SMD	FNS89RVS
PSW	FPS89CUR	FPS89FIL	FPS89SMD	FPS89RVS
IS	FIS89CUR	FIS89FIL	FIS89SMD	FIS89RVS
NPS + PSW + IS	F89CRTNG	F89FLTNG		
No training required	F89CROTH	F89FLOTH		

NOTE: F89CRTOT = F89CRTNG + F89CROTH
F89FLTOT = F89FLTNG + F89FLOTH

Table 5.4

FY89 Recruitment and Training Program for MOS 63B

Category	Expected Accessions	Actual Accessions	SMDR Training Seats	TRAP Training Seats
NPS	3106	2721	2740	2929
PSW	100	83	100	100
IS	100	95	100	100
NPS + PSW + IS	3306	2899		
No training required	500	849		

NOTE: F89CRTOT = 3806 F89FLTOT = 3748

Table 5.5

Matrix of Variable Names for Training Population Data

Variable	Sum Over All MOS
F89CRTOT	132248
F89FLTOT	127054
F89ACT	135596

6. TRAINING COST DATA

This section discusses measures of the cost to train a recruit in a particular occupational specialty. As we developed MOS-D, we gathered data generated by two different costing methodologies for inclusion in the database. Those methodologies are the ATRM-159 report, a TRADOC-developed cost-estimating tool that defines the average cost of training per graduate based on input from each TRADOC installation, and the Army Manpower Cost System (AMCOS) model, which generates a variable (coverage and marginal) cost per student.

The principal variables contained in this section define the cost per graduate in terms of three cost categories: military pay and allowances (MPA), operations and maintenance (OMA), and other costs. Other derived variables attempt to redefine those costs as daily costs.

PRINCIPAL VARIABLES

Table 6.1 presents the variables discussed in this section.

DATA SOURCES EMPLOYED

Data encoded in this section were derived from several sources. The ATRM-159 cost data were provided to RAND from the TRADOC Deputy Chief of Staff for Resource Management. The AMCOS cost estimates were provided courtesy of the Systems Research and Applications Corporation, which also provided the *Army Manpower Cost System: Army*

Table 6.1

Training Cost Variables

Variable	Description
VRCMPA90	ATRM 159 Manpower course costs (FY90).
VRCOMA90	ATRM 159 OMA course costs (FY90).
VRCOTH90	ATRM 159 Other course costs (FY90).
VRCTOT90	ATRM 159 Total course costs (FY90).
VRCRSCST	AMCOS Total variable cost for training (FY89).
VRCSTDAY	AMCOS Expected variable daily cost per day (FY89).
VRCSTMP	AMCOS MPA portion of total training cost (FY89).
VRCSTOM	AMCOS OMA portion of total training cost (FY89).
VRCSTOTH	AMCOS Other portion of total training cost (FY89).
VRMAPDAY	AMCOS Expected daily MPA costs per course (FY89).
VROMADAY	AMCOS Expected daily OMA costs per course (FY89).
VROTHDAY	AMCOS Expected daily other costs per course (FY89).

Active Component Life Cycle Cost Estimation Model Information Book. This document served as an excellent source of information concerning the generation of the cost data.

TRADOC ATRM-159 REPORTS

The TRADOC Resource Management Office produces the ATRM-159 report using input from each of the TRADOC training installations. This report attempts to define the average cost of training per graduate for each training course offered. The report identifies the components of course costs in terms of three appropriation categories, including manpower costs, OMA cost and "other" costs.

Manpower costs include the pay and allowances for each of the instructors associated with the course and the students in attendance. MPA costs for instructors are based on instructor contact hour requirements and expected authorized instructor paygrade. Student compensation is calculated by multiplying the course length in weeks by the weekly pay rate of the modal grade for the course. Student compensation also includes any required per diem and travel pay. In addition, MPA costs also include a portion of the military pay and allowances necessary to compensate all other military personnel who may be required to support the installation.

OMA costs include a variety of expenditures. Flying hour costs, instructional material, pay and allowances for civilian employees, and certain other overhead costs are included in this category. Again, a pro rata share of the OMA costs for other base support operations are charged to each course under this category.

"Other" costs include the cost of ammunition per course graduate, procurement costs, and family housing maintenance costs.

For each of these appropriation categories, the pro rata share of base support expenditures are considered "indirect costs," while those costs that specifically support course requirements (i.e., instructional material, instructor pay, and flying hour costs) are considered "direct costs." Manpower- and cost-estimating relationships (MERs and CERs) are then applied to determine the fixed and variable components of each of these cost categories.[1]

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[1]The principal approach used by the Army to estimate training budgets is through cost- and manpower-estimating relationships developed from information provided by the various training schools on an annual basis. These estimating relationships exist both for individual schools and for general categories such as basic training, special skill training, or aviation training. The cost-estimating relationships and the manpower-estimating relationships quantify the student-load-to-resource relationships and are calculated for both requirements and authorizations. The cost- and manpower-estimating relationships are used in the budget process to adjust accounts based on changes in student load (i.e., Budget Manpower Guidance and the Program Resource Review). The estimating relationships are equations derived from historical cost data for each installation. Composite factors for TRADOC are also derived from the historical data. The equation is in the form of Y=A+Bx. Y is the

Under the variable VRCTOT90, MOS-D contains the total variable course costs for FY90. In addition, the total direct and indirect variable costs for each of the appropriation categories for FY90 are coded according to the following scheme:

- MPA costs VRCMPA90
- OMA costs VRCOMA90
- Other costs VRCOTH90 FN

The 1990 ATRM-159 did not specify values for some of the MOS. Missing values were calculated using the most recent ATRM-159 data available for the MOS (e.g., 1987 or 1985) and inflating those variable cost figures to 1990 using DoD Inflation Guidelines.

Data have been recorded for entry-level MOS courses and the descriptive statistics for these variables are shown in Table 6.2.

MOS can be arrayed based on these costs. For example, Table 6.3 shows several MOS and their associated variable cost.

ARMY MANPOWER COST SYSTEM

The Army Manpower Cost System represents an effort by the Office of the Assistant Secretary of the Army for Financial Management to enhance the Army's ability to conduct cost analysis of manpower issues. The intent of the effort is to build a series of "budget, economic and life cycle cost models for the active, reserve and civilian component of Army manpower" (*AMCOS Information Books*, 1989, p. 4). The model consists of a group of policy modules that address costs attributed to military compensation, enlisted recruiting, officer acquisition, training, permanent change of station, retired pay accrual, selective reenlistment

Table 6.2

Average Variable Costs for Entry-Level MOS, by Cost Category (in dollars)

Variable	Mean	Std Deviation	Min Value	Max Value
VRCMPA90	10646	8590	1614	101849
VRCOMA90	6409	5966	0	45737
VRCOTH90	196	463	0	5151
VRCTOT90	17252	14028	2386	147586

cost or manning and x is the student load. A is interpreted as the training fixed cost. (or fixed manpower) and B is the etimate of the incremental cost of increasing the workload. The B factor is used for budget increments or decrements based on projected student load changes.

Table 6.3

Sample MOS Variable Training Costs Based on ATRM-159 Data (in dollars)

MOS	MOS Title	Variable Cost
24T	PATRIOT Operator & System Mechanic	51391
33P	Electronic Warfare/Intercept Strategic Receiving Subsystems Repairer	49247
27F	VULCAN Repairer	45337
54B	Chemical Operations Specialist	20470
11B	Infantryman	8766

bonus, special pays, medical support, other benefits, and the new GI Bill. The module that addresses training contains costing information for FY89 that has been coded into MOS-D.[2]

VRCRSCST includes the total variable cost for training. VRCSTMP, VRCSTOM, and VRCSTOTH contain the MPA, OMA, and other costs, respectively. Some transformations have been conducted and coded in the database. In particular, each of the AMCOS-related variables has been divided by TNGLGTH to determine the expected daily costs in each of the categories. This information is coded under the variables VRCSTDAY, VRMAPDAY and VROMADAY. VRCSTOT is also a derived variable and represents the product of VRCRSCST and F89FLTNG.

The descriptive statistics for the basic variables containing the AMCOS data for FY89 are shown in Table 6.4.

Again, MOS can be compared based on these per capita costs. A sample of MOS and associated costs is shown in Table 6.5.

Table 6.4

Descriptive Statistics for AMCOS Cost Variables (in dollars)

Variable	Mean	Std Deviation	Min Value	Max Value
VRCSTMP	12780	6452	5031	41766
VRCSTOM	6308	4016	1871	25647
VRCSTOTH	491	295	171	3487
VRCRSCST	19579	9935	7449	65194

[2]Although we describe the AMCOS data here, we employ ATRM-159 data to support our research effort. While certainly useful for a variety of analytical purposes, the AMCOS is less appropriate for our research tasks. This model, for example, amortizes certain costs over the expected life of the soldier and uses average cost factors for paygrades 1 to 3. Our research is directed at the initial entry soldier, and, therefore, the ATRM-159 data was the appropriate choice.

Table 6.5

Sample MOS Variable Training Costs Based on AMCOS Data (in dollars)

MOS	MOS Title	Cost
45K	Tank Turret Repairer	50992
24N	CHAPARRAL System Mechanic	50117
27B	Land Combat Support System Test Specialist	40373
24T	PATRIOT Operator & System Mechanic	40276
36L	Transportable Automatic Switching Systems Operator/Maintainer	36954

TOTAL COSTS

While the ATRM-159–generated course costs provide insights into the cost of training individual recruits, another perspective on the costs of training considers all course graduates (i.e., total cost given throughout).

Several adjustments, however, must be made to the data coded in MOS-D before total costs can be estimated. First, as mentioned in an earlier section, each recruit attends both AIT and basic training. The course cost data that have been coded into MOS-D do not include the cost of basic training unless the course is an OSUT course. Consequently, for the analysis that is to follow, an estimated cost of $6,000 has been added to both the AMCOS and ATRM-159 course cost estimates for each non-OSUT course to account for the cost of basic training.[3]

Second, the ATRM-159 data in MOS-D are based on FY90 dollars, whereas the data included in the variable F89FLTNG (estimated student requirements) are based on FY89 information. In order to make the information compatible, DoD-generated discount multipliers have been applied to both the MPA and OMA course cost estimates.

