Matching Military Occupations and Experience to Academic Preparation in Industrial Technology

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Abstract

The matching of military occupations to instructional programs in industrial technology was investigated. The matching process was facilitated with the aid of specialized computer files known as "Crosswalks," which are maintained by the National Crosswalk Service Center. The results indicated that selected military occupations can be matched with selected instructional programs in industrial technology and that selected industrial technology programs can be matched with selected military occupations. The findings suggest that instructional programs in industrial technology can help credential newly-separated service members and thus help mitigate the higher than normal initial unemployment rate for newly-separated service members.

Introduction

Industrial technology programs exist to prepare technical and technical management-oriented professionals for employment in various technology-based economic endeavors. According to the Department of Labor/Employment & Training Administration's O*NET OnLine (n.d.), industrial technologist are among the "in demand" occupations and occupations found in National High Growth industries—economically critical industries, industries projected to add substantial numbers of new jobs, and industries that are being transformed by technology and innovation. Specifically, the industries in which industrial technologists are in demand include the following: (a) advanced manufacturing, (b) aerospace, (c) biotechnology, (d) geospatial technology, (e) information technology, and (f) nanotechnology. Dohm and Shniper (2007) suggest that industrial technology professionals, regardless of whether they're prepared in a technical field of study or a technical management-oriented field of study will continue to be well represented among the occupations that are considered to be among the (a) fastest growing occupations and (b) occupations that will experience the largest job growth through 2016. Technology-based economic endeavors may in fact experience shortages of technical and technology management oriented professionals. That is, there may be more employment opportunities than job seekers.

Interestingly, one of America's most technologically advanced and largest economic endeavors—the Department of Defense—has a payroll that consists of approximately 2.4 million service members (Office of the Under Secretary of Defense—Comptroller, 2007). Furthermore, according to *Study on Coordination of Job Training Standards with Certification Standards for Military Occupational Specialties* (U.S. Department of Labor, 2005), approximately 180,000 service members retire or otherwise fulfill their service commitments annually. The study also suggested that newly-separated service members experience higher initial unemployment rates than non-veterans because many of the newly-separate service members are not credentialed. As well, a U.S. Department of Veterans Affairs (2008) study found, in part, that

newly-separated service members had difficulties finding their first civilian job within the first two years following separation when compared to their peers with the same educational attainment and demographic characteristics. The purpose of the U.S. Department of Veterans Affairs' study was to better understand the employment histories and outcomes of newly-separated service members. Among the conclusions drawn by this U.S. Department of Veterans Affairs study was that education and training programs need to be redesigned to maximize the transfer value of military experiences.

The Problem
The problem of this investigation was to facilitate the credentialing of service members based on the military occupations for which they were trained. The purpose of the inquiry was to match military occupations to civilian instructional programs in industrial technology that coincided with those military occupations. The goal was to help reduce the high initial unemployment rate among newly-separated service members by providing service members and those in academic programs that prepare industrial technologist with a means of matching service members' training, education, and experience to maximize the transfer value of those military experiences.

Limitations
This investigation was limited to enlisted occupations (rather than warrant officer and officer occupations) because (a) enlisted personnel comprise approximately 85% of all service members (Bureau of Labor Statistics, 2006) and (b) it is the enlisted occupations that are most closely related to industrial technology programs at the associate and baccalaureate levels of academic preparation and occupations associated with industrial technology. As an example, electronic and electrical equipment repair personnel repair and maintain electronic and electrical equipment used by the military. These repairers are normally specialists in avionics, computer, optical, communica-

tions, or weapons systems. Electronic instrument repairers, as an example, install, test, maintain, and repair a wide variety of electronic systems, including navigational controls and biomedical instruments. More experienced enlisted personnel, refereed to as Non-Commissioned Officers, also serve as foremen and line-supervisors. They too "get their hands dirty"; but, they also supervise subordinates. Senior Non-Commissioned Officers, because of their education, training, and years of experience, perform many managerial functions. This inquiry was also limited to Army, Coast Guard, Marine Crops, and Navy occupations because the education and training that Air Force personnel receive are assigned college credit by the Community College of the Air Force.

