



MARIA C. LYTELL, SEAN ROBSON, JOHN A. AUSINK, BARBARA BICKSLER, GRACE FALGOUST,
CHAITRA M. HARDISON, DEVON HILL, ANNIE YU KLEIMAN, MARK TOUKAN

Evaluating the Effectiveness of the Air Force Enlisted Skills Management System

Recommended Changes to Meet Future Demands



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About This Report

This report documents findings and recommendations from a RAND Project AIR FORCE (PAF) project to explore options for modifying or changing the U.S. Air Force (USAF) enlisted skills management system. The report begins with a review of the history and current state of the structure of enlisted occupations (known as Air Force Specialties, or AFSs), and how that structure undergirds the skills management system. It then describes perceived strengths and weaknesses of the current skills management system based on interviews with USAF unit leaders and experts (“system customers”), enlisted assignment teams, and process experts in the system. It follows with a review of modern skills management practices, primarily focused on artificial intelligence applications, used by other organizations. The report goes on to describe findings from our use of natural language processing to demonstrate how well they can infer skill requirements from USAF occupational data. It then details findings from literature and a workshop on implementing an advanced technical track for enlisted technical talent management. The report concludes with findings and recommendations for options to improve or change the enlisted skills management system.

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Summary

Issue

For decades, the U.S. Air Force (USAF) has used Air Force Specialty Codes (AFSCs) as the backbone of its occupational classification system. But with goals to develop mission ready airmen (MRA) and concerns about maintaining sufficient depth in advanced technical skills, questions are starting to arise as to whether this long-standing approach to skills management is sufficiently flexible to achieve future objectives. To address constraints in the USAF's enlisted skills management system, the Air Force asked RAND Project AIR FORCE (PAF) to identify, evaluate, and recommend modifications or new approaches to managing enlisted skills that can meet the demands of a changing and uncertain future in the USAF.

Approach

To meet this objective, the research covered an array of questions that address both breadth (across career fields) and depth (within career fields) of skills management. The research team used multiple methods in conducting its work, including (1) a review of relevant regulatory, policy, and skills management literature; (2) interviews with USAF stakeholders (system customers, enlisted assignment teams, and process experts); (3) a demonstration of how natural language processing (NLP) can be leveraged to provide insights about enlisted occupational specialties; and (4) a workshop with USAF enlisted representatives to discuss an advanced technical track for managing technical talent.

Findings and Recommendations

Infrastructure to Support Modern Skills

- *Current processes for determining skill requirements are useful but limited.* Skill qualifications and training are not centrally managed by any single USAF-wide system, making it difficult to compare skill supply and demand across specialties or to identify skill trends.
- *The Talent Marketplace is a step in the right direction but has room for improvement.* Currently in beta testing, this platform will improve the process of matching airmen to available positions. But barriers to scale and sustain the system exist. Lack of automation is a particularly limiting factor requiring more time-intensive, manual intervention than legacy systems.
- **Recommendation:** *Invest in infrastructure and workflows that automate skill tracking and support cross-functional comparisons.* Design features to support analytic processing and options for centralizing new information on skill requirements are needed. In addition, the Air Force Personnel Center (AFPC), with policy direction from Manpower, Personnel and Services (AF/A1), and Air Education and Training Command (AETC) should incorporate opportunities to leverage NLP to extract and synthesize skill demands.

Assignment System Constraints

- *The assignment system is constrained by policy and resources.* Within the assignment system, airmen in the same AFSC, skill level, and grade are assumed to have similar skill proficiency, with little to no accommodation for specialized skills developed throughout a career. Waivers exist to infuse more flexibility into the system, but their use is erratic.
- **Recommendation:** *Simplify waiver authority for assignments in high-value skill areas to increase assignment flexibility.* As part of the continued Talent Marketplace test, AF/A1 (with analytic support from AFPC) could select a number of high-demand AFSC or high-value skill areas to test simplified waiver procedures that would accelerate their approval. To leverage skill-based information for assignment matching, time on station, retainability, and permanent change of assignment, budgets need to be simultaneously addressed.

Enlisted Occupational Structures, Processes, and Policies

- *Career field structure is deeply embedded in regulation and policy.* AFSCs not only support human resources management but also enable USAF to comply with congressional and Department of Defense (DoD) mandates related to personnel utilization and classification. Needed system modifications must also maintain compliance with existing mandates.
- *The skills management system is optimized within, not across, career fields.* This structure creates a challenge in developing airmen to work across functional lines and can hinder career advancements for airmen who are assigned to unique missions.
- **Recommendation:** *Determine if cross-functional requirements are translated into enlisted career field plans.* Career field and functional managers have varied views about the value of cross-functional experiences in career planning. AF/A1 needs to review how cross-functional requirements from enlisted functional advisory councils are being translated into career field management plans and address disconnects.