Finally, F89FLTNG does not consider the impact of attrition. Once this is applied to F89FLTNG, we can generate the expected number of graduates, which serves as the basis for all costing. When this transformation is conducted, the descriptive statistics for the number of graduates, averaged across entry-level MOS, are as follows:

- Mean 419
- Standard deviation 967
- Maximum value 11,326

[3]This estimate of variable cost of basic training was provided by the TRADOC Deputy Chief of Staff for Resource Management.

The expected number of graduates in 16 MOS exceed one standard deviation from the mean. Table 6.6 lists these "high-density" MOS.

The remaining MOS are within one standard deviation of the mean. However, 52 MOS are greater than the mean while 190 are less than the mean, reflecting that the sample is primarily populated by low-density MOS. In fact, 99 MOS have less than 100 annual expected graduates.

Using the estimated number of graduates and the TRADOC DCS-RM costs, "total" training costs per MOS can be estimated. This represents the expected cost of training all accessions in each MOS in FY89. Table 6.7 illustrates a sample of MOS with high total training costs including the number of expected graduates, variable cost (per graduate), and total estimated costs, based on ATRM-159 data.[4]

Table 6.6

Estimated Course Graduates in High-Density MOS (FY89)

MOS	MOS Title	Graduates
11B	Infantryman	11326
95B	Military Police	4161
13B	Cannon Crewmember	3966
91A	Medical Specialist	3962
88M	Motor Transport Operator	3764
12B	Combat Engineer	2979
63B	Light Wheel Vehicle Mechanic	2534
19K	M1 Armor Crewman	2440
94B	Food Service Specialist	2370
11M	Fighting Vehicle Infantryman	2344
19D	Cavalry Scout	2012
76Y	Unit Supply Specialist	1766
31C	Single Channel Radio Operator	1581
31K	Combat Signaler	1408
11C	Indirect Fire Infantryman	1403
76C	Equipment Records/Parts Specialist	1396

[4]MOS training costs are discussed in greater detail elsewhere, see Way-Smith (1993) and Winkler, Kirin, and Uebersax, forthcoming.

Table 6.7

Sample MOS Throughput Cost Estimates

MOS	MOS Title	Est Grads (FY89)	Variable Cost ($)	Total Cost Estimate ($ millions)
11B	Infantryman	11326	8767	99.3
63B	Light Wheel Vehicle Mechanic	2534	13207	33.5
94B	Food Service Specialist	2370	13410	31.8
31C	Single Channel Radio Operator	1581	18547	29.3
31K	Combat Signaler	1408	14770	20.8
19K	M1 Armor Crewman	2440	8504	20.7
76Y	Unit Supply Specialist	1766	11141	19.7
98C	Signals Intelligence Analyst	750	26043	19.5
19D	Cavalry Scout	2012	9101	18.3
77F	Petroleum Supply Specialist	1217	15021	18.2

7. OCCUPATIONAL AND EDUCATIONAL CLASSIFICATIONS

Extensive efforts have been expended during the last several decades to develop schemes for classifying occupations. Such classifications were intended to support analyses of labor markets by a variety of agencies. They were also expected to provide insight into training- and work-related similarities and dissimilarities among occupations. Such efforts have produced a variety of taxonomies that generally serve one of three purposes:

- *Industrial* taxonomies categorize occupations by services or goods provided (e.g., construction, manufacturing, etc.).
- *Occupational* taxonomies identify groups of similar jobs in various organizations. For example, an electrician is an occupational category, regardless of whether the occupation is in a construction or manufacturing organization.
- *Instructional* taxonomies classify occupations based on educational similarity.

We include information from several occupational taxonomies in MOS-D. Because of our interest in individual training, we emphasized occupational and instructional taxonomies. However, we encoded some industrial-based information generated by the Army and the Department of Defense to address military occupations. Thus we discuss three sets of taxonomies as these pertain to each MOS[1]:

- Military-oriented industrial classifications;
- Occupational taxonomies;
- Instructional program clusters.

PRINCIPAL VARIABLES

Table 7.1 presents the variables discussed in this section.

[1]The reader is reminded that two clustering schemes have already been introduced. In Section 1, we introduced the concept of Career Management Fields, which are groups of similar MOS. In that same section, we also discussed that branch affiliation of the MOS is considered a combat, combat support, or combat service support occupation.

Table 7.1

Occupational Clustering Variables

Variable	Description
AGEDx	Code to identify the Civilian Instructional Program (CIP) expected educational developmental level, where "x" represents the academic concentration (L-language, M-mathematics, R-reading).
ACExyCR	Recommended academic credit hours for military experience at skill level 10. "xy" indicates academic credit level.
CIPCDNO	Indicates number of CIP codes associated with an MOS.
CIPCDxy	A CIP code associated with an MOS; "xy" identifies whether it is code number 1 through 15.
CIPDOTxy	*Dictionary of Occupational Titles* (DOT) code associated with the CIP code. "xy" identifies DOT code 1 through 15.
CIPDTLxy	DOT code occupation title associated with CIPDOTxy.
CIPQLxy	Indicates quality of match between the CIP code and MOS.
CIPRNKxy	Rank for which the CIP code matches the MOS.
CIPSUBxy	Academic subject required to support occupational training.
CLAROC	CMF clustering scheme code.
CLASVCD	Code identifying qualifying ASVAB area.
CLCIP	Code indicating appropriate CIP cluster.
CLDOD	First digit of 6-digit DoD cluster code.
CLDOD2	Remaining five digits of appropriate DoD cluster code.
CLGOE1	Code indicating occupational cluster under the *Guide for Occupational Exploration.*
CLIDOS	Code for linked occupation under Integrated Defense Occupational Stratification code.
CLMCG	Clustering code derived from Military Career Guide.
CLSOC1	Code for linked occupation under Standard Occupational Classification code.
DOTCDGRP	First digit of 9-digit DOT occupational code.
DOTCDx	Associated DOT occupational codes. "x" is a placeholder indicating strength of linkage.
DPTTITL	Title of associated primary DOT occupation.
DOTCIVCP	Code indicating existence of primary civilian counterpart occupation.
DOTCPNO	Numerical count of associated DOT occupations.
DOTGRD	Rank for which the DOT code is appropriate.
DOTHRSOJ	Number of hours to qualify for occupation in a civilian on-the-job training (OJT) program.
DOTPRTx	Code identifying 5 components of DOT code, "x" can equal 1 to 5.
DOTSVP1	Associated civilian vocational preparation code.

DATA SOURCES

Several sources were employed in developing this section. Most data, however, were extracted from two databases provided to RAND by the Defense Manpower Data Center (DMDC).

The first database is the *Military Civilian Occupational Crosscode*, which links military and civilian occupations. This effort was initiated in 1982 and is updated annually. We used the February 1988 version of the database to code the variables in MOS-D. That version contains 69 data fields per military occupation and provides an "analytical crosswalk between military occupational codes of the four Armed Services and the Coast Guard, and

their civilian counterpart occupations as defined in the (U.S. Labor Department's) Dictionary of Occupational Titles (DOT)." Information in MOS-D included:

a. The primary and alternate associated DOT codes and titles. The primary DOT code is the "best-fit" civilian occupation for the MOS. A maximum of four additional DOT codes are included in the database. In determining the equivalency of two occupations, the developers of the database estimated whether (1) fully qualified workers in the civilian occupation could perform the essential tasks of the military occupation after receiving only orientation and equipment-specific training; and (2) fully qualified workers in the military occupation could perform the essential tasks of the civilian occupation after receiving only orientation and equipment-specific training.
b. Other taxonomies or data that could be linked to the MOS or its DOT civilian counterpart. This included the DoD Occupational Code, the Guide for Occupational Exploration Code, and the Standard Occupational Code (SOC).

A second major source of data is the *DoD Military / Civilian Master Crosswalk Project.* This database was also provided by DMDC and is designed to merge the DoD Crosscode with the National Occupational Information Coordinating Committee (NOICC) Crosswalk. The NOICC crosswalk links the DOT codes with a variety of other occupational clustering codes, such as the Census Classification Structure, the Occupational Employment Statistics (OES) Code, and the Classification of Instructional Programs (CIP) Code. Data for MOS-D were derived from the October 1989 version of the Master Crosswalk, which contains information for military occupational codes that were current as of August 1988.

Several references were used to interpret data from these major sources. The SOC was defined by the *Standard Occupational Classification Manual,* published by the U.S. Department of Commerce (1977). Information on the DoD Occupational Code was derived from the *Occupational Conversion Manual (Enlisted / Officer / Civilian),* published by the Office of the Assistant Secretary of Defense for Force Management and Personnel (January 1989). Explanation of the DOT codes can be found in the *Dictionary of Occupational Titles,* an annual publication prepared by the U.S. Department of Labor, Employment and Training Administration. This same organization publishes the *Guide to Occupational Exploration,* which identifies 12 broad occupational interest areas that were also incorporated in MOS-D.

Various additional sources provided additional data included in MOS-D. AR 611-201 includes a taxonomy of MOS that classify CMF into one of 15 CMF occupational clusters.

The *Military Career Guide,* published by the U.S. Military Entrance Processing Command, classifies each occupation into four areas according to the qualifying ASVAB area; in addition, it categorizes MOS into one of 12 occupational areas. The *Vocational Preparation and Occupations* manual, published by the National Occupational Information Coordinating Committee, provides information concerning classification codes in the NOICC Crosswalk. Finally, the American Council on Education (1988) suggests academic credit hours that should be awarded for certain military training.

MILITARY CLASSIFICATION SCHEMES

CMF Occupational Clusters

To support the U.S. Army Recruiting Command Joint Optical Information Network, the Army created occupational clusters of CMFs. These are published in AR 611-201, which identifies 15 clusters and the CMF contained in each cluster.[2] These clusters provide a hierarchical scheme for grouping MOS. With the addition of this scheme, the 317 occupations can be clustered into 33 CMF, which, in turn, can be organized into 15 CMF occupational clusters, which finally can be assigned to either combat arms, combat support arms, or combat service support functions.