Background
The preparation of enlisted personnel for military service begins with what is commonly referred to as "basic training." The purpose of basic training is to provide service members with the affective, cognitive, and psychomotor means needed to fulfill their role as service persons. Each service branch has its own basic training program tailored to the service branch's mission. After basic training, most service members proceed through advance training.

Advance Training
Regardless of the service branch, advance training prepares service members with the knowledge and skills needed to succeed in the occupations to which they were assigned prior to enlistment or during basic training. Advanced training is delivered in settings similar to those found in vocational schools; community, junior, or technical colleges; and four-year colleges or universities. That is, most instruction is offered in classroom and laboratory settings.

Advanced training exists for most military specialties. Over 300 military training centers, 10,000 courses, and 100,000 support personnel, military and civilian, are engaged in it. Depending on the specialty, advanced training

may last anywhere from a few weeks to about a year in duration (Department of Defense, n.d.).

Career Advancement
Requirements for career advancement typically include, but are not limited to, on-the-job-training, additional technical preparation, professional preparation (frequently referred to as professional military education), and career broadening assignments. Milestones achieved in a service member's career include, but are not limited to, promotions and assignments in positions of increasing responsibility and visibility. Promotion requirements, in particular, include, but may not be limited to, time in service, time in grade, job performance, fitness reports, supervisor recommendations, and scores on written examinations (Bureau of Labor Statistics, 2006).

Job Classification
Upon completion of advanced training, Army and Marine Corps personnel are awarded a Military Occupational Specialty and Coast Guard and Navy personnel are awarded a rating. Cumulatively, Military Occupational Specialties and ratings are referred to by the Department of Defense as Military Occupational Codes, which were established to classify all military occupations. These codes can be sorted by branch of service and by whether the occupations are enlisted, commissioned officer, or warrant officer occupations.

Classification Systems
One of the keys to matching military occupations to instructional programs in industrial technology is the ability to link classification systems: specifically, linking Military Occupational Codes to Classification of Instructional Programs Codes. Originally developed by the U.S. Department of Education's National Center for Education Statistics in 1980, Classification of Instructional Programs is a taxonomic coding scheme that contains titles and descriptions of primarily postsecondary instructional programs that supports the accurate tracking, assessment, and

reporting of fields of study and program completion activity (National Center for Education Statistics, 2000; National Center for Education Statistics, 2002).

Crosswalks
Crosswalks were developed to facilitate the linkage between "classification systems." The system of Military Occupational Codes, for example, is a Department of Defense classification system; Classification of Instructional Programs, for example, is a classification system developed by the Department of Education. The National Crosswalk Service Center refers to Crosswalks as specialized computer files that are used to relate classification systems to one another (National Crosswalk Service Center, n.d.).

Among the Crosswalks maintained by National Crosswalk Service Center, are the Military Occupational Code-to-Standard Occupational Classification and the Standard Occupational Classification-to-Classification of Instructional Programs Crosswalks. The Military Occupational Code-to-Standard Occupational Classification Crosswalk cross-references Military Occupational Codes of the Air Force, Army, Coast Guard, Marine Corps, and Navy with equivalent Federal Standard Occupational Classification Codes. These Crosswalk data are intended to support both military and civilian research and analytical functions that require military to civilian occupational conversion information. The content of the Military Occupational Code-to-Standard Occupational Classification Crosswalk was developed by the Defense Manpower Data Center and can be accessed through the following site: https://www.dmdc.osd.mil/owa/odb (National Crosswalk Service Center, 2004).

The Standard Occupational Classification-to-Classification of Instructional Programs Crosswalk is a result of a joint effort between the Department of Education and the Department of Labor. Its purpose of is to show the relationships between instructional program content and their equivalent Federal Standard Occupational Classifi-cation Codes, based on the descriptions of each (National Crosswalk Service Center, 2002).

Standard Occupational Classification
The Standard Occupational Classification system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of over 820 occupations according to their occupational definition. To facilitate classification, occupations are combined to form 23 major groups, 96 minor groups, and 449 broad occupations. Each broad occupation includes details that describe occupations requiring similar job duties, skills, education, or experience (Bureau of Labor Statistics, 2007).