The titles of the clusters, the CMFs contained within each cluster, and the number of MOS in each cluster are listed in Table 7.2. The full titles for the CMF can be found in Table 2.3. Six of the clusters contain only one CMF, and in one case, only one MOS. The two largest clusters are Military Science and Signal Corps. For each MOS, the parent CMF cluster is coded into MOS-D under the variable CLAROC. This is a character variable that contains an abbreviation for the cluster title. These abbreviations are also listed in Table 7.2.

In general, these clusters are clearly aligned with the three branches discussed earlier. For example, all MOS in the AV, GE, GS, MI, MP, SC, and TR clusters are combat support occupations. In 13 of the 15 clusters, all MOS in a cluster are in the same branch. Only the Military Science cluster and the Missile Maintenance cluster contain MOS that are a mixture of combat arms, combat support arms, and combat service support occupations.

Military Career Guide Clusters

Because qualification for each MOS is based upon scores achieved on certain composites of the ASVAB, these composites can serve as the basis for a clustering scheme.

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[2]Although these clusters were developed to support the needs of the U.S. Army Recruiting Command, the categorization scheme does not match the taxonomy presented in the *Military Career Guide*, a document designed for use by military recruiters.

Table 7.2

CMF Occupational Clusters

Cluster Title	CMFs	# of MOS	Variable Entry
Administration and Accounting	71 79	17	AA
Arts and Public Affairs	46 97	19	APA
Aviation	67 93	27	AV
Electronic Maintenance & Calibration	35	1	EMC
General Engineering	51	19	GE
General Science	54 81	7	GS
Health Science	91	32	HS
Mechanical Maintenance	63	29	MM
Military Intelligence Technology	33 96 98	24	MI
Military Police	95	3	MP
Military Science	11 12 13 16 18 19	43	MSC
Missile Maintenance	23 27	26	MIM
Signal Corps	25 29 31 74	48	SC
Supply and Services	55 76 77 94	20	SS
Transportation	88	16	TR

Table 3.5 displays the distribution of the 238 entry-level MOS against the 10 qualifying composites.

Other sources, including the *Military Career Guide*, use ASVAB content areas to generate a different clustering set containing four occupational groupings:

- Business and Clerical (B&C)
- Electronics and Electrical (E&E)
- Health, Science, and Technology (HS&T)
- Mechanical and Crafts (M&C).

Scores for each of these groupings are determined as follows:

- B&C = VE + CS + MK.
- E&E = AR + MK + EI + GS.[3]
- HS&T = VE + AR + MC.
- M&C = AR + MC + AS + EI.

This grouping reduces the number of occupational clusters to four and provides a common basis for comparison of occupations across the services. Currently, each service

[3]This definition equates to the EL composite.

generates qualifying composites using slightly different combinations of ASVAB subtest scores. For example, the composite CL is defined as follows:

- Army AR + MK + VE.
- Navy NO + C S + VE.
- Marines VE + MK + CS.

Each of the entry-level MOS in MOS-D has been linked to an occupational group under the variable CLASVAB. This variable contains the character abbreviation for the group (M&C, HS&T, E&E, or B&C). Typical assignments of occupations to each of these groups include:

- B&C—Legal Specialist
  —Unit Supply Specialist
  —Air Traffic Controller
- M&C—Bridge Crewman
  —Light Wheel Vehicle Mechanic
  —Motor Transport Operator
- E&E—HAWK Firing Section Mechanic
  —Switching Systems Operator
  —Interior Electrician
- HS&T—Infantryman
  —Orthotic Specialist
  —Chemical Operations Specialist

The frequency distribution of MOS among these occupational groups is depicted in Figure 7.1.

In addition to using the four ASVAB Occupational Groups discussed earlier, the *Military Career Guide* also clusters occupations into 12 groups. The title of each cluster as well as the numbers of MOS included in each are displayed in Table 7.3. The linkage between MOS and these occupational clusters is coded into MOS-D under the variable CLMCG. The possible values for that variable are also displayed in Table 7.3.

The Department of Defense Occupation Codes

Periodically, the Training and Performance Data Center has published the *Occupational Conversion Manual* for the Office of the Assistant Secretary of Defense (Force Management and Personnel). This document is designed "to serve as an occupational coding structure" that groups "similar occupations from one or more populations into a logical and consistent structure suitable for a variety of analytical purposes" (1989, p. iii). Those populations include both officer and enlisted specialties in each of the services, as well as Civil Service occupations. Enlisted military occupations are classified into one of 10

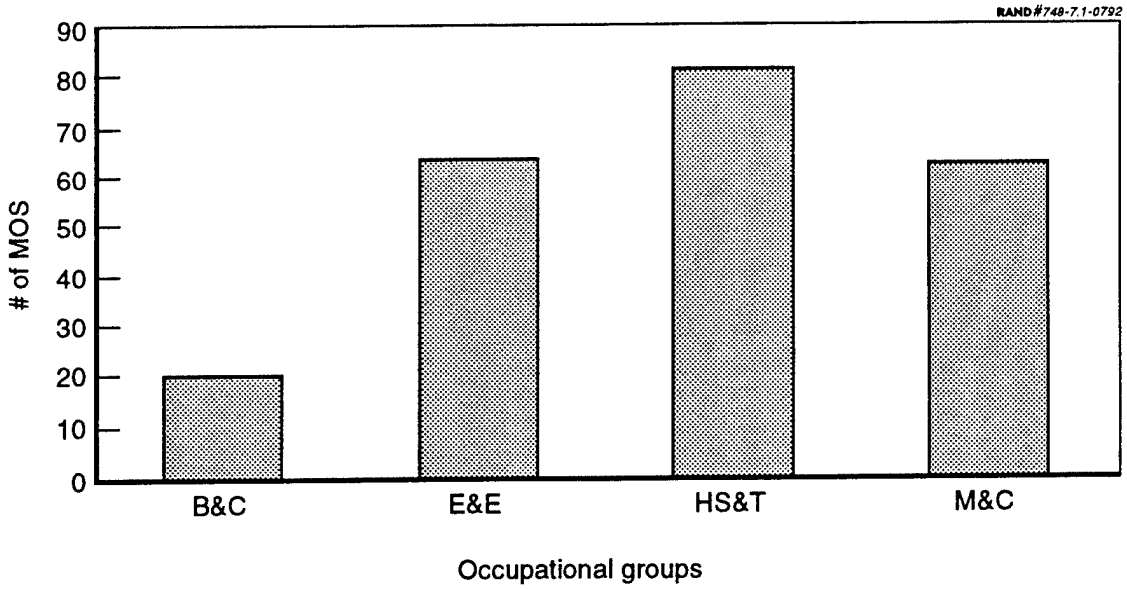

Figure 7.1—*Military Career Guide* ASVAB Occupational Groups

Table 7.3

***Military Career Guide* Clusters**

Cluster Title	CLMCG Entry	Sample Occupations	MOS #
Human Services	1	Chaplain Assistant	2
		Behavioral Science Spec	
Media & Public Affairs	2	Graphics Documentation Tech	8
		Journalist	
Health Care	3	Orthotic Specialist	21
		Eye Specialist	
Engineering, Science & Technical	4	Single Channel Radio Oper	34
		FA Meteorological Crewman	
Administrative	5	Switching System Operator	24
		Legal Specialist	
Service	6	Firefighter	7
		Food Service Specialist	
Vehicle & Machinery Mechanic	7	Wheeled Vehicle Repairer	31
		UH-1 Helicopter Repairer	
Electronic & Electrical Equipment Repair	8	Interior Electrician	69
		Tank Turret Repairer	
Construction	9	Plumber	6
		Quarrying Specialist	
Machine Operator & Precision Work	10	Optical Lab Specialist	9
		Machinist	
Transportation & Material Handling	11	Crane Operator	8
		Petroleum Supply Specialist	
Combat Specialty	12	Infantryman	23
		Cannon Crewman	

occupational areas. These areas are then divided into 68 occupational groups and 160 occupational subgroups. Each occupation is assigned a six-digit code. The first digit identifies the occupational area, the second and third digit identify the occupational group, and the last three digits identify the occupational subgroup. For example, one occupational area is "Craftsmen," which is identified by "7" in the first digit position. This area has 7 subordinate groups each of which is identified by a unique number in the second and third digits. These groups include:

Metalworking	770___
Construction	771___
Utilities	772___
Lithography	774___
Industrial Gas and Fuel Production	775___
Fabric, Leather, and Rubber	776___
Other Craftsmen	779___

Finally, each of these groups has subgroups that can be identified by the entries in the last three positions of the six-digit character. The "Metalworking" group, for example, consists of the following:

General Metalworking	770700
Welding	770701
Machinists	770702
Sheetmetal	770703
Metal Body Repair	770704

This information is coded into MOS-D under two variables. The variable CLDOD consists of a one-digit entry that corresponds to the first digit of the DoD code and identifies the occupational area, while the variable CLDOD2 contains the remaining five digits of the assigned DoD code. The 10 occupational areas, sample occupations, and the numbers of MOS associated with each are displayed in Table 7.4.

The taxonomies introduced in both the *Military Career Guide* and the *Occupational Conversion Manual* are particularly interesting. Unlike several of the other codes that we

Table 7.4

DoD Occupational Areas

Occupational Area	CLDOD Entry	Sample Occupations	MOS #
Infantry, Gun Crews, and Seamanship Specialists	0	Infantryman Cannon Crewman	20
Electronic Equipment Repairmen	1	Unit Level Commo Maintainer FA Digital Systems Repairer	46
Communications & Intelligence Specialists	2	Single Channel Radio Oper Intelligence Analyst	32
Health Care Specialists	3	Dental Specialist Cardiac Specialist	30
Other Technical & Allied Specialists	4	Materiels Quality Spec Petroleum Lab Specialist	18
Functional Support & Administration	5	Journalist Court Reporter	25
Electrical/Mechanical Equipment Repairmen	6	Small Arms Repairer Utilities Equipment Repair	49
Craftsmen	7	Printing/Bindery Specialist Water Treatment Specialist	14
Service & Supply Handlers	8	Food Service Specialist Military Police	8
Non-occupational	9	Patients & Prisoners	0

will examine, these were created specifically for military occupations and account for the variety of unique occupations in the Army. As might be expected, there is a close correspondence between the schemes. The greater number of clusters under the *Military Career Guide* scheme precludes an exact one-for-one correspondence; however, it is not unreasonable to expect that certain clusters should be equivalent and that groups of clusters from the Military Career Guide might correspond to a unique category under the DoD scheme. For example, the "Health Care" categories for each scheme contain the same 21 MOS. The administrative categories (CLDOD=5, CLMCG=5) have 19 common MOS, and 29 MOS share the title craftsmen under both schemes.

OCCUPATIONAL CLASSIFICATION SCHEMES

The Dictionary of Occupational Titles Code

The *Dictionary of Occupational Titles* classifies occupations through the assignment of nine-digit code numbers. There are nine occupational groups to which an occupation can be assigned:

Category Title	Category Code
Professional, technical, and managerial occupations	0/1
Clerical and sales occupations	2
Service occupations	3
Agriculture, fishery, forestry, and related occupations	4
Processing occupations	5
Machine trades occupations	6
Benchwork occupations	7
Structural work occupations	8
Miscellaneous occupations	9

As in the DoD clustering scheme, each of these occupational categories is divided into occupational divisions that are, in turn, subdivided into occupational groups. There are 82 divisions and 559 groups currently in the DOT code structure. Table 7.5 illustrates the distribution of MOS that fall within these occupational categories.

Table 7.5

Distribution of MOS Among DOT Categories

DOT Category	% of MOS
Professional, technical, & managerial	9.0
Clerical and sales	11.2
Service occupations	11.2
Agriculture, fishery, forestry, and related occupations	0.0
Processing occupations	0.0
Machine trades occupations	16.3
Benchwork occupations	3.4
Structural work occupations	24.0
Miscellaneous occupations	3.9

A typical DOT code not only identifies the category, division, and group, but it also provides some insight into the nature of the expected duties. The DOT code assigned to MOS 44B, Metal Worker, can be used to illustrate the three component subcodes. The DOT code assigned to that MOS is "807381010."

The first digit of the code identifies the job category. This occupation is in category "8" entitled "Structural Work Occupations." This category has seven subdivisions.

Division Title	Division Code
Occupations in metal fabricating	80
Welders, cutters, and related occupations	81
Electrical assembling, installing, & repairing	82
Painting, plastering, waterproofing, cementing	83
Excavating, grading, paving, & related occupations	84
Construction occupations	85
Structural work occupations	86

The first two digits of the sample MOS is "80"; therefore, this is considered an "occupation in metal fabricating." Finally, this particular occupational division has, in turn, seven subordinate occupational groups.

Group Title	Group Code[4]
Riveter	800
Fitting, bolting, screwing, & related occupations	801
Tinsmiths, coppersmiths, & related occupations	804
Boilermakers	805
Transportation equipment assemblers	806
Body workers, transportation equipment	807
Miscellaneous occupations in metal fabricating	809

The first three digits of this DOT code are 807; therefore, this occupation is defined as a "body worker, transportation equipment." One other MOS, 68G, shares the same DOT code. That military occupation is entitled "Aircraft Structural Repairer."

MOS-D contains several variables that characterize the DOT linkage. DOTCIVCP is a nominal variable that indicates whether or not a primary civilian equivalent occupation exists for a particular MOS. If DOTCIVCP = 1, then an equivalent occupation does exist and that occupation is described by several other variables. Based on the Crosscode database, 214 entry-level, active MOS in MOS-D have one or more associated civilian occupations. DOTCDGRP contains the first digit of the primary DOT code, which defines the principal category to which the MOS has been linked. The entire nine-digit code for the primary DOT

[4]The nonsequential code number is intentionally developed to allow for the future identification of additional occupations and the potential assignment of new codes.

code is found in the variable entitled DOTCD1, while the first three digits are coded in DOTPRT1. The associated title of that civilian occupation is coded under the variable DOTTITL. Other DOT codes that are also considered to be equivalent are found in the variables DOTCDx, where x can assume any value between 2 and 5. Hence, any MOS can have up to five associated DOT codes that are considered to be equivalent occupations. The number of equivalent civilian occupations is coded under the ratio variable DOTCPNO. The sample MOS, 44B, Metal Worker, does, in fact, have five associated DOT codes.

DOT Code	DOT Title
807381010	Body worker, transportation equipment
620381010	Motorized vehicle & engineering equipment mechanic and repairer
819384010	Welders, cutters and related occupations
845381010	Transportation equipment painter and related occupations
806381046	Transportation equipment assembler

The number of MOS that are associated with one or more DOT code is illustrated in Table 7.6.

Table 7.6

Distribution of MOS by Number of DOT Codes

Number of DOT codes	Number of MOS
0	28
1	82
2	59
3	35
4	21
5	17

Two considerations must be highlighted at this point. First, unlike the DoD or *Military Career Guide* clusters, the DOT codes were not created with military occupations in mind. There is a category in the DOT entitled "armed forces enlisted personnel," which serves as a catch-all for those military occupations without a civilian counterpart. For this category the first three digits of the DOT code are 378. For example, MOS 19K (Tank Crewman) is assigned the DOT code 378683018. Within MOS-D, these DOT codes have been

entered under DOTCD1, although the value for DOTCIVCP is "0." Second, associated DOT codes can be found in AR 611-201 as part of the specific entries for each MOS. However, there is no one-for-one correspondence between the DOT codes listed in the regulation and those that were extracted from the Crosscode and Crosswalk databases. As demonstrated earlier, for the sample MOS 44B, the databases indicate five equivalent occupations. For the same MOS, AR 611-201 lists six equivalent DOT codes. However, only two codes are common to both the databases and the regulation.

The next subfield in the code provides a measure of the duties of the occupation. In particular, these duties identify the job incumbent's expected interaction with *people, data*, or *things*. The following scales are used to define that interaction:

	Digit 4 Data	**Digit 5 People**	**Digit 6 Things**
0	Synthesizing	Mentoring	Setting up
1	Coordinating	Negotiating	Precision Working
2	Analyzing	Instructing	Operating-Controlling
3	Compiling	Supervising	Driving-Operating
4	Computing	Diverting	Manipulating
5	Copying	Persuading	Tending
6	Comparing	Speaking-signaling	Feeding-offbearing
7		Serving	Handling
8		Taking Instructions	

The scales are designed so that a lower number indicates a more complex relationship. As might be imagined, these scales have been the subject of intense debate with several critics questioning the selection of action verb and others criticizing the manner in which the values were assigned to particular occupations. For example, some argue that "persuading" is a more complex task than "supervising." Others argue that all supervisory occupations require "supervising," "persuading," and "instructing" and it would be impossible for an observer to identify the dominant task in order to determine an appropriate rating.

In MOS-D, DOTPRT2 contains the data value for the occupation, DOTPRT3 contains the value indicating the degree of people interaction, and DOTPRT4 contains the measure of the expected relationship between the incumbent and equipment. It must be recognized that the primary emphasis in the construction of MOS-D was on entry-level occupations and, consequently, military occupations were linked to equivalent entry-level civilian occupations. Both the Crosscode and the Crosswalk databases contain a variable that defines the range of

paygrades for which the civilian equivalent job was applicable. Only those linkages that were effective at the entry level are coded into MOS-D, and the range of paygrades was captured under variable DOTGRD. It should be expected that the majority of the DOT codes associated with these entry-level occupations should reflect data, people, and equipment ratings that are at the less complex end of the rating spectrum.

Table 7.7 illustrates the distribution of MOS across the possible values for the data, people, and things variables. All entries represent the percentage of the MOS for which a primary civilian equivalent has been identified. As indicated, the majority of MOS are low complexity for "people," confirming the expectation that entry-level soldiers are primarily "taking instructions." It is interesting, however, that the majority of MOS rate fairly high on the data and things scales, indicating that the military occupations are considered somewhat complex. In fact, the clear preponderance of occupations are rated as involved in "precision working" and "analyzing" data.

The last group of digits provides a unique code to identify the specific title of the occupation. If the first six digits of a code are associated with only one job, the last three digits will be 010. If more than one occupation is associated with the same initial six digits, then these occupations are listed in numerical order and assigned increasing values for the final three digits. The values increase by steps of four to allow for future integration of newly defined occupations. For example, three occupations are assigned the six digit code 377677.

Table 7.7

Distribution of MOS Over Data, People, and Things Measures

Scale Value	Data	People	Things
0	10.0	0	9.6
1	4.6	0	48.3
2	44.6	0	15.4
3	29.6	0	4.2
4	1.7	0.8	6.7
5	0.4	0.4	0
6	9.2	39.2	0
7	NA	2.5	15.8
8	NA	47.9	NA

Those occupations and their full nine-digit codes are:

- Bailiff 377667010
- Deputy Sheriff, Building Guard 377667014
- Deputy Sheriff, Civil Division 377667018

Within MOS-D, there are three occupations that are assigned the first six digits of 079374. Those occupations and their full nine-digit codes are:

MOS	MOS Title	DOT Code	DOT Title
91A	Medical Specialist	079374010	Emergency Medical Tech
91C	Practical Nurse	079374014	Nurse, Licensed Practical
91D	Operating Room Specialist	079374022	Surgical Technician[5]

In accordance with the convention introduced earlier, the last three digits of every primary DOT code are contained in the variable DOTPRT5.

Other Linked Information

Other information is linked to each DOT code, including expected physical demands, working conditions, general educational development, and a measure of the expected job training requirements. We did not include either the expected physical demands or the working conditions in MOS-D. The physical requirements for each MOS are extracted from AR 611-201 and are felt to be more applicable than the information in the DOT. The working conditions did not account for the field conditions required of most military occupations and were not, therefore, considered to be of significant utility. However, both the general educational development measures and the job-training requirements were coded into MOS-D.