Definition of Industrial Technology
The Bureau of Labor Statistics (2001c) characterizes industrial technologists as those who apply engineering theory and principles to problems of industrial layout or manufacturing production, usually under the direction of engineering staff. Industrial technologists may study and record time, motion, method, and speed involved in performance of production, maintenance, clerical, and other worker operations for such purposes as establishing standard production rates or improving efficiency. The National Center for Education Statistics (2000) characterizes industrial technology as an instructional program that prepares individuals to apply basic engineering principles and technical skills in support of industrial engineers and managers. It includes instruction in optimization theory, human factors, organizational behavior, industrial processes, industrial planning procedures, computer applications, and report and presentation preparation. The National Association of Industrial Technology (2006, p. 1) defines industrial technology as:

> A field of study designed to prepare technical and/or technical management-oriented professionals for employment in business, industry, education, and government. Indus-trial Technology degree programs and professionals in Industrial Technology careers typically will be involved with the:

a. application of theories, concepts, and principles found in the humanities and the social and behavioral sciences, including a thorough grounding in communication skills.
b. understanding of the theories and the ability to apply the principles and concepts of mathematics and science and the application of computer fundamentals.
c. application of concepts derived from, and current skills developed in, a variety of technical and related disciplines which may include, but are not limited to, materials and production processes, industrial management and human relations, marketing, communications, electronics, and graphics.
d. completion of a field of specialization, for example, electronic data processing, computer aided design, computer integrated manufacturing, manufacturing, construction, energy, polymers, printing, safety, or transportation.

Method
This inquiry was intended to affect two stakeholders: service members and those who prepare industrial technologists. In response, this inquiry attempted to match selected military occupations to their corresponding instructional programs in industrial technology from a service member's perspective and from the perspective of those who prepare industrial technologists.

Service Member's Approach
To mimic the process a service member would undertake when attempting to identify an instructional program in industrial technology that corresponds to their Military Occupational Code, four similar enlisted Military Occupational Codes were selected—an Army code, a Coast Guard code, a Marine Corps code, and a Navy code. The Military Occupational Codes were then crosswalked using the Military Occupational Code-to-Standard Occupational Classification Crosswalk to identify

corresponding Standard Occupational Classification Codes and Titles (see Figure 1). These results were then crosswalked using the Standard Occupational Classification-to-Classification of Instructional Programs Crosswalk to identify the Military Occupational Codes' corresponding instructional programs in industrial technology as reflected by the instructional programs' Classification of Instructional Programs Codes. This crosswalking process should deliver a match between a service member's military occupation and the corresponding instructional program in industrial technology.

In addition, and with the aid of the Military Occupational Code-to-Standard Occupational Classification Crosswalk database, the Standard Occupational Classification Code data were sorted to identify all Military Occupational Codes associated with that Standard Occupational Classification Code and the respective Classification of Instructional Programs Code (see Figure 2). This sort, while perhaps extraneous, offers a perspective on all the enlisted occupations associated with a particular Classification of Instructional Programs Code. That is, the sort identifies all military occupations that match a particular instructional program: a value-added product for those who prepare industrial technologists.