The job-training requirement is based on the premise that every occupation requires a certain amount of time to acquire the knowledge necessary for acceptable performance. Certainly, that time can be a minimal introductory orientation or it may involve several years of intense study. Associated with each DOT code is a variable entitled the "specific vocational preparation" (SVP), which identifies the expected amount of time required to achieve average performance. This measure includes both formal education and an initial

[5]Obviously, there is one other civilian occupation between Licensed Practical Nurse and Surgical Technician identified by the DOT code 979374018, which is not included in MOS-D.

period of practice. Specifically, it accounts for vocational education, apprentice training, in-plant training, on-the-job training and essential experience in other occupations. The Crosswalk includes an ordinal variable that specifies the expected level of preparation:

Value	Definition
1	Short demonstration only
2	Anything beyond short demonstration, up to and including 30 days
3	Over 30 days but less than 3 months
4	Over 3 months but less than 6 months
5	Over 6 months but less than 1 year
6	Over 1 year but less than 2 years
7	Over 2 years but less than 4 years
8	Over 4 years but less than 10 years
9	Over 10 years

A similar ordinal variable was created for MOS-D, entitled DOTSVP1, which contained the SVP value for the associated primary DOT code.

The general educational development measure attempts to define the aptitudes necessary for a worker to perform adequately in a particular occupation. This measure and the SVP are complementary in that a worker is expected to possess the aptitudes quantified in the measures of general educational development to achieve an average performance level in the time specified in the SVP.

The general educational development measure is subdivided into three factors—reasoning, mathematical development, and language development. Ordinal scales have been created that define a level of development in each area and assign those levels a value from one to six. A level six rating represents the highest level of development and indicates that the occupation requires significant educational development. As a means of illustrating the scope and detail of these scales, the definition of level one and level six for mathematical development are as follows:

Level one: Add and subtract two digit numbers. Multiply and divide 10s and 100s by 2, 3, 4, 5. Perform the four basic arithmetic operations with coins as part of a dollar. Perform operations with units such as cup, pint, and quart; inch, foot and yard; and ounce and pound.

Level six: Advanced calculus work with limits, continuity, real number systems, mean value theorem, and implicit function theorem. Apply fundamental concepts of groups, rings, and fields. Work with differential equations, linear algebra, infinite series, advanced operations methods, and functions of real and complex variables. Work with mathematical statistics, mathematical probability and applications, experimental design, statistical inference, and econometrics.

The GED-level ratings associated with each of the primary DOT codes are included in MOS-D under the variables AGEDL (language), AGEDM (mathematics), and AGEDR (reasoning). The MOS-equivalent occupations could be expected to have lower values on the developmental scales. In fact, the mode for each of the three variables is "4" and the distribution for each is depicted in Table 7.8. These values appear relatively high particularly in light of the expected tasks of a soldier in an entry-level MOS. Level 4 in Language Development, for example, requires the individual to be able to:

- Read novels, poems, newspapers, periodicals, journals, manuals, dictionaries, thesauruses, and encyclopedias;
- Write business letters, expositions, summaries, and reports, using prescribed formats and conforming to all rules of punctuation, grammar, diction, and style;
- Speak and participate in panel discussions, dramatizations, and debates. Speak extemporaneously on a variety of subjects.

Table 7.8

Frequency Distributions for AGEDL, AGEDM, & AGEDR

Level	AGEDR	AGEDM	AGEDL
1	0	5.6	2.3
2	1.7	13.6	10.3
3	15.3	37.9	36.7
4	74.0	39.5	45.8
5	8.5	2.8	4.5
6	0.6	0.6	0.6

THE GUIDE FOR OCCUPATIONAL EXPLORATION (GOES) CLUSTERING SCHEME

The GOES scheme is designed to cluster occupations not by the similarity of expected work but by the interest factors and personal traits of the worker. This particular scheme is

intended to assist the job counselor in the recruitment and placement of job applicants into appropriate occupations. The scheme is based on 12 interest factors.[6]

1 Artistic
2 Scientific
3 Plants and animals
4 Protective
5 Mechanical
6 Industrial
7 Business Detail
8 Selling
9 Accommodating
10 Humanitarian
11 Leading-influencing
12 Physical performing

These 12 interest factors are further subdivided into 66 discrete groupings. Occupations within a discrete group are sequentially numbered so that every occupation has a six-digit GOES code. This code has been included in MOS-D under the variable CLGOE1. For example, interest area 5 is entitled "Mechanical." It contains 12 discrete subgroups, one of which is "Equipment Operation." Within this subgroup, there are four specific job categories.

- 051101 Construction
- 051102 Mining and quarrying
- 051103 Drilling and oil exploration
- 051104 Materials handling

MOS 12C, Bridge Crewman, is assigned GOES code 051104. Five MOS, including 12F Engineer Tracked Vehicle Crewman, 62E Heavy Construction Equipment Operator, 62F

[6]These factors were identified after a 307-item inventory questionnaire was administered to 525 males and 590 females in nine states. A principal components factor analysis with varimax rotation was performed to identify the interest factors. Occupational analysts then reviewed job summaries and allocated occupations to interest areas. Once jobs were assigned to interest areas, they were then grouped based on the capabilities and adaptabilities required of the worker.

Crane Operator, 62H Concrete and Asphalt Equipment Operator, and 62J General Construction Equipment Operator, are assigned GOES code 051101.

The distribution of MOS among the 12 possible interest areas is depicted in Table 7.9. As expected, some interest factors have no corresponding military occupations, and the majority of the occupations are found in interest area five—Mechanical.

The reader may recognize a similarity between this clustering scheme and the Holland Coding Scheme, which categorizes people and environments into one of six principal categories.[7] The developers of the GOES argue that there is certain correspondence between the GOES scheme and the Holland scheme. That relationship is depicted in Table 7.10.

In 1986, an effort was completed at the Navy Personnel Research and Development Center (NPRDC) to code Army occupations by assigning three-letter Holland codes to Army MOS (Holland and Baker, 1986). This effort was intended to support recruiting efforts by allowing recruiters to match individual interests and preferences with occupational requirements. Results of this effort indicate a close relationship between the two schemes, with both arguing that the majority of Army occupations clearly fall in the "Realistic" category. There does appear to be some disparity between the schemes in the assignment of the "Enterprising" code. The GOES scheme does not assign any MOS to the equivalent "Selling" category, while the NPRDC effort assigned nearly 10 percent of the occupations to that category. The comparative results are depicted in Figure 7.2.

Table 7.9

Frequency Distribution of CLGOE1

Value for CLGOE1	Percentage of MOS
1	2.3
2	4.6
3	0.0
4	5.9
5	64.3
6	2.3
7	8.7
8	0.0
9	0.0
10	6.9
11	5.0
12	0.0

[7]Three-letter Holland codes are developed for occupations; the first letter indicates the dominant category, the second and third letters indicate, in descending order, the next most important categories.

Table 7.10

Comparison of Holland Occupational Categories & GOES Interest Areas

GOES Interest Areas	Holland Occupational Categories
Artistic	Artistic
Scientific	Investigative
Plants & animals	Realistic
Protective	
Mechanical	
Industrial	
Business Detail	Conventional
Selling	Enterprising
Accommodating	Social
Humanitarian	
Leading-influencing	
Physical Performing	

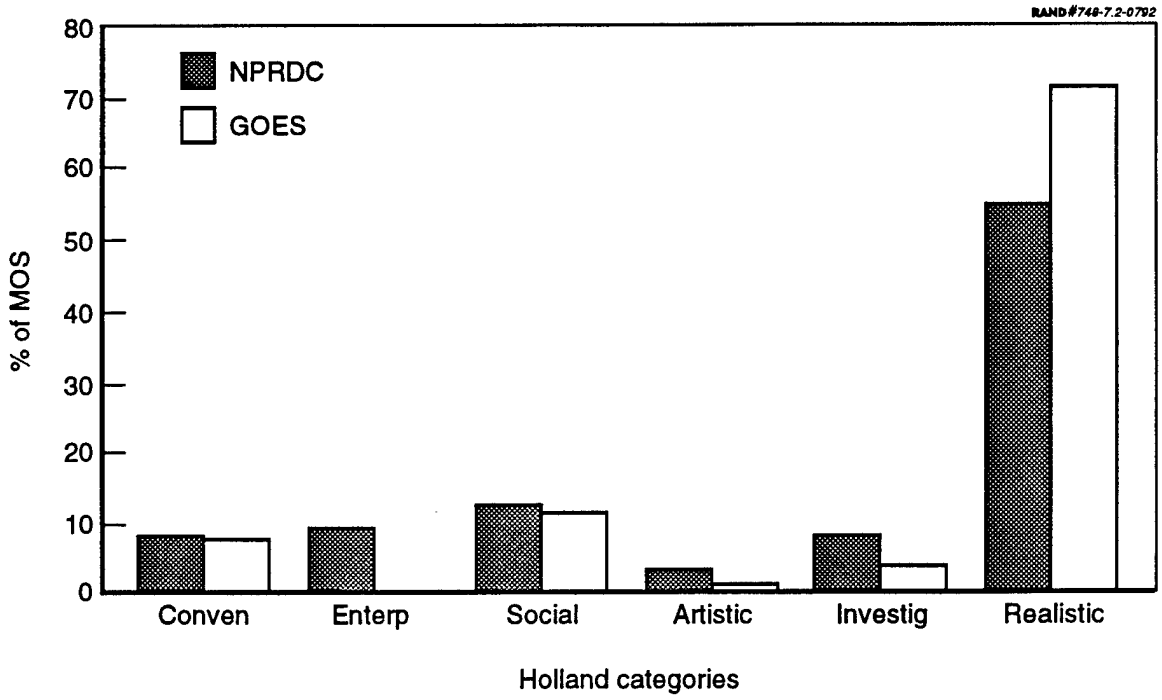

Figure 7.2—Distribution of MOS by GOES Areas and Holland Categories

THE STANDARD OCCUPATIONAL CLASSIFICATION SCHEME

Efforts to develop the Standard Occupational Classification (SOC) scheme were initiated in 1966 on the suggestion of the Interagency Committee on Occupational Classification. The intent of the Standard Occupational Classification Code (SOCC) is to "provide a mechanism for cross-referencing and aggregating occupation-related data collected by social and economic statistical reporting programs" (National Occupational Information Coordinating Committee, 1982).

The SOC codes every occupation "in which work is performed for pay or profit" (National Occupational Information Coordinating Committee, 1982). The code employs a four-tier coding scheme that includes division, major groups, minor groups, and unit groups, although the SOC manual also suggests a fifth tier comprised of a collection of divisions. This fifth tier includes the following categories:

1. Administrative, engineering, scientific, teaching, and related occupations.
2. Technical, clerical, sales, and related occupations.
3. Service occupations including military occupations.
4. Farming, forestry, fishing, and hunting occupations.
5. Production occupations, including construction, extractive, transportation, and related occupations.