Industrial Technology Approach
From the perspective of those who prepare industrial technologists, an industrial technology Classification of Instructional Programs Code was selected and crosswalked using the Standard Occupational Classification-to-Classification of Instructional Programs Crosswalk to identify corresponding Standard Occupational Classification Codes and Titles (see Figure 3). The results were then crosswalked using the Standard Occupational Classification-to-Military Occupational Code Crosswalk to identify the Military Occupational Codes that correspond to the instructional program in industrial technology as reflected by its Classification of Instructional Programs Code. The results provide those who prepare
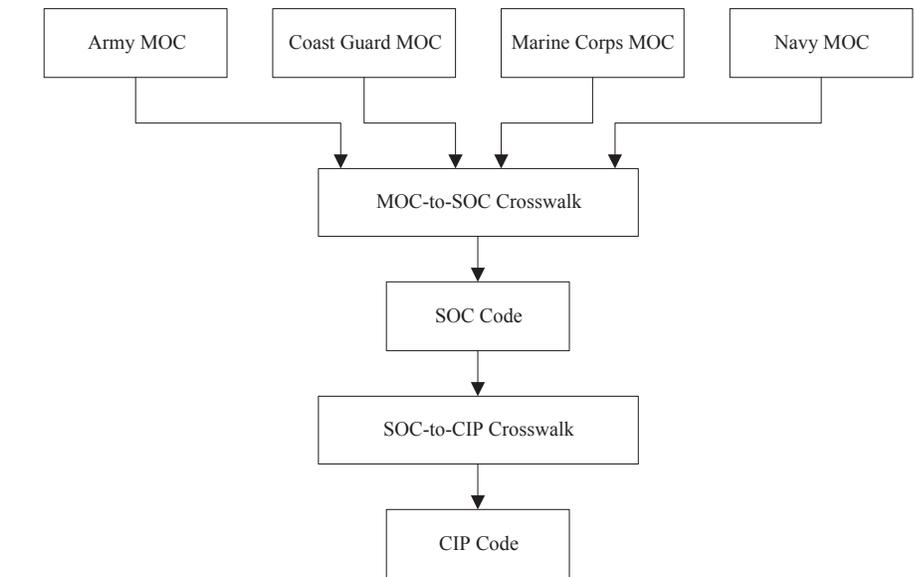

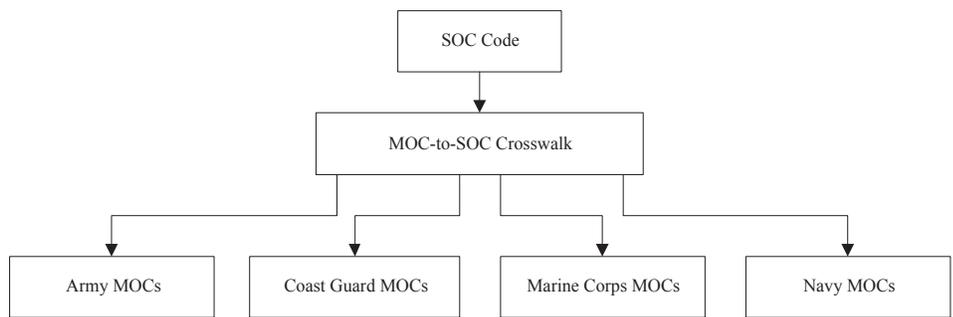*Figure 1. Military Occupational Code to Classification of Instructional Programs Code Crosswalk*

Figure 2. Standard Occupational Classification Code to Military Occupational Code Crosswalk

industrial technologist with a list of military occupations associated with a particular instructional program in industrial technology.

Findings
Service Member's Approach
The four similar enlisted Military Occupational Codes—15N, Avionic Mechanic (Army); 555, Avionics Technician (Coast Guard); 5948, Aviation Radar Technician (Marine Corps); and 7137, Aircraft Instrument IMA Technician (Navy)—when Military Occupational Code-to-Standard Occupational Classification crosswalked yielded the following Standard Occupational Classification Code and Standard Occupational Classification Title respectively: 49-2091, Avionics Technicians (see
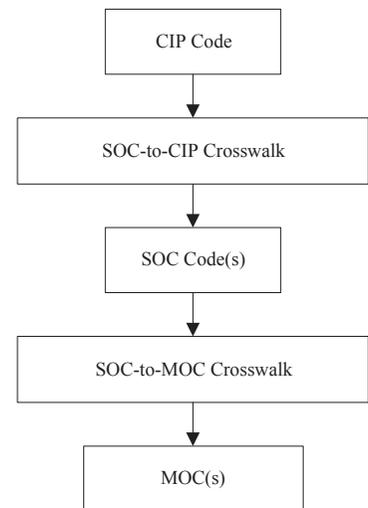

Figure 3. Classification of Instructional Programs Code to Military Occupational Code Crosswalk

Figure 4). Avionics Technicians install, inspect, test, adjust, or repair avionics equipment, such as radar, radio, navigation, and missile control systems in aircraft or space vehicles (Bureau of Labor Statistics, 2001d).

A Standard Occupational Classification-to-Classification of Instructional Programs Crosswalk yielded the following Classification of Instructional Programs Codes and Classification of Instructional Programs Titles respectively: 47.0607, Airframe Mechanics and Aircraft Maintenance Technology/Technician and 47.0609, Avionics Maintenance Technology/Technician. Airframe Mechanics and Aircraft Maintenance Technology/Technician (47.0607) instructional programs prepare individuals to apply technical knowledge and skills to repair, service, and maintain all aircraft components other than engines, propellers, avionics, and instruments. It includes instruction in layout and fabrication of sheet metal, fabric, wood, and other materials into structural members, parts, and fittings, and replacement of damaged or worn parts such as control cables and hydraulic units (National Center for Education Statistics, 2000b). Avionics Maintenance Technology/Technician (47.0609) instructional programs prepare individuals to apply technical knowledge and skills to repair, service, and maintain all types of aircraft operating, control, and electronic systems. It includes instruction in flight instrumentation, aircraft communications and homing systems, radar and other sensory systems, navigation aids, and specialized systems for various types of civilian and military aircraft (National Center for Education Statistics, 2000b).

A Standard Occupational Classification Code sort within the Military Occupational Code-to-Standard Occupational Classification Crosswalk database on the 49-2091 Standard Occupational Classification Code yielded eleven Army, one Coast Guard, thirty-one Marine Corps, and forty-eight Navy enlisted Military Occupational Codes that corresponded to the Airframe Mechanics and Aircraft Maintenance Technol-
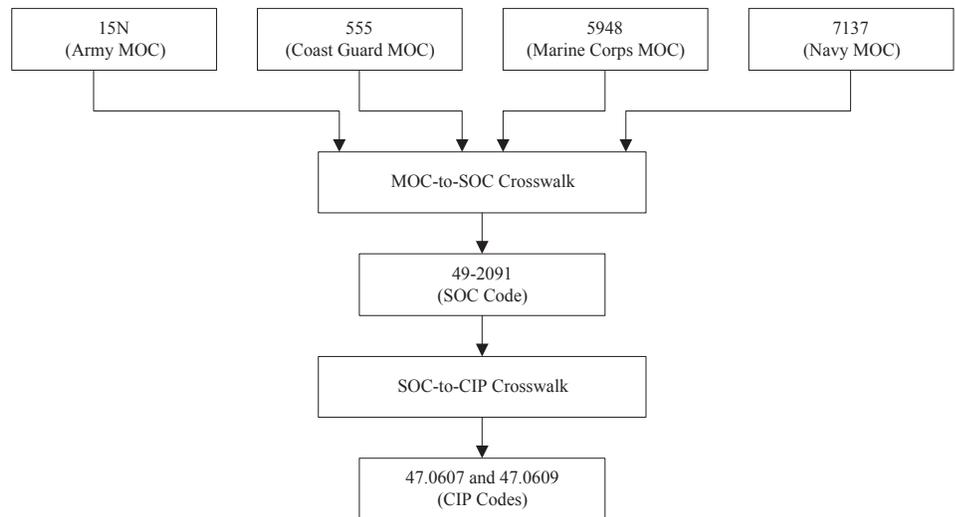

Figure 4. Military Occupational Code to Classification of Instructional Programs Code Crosswalk Results
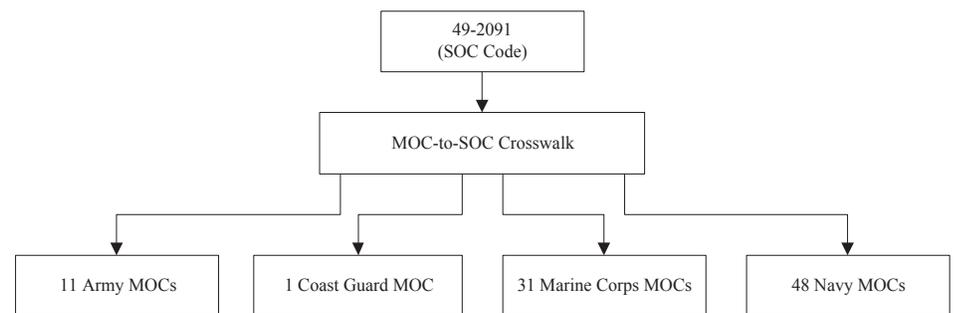

Figure 5. Standard Occupational Classification Code Sort Results

ogy/Technician (47.0607) instructional program and the Avionics Maintenance Technology/Technician (47.0609) instructional program (see Figure 5).