Within the SOCC, there are 21 divisions that are subdivided into 63 major groups. These major groups include approximately 226 minor groups as well as the unit groups or specific job identifiers. For example, the "service occupations" tier includes five divisions—service occupation supervisors, protective service occupations, service occupations other than protective and household, private household occupations, and military occupations. The division entitled "protective services occupations" includes three minor groups—firefighting and fire prevention, police and detectives, and guards. Finally, "guards" includes four unit groups—crossing guards, correctional institution officers, guards, and police, except public service and protective service occupations not elsewhere classified.

The division entitled "military occupations" is reserved for those occupations that are unique to the military. Many military occupations are similar to the occupations in the other divisions, and they are classified in those groups.

Each unit group or specific occupation in the SOCC is awarded a four-digit code. The first two digits indicate the major group, the third digit specifies the minor group, and the fourth digit identifies the specific occupation. Expanding the earlier example, the "protective

services occupations" division is assigned the code of 51, "guards" are identified by a third digit of 3, and "crossing guards" are assigned a fourth digit of 2 for a complete SOCC code of 5132. These four-digit codes are included in MOS-D under the variable CLSOC1.

Table 7.11 illustrates the distribution of SOC codes among the entry-level Army MOS. Utilizing the convention introduced in the SOC manual, only the assignment of occupations to the "collection of divisions" is displayed. Those military occupations that are considered unique to the military and assigned a special code are displayed in a separate category.

Table 7.11

Distribution of MOS Among SOC Codes

SOCC Collection of Divisions	% of MOS
Administrative, engineering, scientific, teaching, & related occupations (major groups 10–34)	7.0
Technical, clerical, sales, & related occupations (major groups 36–48)	27.4
Service occupations (major groups 50–53)	4.8
Farming, forestry, fishing, & hunting occupations (major groups 55–58)	0
Production occupations, including construction, extractive, transport, & related occupations (major groups 60–83 & 99)	52.4
Military occupations	8.4

INSTRUCTIONAL PROGRAM CLASSIFICATION CODE

The CIP code classifies instructional programs at the elementary, secondary, and postsecondary level. This scheme is designed to "provide a standard for collecting, reporting, analyzing, interpreting and disseminating data about instructional programs" (Military Personnel Management Directorate, Office of the Deputy Chief of Staff for Personnel, 1988). The correspondence between various DOT codes and CIP codes is captured in the *Vocational Preparation and Occupations Manual* (VPO) and both the Crosscode and Crosswalk databases.

The CIP employs a hierarchical coding system that assigns each academic or vocational program a six-digit code of the form "XY.ABCD." The first two digits, XY, identify the vocational program. The first two digits following the decimal identify a program subcategory, while the last two digits serve as placeholders within the subcategory. The VPO indicates that there are 50 vocational program areas but that the majority of occupations are clustered in 17 programs. The VPO also clusters the CIP programs into 7 program areas.

Table 7.12 displays these 7 program clusters and the distribution of MOS among them. MOS-D contains the variable CLCIP, which identifies the broad program area that supports the primary DOT code associated with each MOS. In addition, in the Crosswalk, other

Table 7.12

Distribution of MOS Among CIP Program Areas

Program Cluster	Program Code	% of MOS
Agriculture/Agribusiness & Natural Resources Education	AG	3.4
Business & Office Education	BU	11.6
Health Occupations Education	H	9.4
Home Economics Education	HE	2.1
Marketing & Distributive Education	DE	0
Technical Education	TE	23.6
Trade & Industrial Education	TI	30.5

NOTE: 9.3 percent of the MOS are not associated with any particular CIP program.

programs were identified that could support vocational preparation for a particular MOS. That database expanded the information originally provided in the Crosscode and identified up to 15 CIP programs that might be applicable. The variable CIPCDNO identifies the number of programs associated with an MOS. CIPCDxy identifies the CIP codes with "xy" for the first through the 15th code, CIPDOTxy identifies the corresponding DOT code, CIPDTLxy specifies the DOT title for the associated DOT code, and CIPQLxy provides a measure of the quality of match between the CIP code and the MOS.

THE AMERICAN COUNCIL ON EDUCATION ACADEMIC RATING

Another set of data that links military occupations to educational programs is provided by the American Council on Education. This organization initiated an effort to identify the appropriate amount of academic credit that should be granted to soldiers who complete training in certain MOS. While these data do not provide any direct means of clustering occupations, they can be used to group those occupations based on common vocational or academic programs.

The data coded into MOS-D were extracted from an ACE-generated annual publication that recommends that academic institutions grant credit in particular academic subject areas for experience or training in each military occupation. Each MOS by skill level is recommended for a number of credit hours, type of credit (vocational, associate, baccalaureate, or graduate), and field of study. For example, for MOS 12B (Combat Engineer), ACE recommends the following:

- Skill level 10 (vocational certificate category), 3 semester hours in hand-tool operation;

- Skill level 20 (vocational certificate category), 6 semester hours in construction equipment operation and 3 in hand-tool operation;
- Skill level 30 (vocational certificate category), 9 semester hours in demolition operations, 6 in construction equipment operations, and 3 in hand-tool operations;
- Skill level 40 (vocational certificate category), 15 semester hours in construction equipment operations, 9 in demolitions operations, 3 in hand-tool operations, 2 in geography, 3 in construction methods, 1 in blueprint reading, 2 in communication skills, and 3 in construction supervision.
- Skill level 40 (baccalaureate/associate degree category), 3 semester hours for field experience in management and additional credit in administration and in construction on the basis of institutional evaluation.

We have coded much of this information in MOS-D. Under the variables ACEASCR (associate level), ACEBACR (baccalaureate level), ACEGRCR (graduate level), and ACEVOCR (vocational level), the number of credit hours suggested by the ACE at each academic level has been recorded for each MOS. However, since the intended use of this database was to study entry-level MOS, only the credit associated with skill level 10 for each MOS was encoded. For example, for MOS 12B, the database entries are

ACEASCR - "0" ACEBACR - "0" ACEGRCR - "0" ASEVOCR - "3"

ACE recommends that 147 MOS be considered for vocational credit for military service, with the amount of credit varying between 1 and 38 credit hours. One hundred and fifty-three MOS are identified as appropriate for credit at the associate level, with the number of credit hours varying from 1 to 37 hours. Only 5 MOS are identified as potential candidates for academic credit at the baccalaureate level, with the maximum number of credit hours equaling 6. MOS 91T (Animal Care Specialist) is nominated for 6 credit hours at the baccalaureate level. Only one MOS is recommended for graduate level credit, with 6 credit hours recommended for service in MOS 01H (Biological Sciences Assistant).

On average, the MOS contained in CMF 91 (Medical) are nominated for approximately 14 credit hours at the associate level. CMF 51 (General Engineering) has the highest average number of credits recommended at the vocational level, with 9 credit hours recommended on average per MOS.

8. USE OF MOS-D

We developed MOS-D to support analysis of new concepts for conducting individual training. The Army is developing new individual training concepts to cope with shrinking resources and growing constraints on traditional training methods. Such concepts propose, for example, to reduce the length of resident training, expand the use of training technologies, and better capitalize on the outputs of the nation's civilian vocational education system. Such concepts, if implemented, could permit the Army to reduce the size and scope of the personnel, facilities, and consumables used currently to conduct individual training.

Changes of such magnitude will require careful evaluation. Army policymakers need to know which new training concepts hold the greatest promise for saving resources now devoted to individual training. New training concepts must be defined thoroughly and linked to specific occupations and training courses. Analysis must then identify how to implement new training concepts efficiently and cost-effectively while maintaining acceptable levels of individual proficiency.

MOS-D was created to support background analysis of Army occupations. Our goal was to provide a means for classifying Army occupations according to training-related characteristics and linking them with recent training concepts identified by the Army. Given the substantial costs, workload, and diversity of occupations, MOS-D focuses on the initial skill training of enlisted personnel. In developing MOS-D, we have sought to identify and integrate in a common format key attributes of Army enlisted MOS relevant to training. In practice, this includes available information on personnel, training, and work-related characteristics at the MOS level of detail.

Our primary intention is to use MOS-D to identify broad training-related characteristics of enlisted MOS. For example, through use of multivariate statistical techniques (e.g., factor or principal components analysis), we expect to uncover a few underlying "factor dimensions" composed of a larger number of related variables. In such analysis, we might expect that several variables linking MOS to civilian education and training programs (e.g., DOT and CIP information) might point to an identifiable factor dimension, which could be entitled "civilian similarity." Because factor dimensions are customarily composed of several variables with differing weights, scores can be created to rank each MOS on a factor dimension. Thus it could be possible to rank all 242 Army entry-level enlisted MOS with respect to their "civilian similarity," from most similar to least

similar. Rankings can provide useful analytical information beyond that provided by simple classifications (e.g., "green" versus "non-green" MOS), as are now used.

We expect that analysis of MOS-D will reveal a number of broad training characteristics shared by all entry-level enlisted MOS, and these could prove helpful in linking the MOS to training concepts under consideration by the Army. For example, if "civilian similarity" proves to be an important training-related characteristic, the data could help clarify strategies for capitalizing on civilian education, employment experience, and so forth. We are hopeful that such analyses will reveal insights into other training concepts now being considered by the Army, such as distributed training and expanded use of training technologies. Such analysis could also suggest other new concepts, or refinements of existing concepts not currently considered, depending on empirical results.

Whereas MOS-D was created primarily to support analysis of new training concepts, other uses of the data are possible. MOS-D is organized around individual occupations, and in addition to training data, it includes information on personnel characteristics and occupational structure. Thus, the data could prove useful to planners considering alterations of occupational structure or force structure more generally. Moreover, given the inclusion of extensive Crosswalk information linking the MOS to civilian employment and education databases, the data could prove useful for analysis of a variety of labor market issues.