Industrial Technology Approach
An industrial technology instructional program, Information Technology, was selected and its Classification of Instructional Programs Code (11.0103) and Classification of Instructional Programs Title (Information Technology) were identified and crosswalked using the Standard Occupational Classification-to-Classification of Instructional Programs Crosswalk to identify corresponding Standard Occupational Classification Codes and Titles (see Figure 6). Instructional programs in Information Technology focus on the design of technological information systems, including computing systems, as solutions to business and research data and

communications support needs. The programs focus on instruction in the principles of computer hardware and software components, algorithms, databases, telecommunications, user tactics, application testing, and human interface design (National Center for Education Statistics, 2000a).

The Standard Occupational Classification-to-Classification of Instructional Programs Crosswalk resulted in the identification of four Standard Occupational Classification Codes that match the 11.0103 Classification of Instructional Programs Code: 15.1031 (Computer Software Engineers, Applications), 15.1032 (Computer Software Engineers, Systems Software), 15.1051 (Computer Systems Analysts), and 15.1081 (Network Systems and Data Communications Analysts). Aided by the Standard Occupational Classifica-

tion-to-Military Occupational Code Crosswalk, the four Standard Occupational Classification Codes yielded fifty-five associated Military Occupational Codes. Of the fifty-five, forty were warrant officer, officer, or Air Force Military Occupational Codes. The fifteen enlisted Military Occupational Codes—one Army code, ten Marine Corps codes, and four Navy codes that matched the 15.1051 (Computer Systems Analysts) and 15.1081 (Network Systems and Data Communications Analysts) Standard Occupational Classification Codes, and thus the 11.0103 Classification of Instructional Programs Code. Computer Systems Analysts (15.1051) analyze science, engineering, business, and all other data processing problems for application to electronic data processing systems. They analyze user requirements, procedures, and problems to automate or improve existing systems and review computer system capabilities, workflow, and scheduling limitations; and may analyze or recommend commercially available software (Bureau of Labor Statistics, 2001a). Network Systems and Data Communications Analysts (15.1081) analyze, design, test, and evaluate network systems, such as local area networks, wide area networks, Internet, intranet, and other data communications systems. They perform network modeling, analysis, and planning and research and recommend network and data communications hardware and software. They may work with telecommunications specialists who deal with the interfacing of computer and communications equipment and they may supervise computer programmers (Bureau of Labor Statistics, 2001b).
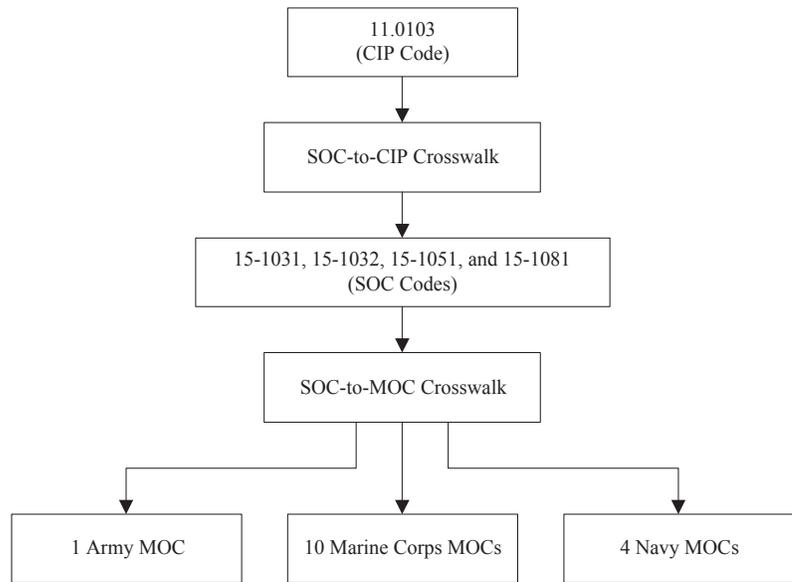

Figure 6. Classification of Instructional Programs Code to Military Occupational Code Crosswalk Results

Discussion

Those involved with the preparation of industrial technologists, including administrators, advisors, and faculty members can, with the aid of Crosswalks, match instructional programs in industrial technology, as reflected by their Classification of Instructional Programs Codes, to military occupations, thus facilitating the credentialing of enlisted service members. The procedure involves (a) identifying their instructional program Classification of Instructional Programs Code, (b) matching it to its counterpart Standard Occupational Classification Code, and then (c) matching the Standard Occupational Classification Code to its counterpart Military Occupational Code (see Figure 7).

Service members with an interest in capitalizing on their military education,

occupational experience, and training associated with their military occupation can, with the aid of Crosswalks, match their military occupation as reflected by their Military Occupational Code to instructional programs in industrial technology that will lead to credentialing. The procedure involves (a) identifying their Military Occupational Code, (b) matching their Military Occupational Code to its counterpart Standard Occupational Classification Code, and then (c) matching the Standard Occupational Classification Code to its counterpart Classification of Instructional Programs Code (see Figure 8).

Awarding Credit

Most colleges and universities accept military coursework, training, and other related occupational specialty experience for use in fulfilling graduation re-
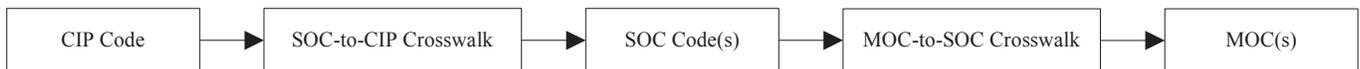

Figure 7. Classification of Instructional Programs Code to Military Occupational Code Crosswalk

Figure 8. Military Occupational Code to Classification of Instructional Programs Code Crosswalk

The University of Kentucky does not automatically award military credit to students at the onset of enrollment. However, after a degree seeking student has been enrolled at UK and earned 12 hours, he or she may request that the military record be sent to the Office of Admission for evaluation. Military Credit is awarded following the procedures below:

I.   Procedures
    A. The student must submit a letter requesting evaluation, along with the necessary supportive documentation, to the Office of Admission.
    B. The letter should specify the types of educational experiences the student wishes to have evaluated.
        1. Military Schools should be listed by:
        Name of school
        Location
        Name of course
        Length of course in weeks
        Date course began
        Date course completed
        Final mark and/or standing in class
        2. Military Occupational Specialties (MOS) should be listed by:
        Complete MOS designation
        MOS Title
        Period of time MOS was held as a primary duty assignment
        How MOS was awarded (School Attendance, OJT, etc.)
        MOS evaluation score and date of evaluation

II.   Documentation
    A. Official documentation is necessary to support the awarding of any credit based on military service. The supportive documentation required is as follows:
        1. Computerized transcript from the Army/American Council on Education Registry (request forms are available in the Office of Admission)
        2. Copies of Course Completion Certificates
        3. Enlisted Evaluation Data Report reflecting competency in any MOS submitted for evaluation
        4. DD Form 214 (Report of Transfer or Discharge) if no longer on Active Duty
    B. Required documentation may be obtained as follows:
        1. Active Duty Personnel: Custodian of individual's personnel records, Military installation to which assigned
        2. Retired Army Personnel or Reserve Personnel:
        US Army Reserve Component & Administration Center (TAGO)
        9700 Page Boulevard
        St. Louis, Missouri 63132
        3. Discharged Personnel (Veterans):
        General Services Administration
        National Personnel Records Center (Military Personnel Records)
        9700 Page Boulevard
        St. Louis, Missouri 63132
        4. Discharged Personnel Now Members of Army National Guard:
        National Guard unit to which assigned

III.   Awarding of Credit
Credit is evaluated using the ACE Guide for evaluation of military credit (Army, Navy, Air Force, Coast Guard). ACE guide recommends hours to be awarded based on the length and content of each course. Evaluations are typed on appropriate form.
    A. A degree-seeking student must enroll and earn a minimum of 12 semester hours prior to any credit being awarded based on military service.
    B. Credit will be awarded on the student's official academic transcript.
    C. No credit will be awarded based on a Military Occupational Specialty (MOS) which has not been held as a primary duty assignment for a minimum duration of one (1) year or more.
    D. Copies of the Evaluation are forwarded to the college dean's office and to Student Records Office.
    E. One copy of the evaluation is maintained in the Office of Admission "Military Credit Evaluation" file.
    F. Each college determines how awarded hours may be used in the degree program.