Appendix A
MOS AND TITLES

MOS	MOS Title
00B	Diver
00E	Recruiter
00R	Recruiter/Retention NCO
00Z	Command Sergeant Major
01H	Biological Sciences Assistant
02X	Bandsman
05D	Electronic Warfare/Sig Intell Emitter Locator
05H	Electronic Warfare/Sig Intell Morse Interceptor
05K	Electronic Warfare/Sig Intell Non-Morse Interceptor
11B	Infantryman
11C	Indirect Fire Infantryman
11H	Heavy Antiarmor Weapons Infantryman
11M	Fighting Vehicle Infantryman
11Z	Infantry Senior Sergeant
12B	Combat Engineer
12C	Bridge Crewman
12F	Engineer Tracked Vehicle Crewman
12Z	Combat Engineering Senior Sergeant
13B	Cannon Crewman
13C	Tacfire Operations Specialist
13E	Cannon Fire Direction Specialist
13F	Fire Support Specialist
13M	Multiple Launch Rocket System Crewmember
13N	Lance Crewmember
13P	MLRS/Lance Operations Fire Direction Specialist
13R	FA Firefinder Radar Operator
13Z	FA Senior Sergeant
15E	Pershing Missile Crewmember
16D	Hawk Missile Crewmember

MOS	MOS Title
16E	Hawk Fire Control Crewmember
16F	Light ADA Crewmember
16H	Air Defense Artillery OPS/Intell Assistant
16J	Defense Acquisition Radar Operator
16P	Chaparral Crewmember
16R	Vulcan Crewmember
16S	Manpads/Stinger Crewmember
16T	Patriot Missile Crewmember
16Z	ADA Senior Sergeant
17B	FA Radar Crewmember
18B	Special Operations Weapons Sergeant
18C	Special Operations Engineer Sergeant
18D	Special Operations Medical Sergeant
18E	Special Operations Communications Sergeant
18F	Special Operations Intelligence Sergeant
18Z	Special Operations Senior Sergeant
19D	Cavalry Scout
19E	M60 Armor Crewman
19K	M1 Armor Crewman
19Z	Armor Sergeant
21G	Pershing Electronics Material Specialist
21L	Pershing Electronics Repairer
23R	Hawk Missile System Mechanic
24C	Hawk Firing Section Mechanic
24G	Hawk Information Coordination Cen Mechanic
24H	Hawk Fire Control Repairer
24K	Hawk Continuous Wave Radar Repairer
24M	Vulcan System Mechanic
24N	Chaparral System Mechanic
24R	Hawk Master Mechanic
24T	Patriot Operator & System Mechanic
25L	AN/TSQ 73 ADA Com & Con System OP/Repairer
25P	Visual Info/Audio Doc Systems Spec

MOS	MOS Title
25Q	Graphics Documentation Specialist
25R	Visual Info/Audio Equip Repairer
25S	Still Documentation Specialist
25Z	Visual Information Chief
27B	Land Combat Support System Test Specialist
27E	Tow/Dragon Repairer
27F	Vulcan Repairer
27G	Chaparral/Redeye Repairer
27H	Hawk Firing Section Repairer
27J	Hawk Field Maint Equip/Pulse ACQ Radar Repairer
27K	Hawk Fire Control Cont Wave Radar Repairer
27L	Lance System Repairer
27M	MLRS Repairer
27N	Forward Area Alerting Radar Repairer
27T	Pedestal Mounted Stinger Los-ADA System Repairer
27V	Hawk Maintenance Chief
27X	Patriot System Repairer
27Z	Land Combat/ADA Systems Maintenance Chief
29E	Radio Repairer
29F	Fixed Communications Security Equip Repairer
29J	Teletypewritter Equipment Repairer
29M	Tactical Satellite/Microwave Repairer
29N	Telephone Central Office Repairer
29P	Communications Security Maintenance Chief
29S	Field Commo Security Equipment Repairer
29T	Satellite/Microwave Communications Chief
29V	Strategic Microwave Systems Repairer
29W	Communications Maintenance Support Chief
29X	Communications Equipment Maintenance Chief
29Y	Satcom Systems Repairer
29Z	Electronics Maintenance Chief
31C	Single Channel Radio Operator
31D	MSE Transmission System Operator

MOS	MOS Title
31F	MSE Network Switching System Operator
31G	Tactical Communications Chief
31K	Combat Signaler
31L	Wire Systems Installer
31M	Multichannel Commo Systems Operator
31N	Commo Systems/Circuit Controller
31Q	Tactical Satellite/Microwave Systems Operator
31V	Unit Level Communications Maintainer
31W	Mobile Subscriber Equipment Communications Chief
31Y	Communications Systems Supervisor
31Z	Communications Operations Chief
33M	EW/Intercept Strategic System Analyst & C&C Systems Rep
33P	EW/Intercept Strategic Receiving Subsystems Rep
33Q	EW/Intercept Strategic Proc/Storage Subsystems Rep
33R	EW/Intercept Aviations Systems Repairer
33T	EW/Intercept Tactical Systems Repairer
33V	EW/Intercept Aerial Sensor Repairer
33Z	EW/Intercept Aerial Sensor Repairer
35G	Biomedical Equipment Specialist
35H	TMDE Maintenance Support Specialist
35U	Advanced Medical Equipment Repairer
36L	Transportable Automatic Switching System OP/Maintainer
36M	Switching Systems Operator
39B	Automatic Test Equipment Operator/Maintainer
39C	Target Acquisition/Surveillance Radar Repairer
39D	Decentralized SVC Support System Computer Sys Repairer
39E	Special Electronics Devices Repairer
39G	Automated Communications Computer Systems Rep
39L	FA Digital Systems Repairer
39V	Computerized Systems Maintenance Chief
39W	Radar/Special Electronics Devices
39X	Electronics Equipment Maintenance Chief
39Y	FA Tactical Fire Direction Systems Repairer

MOS	MOS Title
41C	Fire Control Instrument Repairer
42C	Orthotic Specialist
42D	Dental Laboratory Specialist
42E	Optical Laboratory Specialist
43E	Parachute Rigger
43M	Fabric Repair Specialist
44B	Metal Worker
44E	Machinist
45B	Small Arms Repairer
45D	Self Propelled FA Turret Mechanic
45E	M1 Abrams Tank Turret Mechanic
45G	Fire Control Systems Repairer
45K	Tank Turret Repairer
45L	Artillery Repairer
45N	M60A1/A3 Tank Turret Mechanic
45T	Bradley Fighting Vehicle System Turret Mechanic
45Z	Armament/Fire Control Maintenance Supervisor
46N	Pershing Electrical-Mechanical Repairer
46Q	Journalist
46R	Broadcast Journalist
46Z	Public Affairs Chief
51B	Carpentry & Masonry Specialist
51G	Materials Quality Specialist
51H	Construction Engineering Supervisor
51K	Plumber
51M	Firefighter
51R	Interior Electrician
51T	Technical Engineering Supervisor
51Z	General Engineering Supervisor
52C	Utilities Equipment Repairer
52D	Power-Generation Equipment Repairer
52E	Prime Power Production Specialist
52F	Turbine Engine Driven Generator Repairer

MOS	MOS Title
52G	Transmission & Distribution Specialist
52X	Special Purpose Equipment Repairer
54B	Chemical Operations Specialist
55B	Ammunition Specialist
55D	Explosive Ordnance Disposal Specialist
55G	Nuclear Weapons Specialist
55R	Ammunition Stock Control & Accounting Specialist
55X	Ammunition Inspector
55Z	Ammunition Supervisor
57E	Laundry & Bath Specialist
57F	Graves Registration Specialist
62B	Construction Equipment Repairer
62E	Heavy Construction Equipment Operator
62F	Crane Operator
62G	Quarrying Specialist
62H	Concrete & Asphalt Equipment Operator
62J	General Construction Equipment Operator
62N	Construction Equipment Operator
63B	Light Wheel Vehicle Mechanic
63D	Self Propelled FA System Mechanic
63E	M1 Abrams Mechanic
63G	Fuel & Electrical Systems Mechanic
63H	Track Vehicle Repairer
63J	Quartermaster & Chemical Equipment Repairer
63N	M60A1/A3 Tank System Mechanic
63S	Heavy Wheel Vehicle Mechanic
63T	Bradley Fighting Vehicle System Mechanic
63W	Wheel Vehicle Repairer
63Y	Track Vehicle Mechanic
63Z	Mechanical Maintenance Supervisor
67G	Utility Airplane Repairer
67H	Observation Airplane Repairer
67N	Utility Helicopter Repairer

MOS	MOS Title
67R	AH-64 Attack Helicopter Repairer
67S	Scout Helicopter Repairer
67T	Tactical Transport Helicopter Repairer
67U	Medium Helicopter Repairer
67V	Observation/Scout Helicopter Repairer
67X	Heavy Lift Helicopter Repairer
67Y	AH-1 Attack Helicopter Repairer
67Z	Aircraft Maintenance Senior Sergeant
68B	Aircraft Powerplant Repairer
68D	Aircraft Powertrain Repairer
68F	Aircraft Electrician
68G	Aircraft Structural Repairer
68H	Aircraft Pneudraulics Repairer
68J	Aircraft Armament/Missile Systems Repairer
68K	Aircraft Components Repair Supervisor
68L	Avionic Communications Equipment Repairer
68N	Avionic Mechanic
68P	Avionic Maintenance Supervisor
68Q	Avionic Flight Systems Repairer
68R	Avionic Radar Repairer
71C	Executive Administrative Assistant
71D	Legal Specialist
71E	Court Reporter
71G	Patient Administration Specialist
71L	Administrative Specialist
71M	Chaplain Assistant
72E	Tactical Telecommunications Center Operator
72G	Automatic Data Telecommunications Center Operator
73C	Finance Specialist
73D	Accounting Specialist
73Z	Finance Senior Sergeant
74D	Computer/Machine Operator
74F	Programmer/Analyst

MOS	MOS Title
74Z	Data Processing NCO
75B	Personnel Administration Specialist
75C	Personnel Management Specialist
75D	Personnel Records Specialist
75E	Personnel Actions Specialist
75F	Personnel Information System Management Specialist
75Z	Personnel Sergeant
76C	Equipment Records & Parts Specialist
76J	Medical Supply Specialist
76P	Material Control & Accounting Specialist
76V	Material Storage & Handling Specialist
76X	Subsistence Supply Specialist
76Y	Unit Supply Specialist
76Z	Senior Supply/Service Sergeant
77F	Petroleum Supply Specialist
77L	Petroleum Laboratory Specialist
77W	Water Treatment Specialist
79D	Reenlistment NCO
81B	Technical Drafting Specialist
81C	Cartographer
81Q	Terrain Analyst
81Z	Topographic Engineering Supervisor
82B	Construction Surveyor
82C	FA Surveyor
82D	Topographic Surveyor
83E	Photo & Layout Specialist
83F	Printing & Bindery Specialist
88H	Cargo Specialist
88K	Watercraft Operator
88L	Watercraft Engineer
88M	Motor Transport Operator
88N	Traffic Management Coordinator
88P	Locomotive Repairer

MOS	MOS Title
88Q	Railway Car Repairer
88R	Airbrake Repairer
88S	Locomotive Electrician
88T	Railway Section Repairer
88U	Locomotive Operator
88V	Train Crewmember
88W	Railway Movement Coordinator
88X	Railway Senior Sergeant
88Y	Marine Senior Sergeant
88Z	Transportation Senior Sergeant
91A	Medical Specialist
91B	Medical NCO
91C	Practical Nurse
91D	Operating Room Specialist
91E	Dental Specialist
91F	Psychiatric Specialist
91G	Behavioral Science Specialist
91H	Orthopedic Specialist
91J	Physical Therapy Specialist
91L	Occupational Therapy Specialist
91N	Cardiac Specialist
91P	X-Ray Specialist
91Q	Pharmacy Specialist
91R	Veterinary Food Inspection Specialist
91S	Preventive Medicine Specialist
91T	Animal Care Specialist
91U	Ear Nose & Throat Specialist
91V	Respiratory Specialist
91W	Nuclear Medicine Specialist
91X	Health Physics Specialist
91Y	Eye Specialist
92B	Medical Laboratory Specialist
92E	Cytology Specialist

MOS	MOS Title
93B	Aeroscout Specialist
93C	Air Traffic Control Operator
93D	Air Traffic Control System, Subsystem & Equip Repairer
93F	FA Meteorological Crewmember
93P	Aviations Operations Specialist
94B	Food Service Specialist
94F	Hospital Food Service Specialist
95B	Military Police
95C	Corrections NCO
95D	CID Special Agent
96B	Intelligence Analyst
96D	Imagery Analyst
96F	Psychological Operations Specialist
96H	Aerial Intelligence Specialist
96R	Ground Surveillance Systems Operator
96Z	Intelligence Senior Sergeant
97B	Counterintelligence Agent
97E	Interrogator
97G	Counter-Signals Intelligence Specialist
97Z	Counterintelligence/Human Intel Senior Sergeant
98C	EW/Signal Intelligence Analyst
98D	Emitter Locator Identifier
98G	EW/Signal Intelligence Voice Interceptor
98H	Morse Interceptor
98J	EW/Signal Intelligence Non-communications Interceptor
98K	Non Morse Interceptor Analyst
98Z	Signals Intelligence/EW Chief

Appendix B
VARIABLES IN MOS-D

This appendix contains information about each of the variables that appears in MOS-D. Specifically, it contains:

- an alphabetical listing of the variables;
- the number of the table in which the variable is introduced;
- an indicator defining whether or not the variable is an input data point (I) as opposed to a derived variable (D); and
- the source document for all input variables.

Variable	Table	Input	Source
ACAT1-3A	3.1	I	PERSCOM Force Management Book
ACAT3B	3.1	I	PERSCOM Force Management Book
ACAT4	3.1	I	PERSCOM Force Management Book
ACExyCR	7.1	I	American Council on Education Guide 1989
AFQTDOD	3.1	I	Eitelberg text
AFQTREQ	3.1	I	REQUEST data October 89
AFRMED	3.1	I	AR 611-201 UPDATE 2
AGEDx	7.1	I	DoD Military Civilian Occupational Crosscode 1989
ASVAB	3.1	I	Eitelberg text
ASVAx	3.1	I	AR 611-201 UPDATE 2
ASVAyzx	3.1	D	
ASVSx	3.1	I	AR 611-201 UPDATE 2
CIPCDNO	7.1	D	
CIPCDxy	7.1	I	DoD Military Civilian Occupational Crosscode 1989
CIPDOTxy	7.1	I	DoD Military Civilian Occupational Crosscode 1989
CIPDTLxy	7.1	I	DoD Military Civilian Occupational Crosscode 1989
CIPQLxy	7.1	I	DoD Military Civilian Occupational Crosscode 1989
CIPRNKxy	7.1	I	DoD Military Civilian Occupational Crosscode 1989
CIPSUBxy	7.1	I	DoD Military Civilian Occupational Crosscode 1989
CLAROC	7.1	I	AR 611-201 UPDATE 2

Variable	Table	Input	Source
CLASVCD	7.1	I	Military Career Guide FR 90
CLBRANCH	2.1	I	Enlisted Personnel Management Division
CLCIP	7.1	R	DoD Military Civilian Occupational Crosscode 1989
CLCMF	2.1	I	AR 611-201 UPDATE 2
CLDOD	7.1	D	
CLDOD2	7.1	D	
CLGOE1	7.1	I	DoD Military Civilian Occupational Crosscode 1989
CLIDOS	7.1	I	DoD Military Civilian Occupational Crosscode 1989
CLMCG	7.1	I	Military Career Guide FY 90
CLSOC1	7.1	I	DoD Military Civilian Occupational Crosscode 1989
DOTCDGRP	7.1	D	
DOTCDx	7.1	I	DoD Military Civilian Occupational Crosswalk 1988
DOTCIVCP	7.1	I	DoD Military Civilian Occupational Crosswalk 1988
DOTCPNO	7.1	D	
DOTGRD	7.1	I	DoD Military Civilian Occupational Crosswalk 1988
DOTHRSOJ	7.1	I	DoD Military Civilian Occupational Crosswalk 1988
DOTPRTx	7.1	D	
DOTSVP1	7.1	I	DoD Military Civilian Occupational Crosscode 1989
DPTTITL	7.1	I	DoD Military Civilian Occupational Crosswalk 1988
F89ACT	5.1	I	PERSCOM Force Management Book
F89FLOTH	5.1	I	PERSCOM Force Management Book
F89FLTNG	5.1	I	PERSCOM Force Management Book
F89FLTOT	5.1	D	
F89OPTOT	5.1	D	
F90TGTOT	5.1	D	
FabCROTH	5.1	I	PERSCOM Force Management Book
FabCRTNG	5.1	I	PERSCOM Force Management Book
FabCRTOT	5.1	D	
FabOPRz	5.1	I	PERSCOM Force Management Book
FabRVTOT	5.1	D	
FabSDTOT	5.1	D	
FISabxyz	5.1	I	PERSCOM Force Management Book
FNSabxyz	5.1	I	PERSCOM Force Management Book

Variable	Table	Input	Source
FPSabxyz	5.1	I	PERSCOM Force Management Book
MBEARCD	2.1	I	PERSCOM Force Management Book
MCASCNT	2.1	I	REQUEST data Oct 89
MCASTP	2.1	I	AR 601-210
MCUTSC5/6	2.1	I	Army Times May 1990
MENLBNS	2.1	I	PERSCOM Force Management Book
MENTRLVL	2.1	I	AR 611-201 UPDATE 2
MOS	2.1	I	AR 611-201 UPDATE 2
MOSACTV	2.1	I	AR 611-201 UPDATE 2
MRCPRI	2.1	I	PERSCOM Force Management Book
MRENLBNS	2.1	I	PERSCOM Force Management Book
MSAA	2.1	I	QUALS FILES April 90
MSACOLFD	2.1	I	MacDonald Text
MSAPPROG	2.1	I	MacDonald Text
MSAR	2.1	I	QUALS FILES April 90
MSASICD	2.1	I	AR 611-201 UPDATE 2
MSASINO	2.1	D	
MSECCLR	3.1	I	AR 611-201 UPDATE 2
MSFEM	2.1	R	QUALS FILES April 90
MSNG	2.1	I	QUALS FILES April 90
MSNRMOS	2.1	I	AR 611-201 UPDATE 2
MSTITLE	2.1	I	AR 611-201 UPDATE 2
MSTOPRK	2.1	I	AR 611-201 UPDATE 2
MSTRM	3.1	I	PERSCOM Force Management Book
PCLRVSN	3.1	I	AR 611-201 UPDATE 2
PHYCOD	3.1	I	AR 611-201 UPDATE 2
PHYSCx	3.1	D	
PULHES	3.1	I	AR 611-201 UPDATE 2
TATTRIT	4.1	I	QUALS files April 1990
TCLASS	4.1	I	ATRRS/Formal Schools Catalog
TCLMAX89	4.1	I	ATRRS/Formal Schools Catalog
TCLMIN89	4.1	I	ATRRS/Formal Schools Catalog
TCLOPT89	4.1	I	ATRRS/Formal Schools Catalog

Variable	Table	Input	Source
TCMN	4.1	I	AR 611-201 UPDATE 1
TINFO	4.1	I	AR 611-201 UPDATE 1
TMAN	4.1	I	AR 611-201 UPDATE 1
TMNIFRA	4.1	D	
TNGCRSCD	4.1	I	ATRRS/Formal Schools Catalog
TNGLGTH	4.1	I	ATRRS/Formal Schools Catalog
TNGLOCN	4.1	I	ATRRS/Formal Schools Catalog
TNOSHO	4.1	I	QUALS files April 1990
TOSUT	4.1	I	QUALS files April 1990
TTOT	4.1	I	AR 611-201 UPDATE 1
VRCMPA90	6.1	I	FY 90 ATRM-159 reports
VRCOMA90	6.1	I	FY 90 ATRM-159 reports
VRCOTH90	6.1	I	FY 90 ATRM-159 reports
VRCRSCST	6.1	I	FY 89 AMCOS data
VRCSTDAY	6.1	D	
VRCSTMP	6.1	I	FY 89 AMCOS data
VRCSTOM	6.1	I	FY 89 AMCOS data
VRCSTOTH	6.1	I	FY 89 AMCOS data
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