Figure 9. Evaluation of Military Credit (Office of the Registrar, 2007)

quirements. However, each institution has its own policies for accepting and applying military-related credits in the fulfillment of graduation requirements. As an example, the University of Kentucky's policy appears in Figure 9.

Like all transfer students, veterans too must ensure that all their transcripts are provided to the college or university. The content of the transcripts are then reviewed by college or university officials aided by the American Council on Education's *Guide to the Evaluation of*

Educational Experiences in the Armed Services (2007).

Since 1945, the American Council on Education has provided a bridge between the Department of Defense and higher education with its *Guide to the*

MC-1715-0185
AVIATION RADAR TECHNICIAN
Course Number: *Version 1:* E2V. *Version 2:* E2V.
Location: Communication Electronics School, Twentynine Palms, CA.
Length: *Version 1:* 26–27 weeks (931 hours). *Version 2:* 33 weeks (585 hours).
Exhibit Dates: *Version 1:* 7/95–11/02. *Version 2:* 12/02–Present.
Learning Outcomes: *Version 1:* Before 7/95 see MC-1715-0156. Upon completion of the course, students will be able to install, test, adjust, and troubleshoot a specific radar and display system to the module level. *Version 2:* Upon completion of the course, students will be able to install, test, adjust, and troubleshoot a specific radar and display system to the module level.
Instruction: *Version 1:* The course covers concepts of radar system operation; assembly and disassembly adjustment; use of built-in test equipment, special tools, and external test equipment; and preventive maintenance. *Version 2:* Audiovisual materials, practical exercises, laboratory, lecture, and computer-based training. The course covers concepts of radar system operation; assembly and disassembly adjustment; use of built-in test equipment, special tools, and external test equipment; preventive maintenance; and "UNIX" system.
Credit Recommendation: *Version 1:* In the vocational certificate category, 3 semester hours in microwave communications and 3 in microwave communication laboratory. In the lower-division baccalaureate/associate degree category, 3 semester hours in electronic systems troubleshooting and maintenance (8/02). *Version 2:* In the lower-division baccalaureate/associate degree category, 3 semester hours in radar systems, 3 in UNIX, and 3 in electronic systems troubleshooting and repair (7/04).

Figure 10. Course Exhibit (American Council on Education, 2007)

Evaluation of Educational Experiences in the Armed Services. Typically used by academic advisors, admissions officers, career counselors, and registrars, the guide is the standard reference that recommends the assignment of credit for military coursework, training, and other related occupational specialty experience. An exhibit from the online version of the guide for the US Marine Corps' Aviation Repair Technician course appears in Figure 10. Although the American Council on Education makes recommendations, each institution determines the number credits it will accept and how credits will be applied towards fulfilling graduation requirements (i.e. free electives, general education requirements, cognate requirements, major requirements, etc).

Implications

Newly-separated service members are an invaluable economic development resource—some might say they are a national treasure because of the training, education, and experience they possess and their grounding in technology. And because of the discipline instilled in them and the technological knowledge and skills they possess, newly-separated service members, with the aid of instructional programs in industrial technology, have the potential to help fill this nation's projected rapidly growing technology-based occupations and occupations that are projected to experience significant job growth.

Military course and training program titles, however, reflect the specialties for which the training is intended and may be difficult for college and university admissions personnel and industrial technology administrators, advisors, and faculty to translate. This can also be said of the terms used to describe the military occupations or Military Occupational Codes.

Industrial technology programs can improve the credentialing rate among newly separated service members by matching military occupations with the opportunities to complete an associate or baccalaureate degree in industrial technology. By increasing the credentialing rate among service members, the existing higher than normal initial unemployment rate among service members can be mitigated. Industrial technology programs that offer on-line programs can lean forward even further by beginning the credentialing process prior to the service members' separation. Key to any program's success involves the use of tools such as Crosswalks and the *Guide to the Evaluation of Educational Experiences in the Armed Services* and recognizing the value of service members' military experiences.

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