Better Managing of Technical Talent in the Enlisted Force

- *The current institutional track does not meet needs for managing technical talent.* In the institutional track, airmen become supervisors and leaders as they move through their careers—careers focused on managing personnel and resources, not on continuing to develop and apply technical skills to complex missions. This limits the ability to increase technical skills among junior airmen so there is sufficient technical talent among the more senior grades.
- **Recommendation:** *Continue to pursue an advanced technical track for enlisted career fields.* The USAF is exploring implementation of an advanced technical track for its enlisted force to retain and manage technical expertise within the force. Factors that need to be considered in developing and implementing a technical track include clear objectives and expectations, flexibility with incentives, and minimum size of the career field to sustain a technical track.

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Introduction

For decades, the U.S. Air Force (USAF) has used Air Force Specialty Codes (AFSCs) as the backbone of its occupational classification system. AFSCs are alphanumeric codes representing occupational specialties (e.g., 1D7X1 is the AFSC for the Cyber Defense Operations specialty). Airmen receive technical training within their specialties and their assignments and developmental opportunities are largely managed within their career fields. However, USAF leadership has been seeking ways to train, assign, and utilize airmen both within and across AFSCs—which collectively make up skills management.¹ For example, the USAF has embarked on building a Digital Air Force that can meet persistent and growing threats in cyberspace.

Similarly, the USAF had been in the process of implementing the multi-capable airmen (MCA) concept for the past few years and recently introduced the concept of mission ready airmen (MRA). MCA had been expected to perform tasks outside their core AFSCs in deployed environments, particularly in support of Agile Combat Employment (ACE) schemes of maneuver. Identification and implementation of cross-cutting skills for Digital Air Force and MCA (or, potentially, MRA), however, are constrained by the existing reliance on AFSCs and associated career field structures.² Although the USAF has been introducing flexibility to managing enlisted skills across AFSCs and functional lines (e.g., by consolidating AFSCs), the AFSC structure as a driver of enlisted personnel management remains intact.

Recent discussions with personnel under the Deputy Chief of Staff for Manpower, Personnel and Services (AF/A1), Headquarters USAF, have also revealed concerns about managing enlisted talent within career fields. These concerns tend to focus on airmen with advanced technical skills, such as those in cyber, because of the strong labor market demand for people with advanced technical skills.

The USAF is therefore aiming to modernize its enlisted skills management system to address different challenges. Specifically, the USAF seeks to improve its enlisted skills management system so that it has three key features: (1) flexibility for assigning, training, and utilizing airmen across career fields; (2) defined structures for intentional development and retention of airmen with deep technical skills; and (3) data, policies, and workflows nested within an infrastructure to support the identification and management of skills across the enlisted force.

¹ Our use of the term *skill* here can be thought of as broad and inclusive of knowledge and abilities—referring not only to skills in the strictest sense (i.e., what people have learned to do over time), but also to any *knowledge, skills, abilities, and other characteristics* (KSAOs) or *competencies* that are required on the job. We adopt this broad use of the term *skill* when referring to the enlisted skills management system.

² On February 12, 2024, Department of the Air Force (DAF) leadership announced plans to develop MRA with “a mix of skills needed for wartime operational mission readiness” in support of “reoptimizing for great power competition.” Department of the Air Force, “Reoptimizing for Great Power Competition,” webpage, undated.

Objective and Approach

To address constraints in the USAF’s enlisted skills management system, AF/A1 asked RAND Project AIR FORCE (PAF) to identify, evaluate, and recommend modifications or new approaches to managing enlisted skills that can meet the demands of a changing and uncertain future. To meet this objective, we addressed five main policy questions and employed different methods. The policy questions and associated methods are outlined in Table 1.1. (Details on specific methods are addressed in later chapters and appendixes of the report.)

Table 1.1. Methods Used to Address Policy Questions for This Project

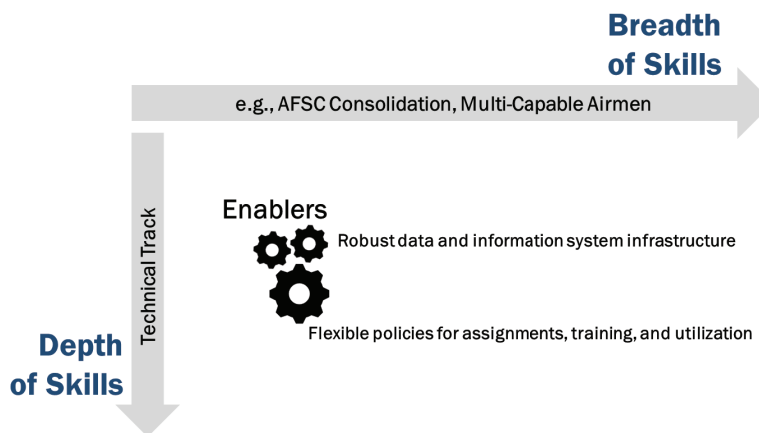
Policy Questions	Methods
What is the history of the USAF enlisted occupational structure, and how do regulations and policies affect the current USAF enlisted skills management system?	<ul style="list-style-type: none"> • Reviewed law, policy, and literature for the following: <ul style="list-style-type: none"> – regulatory and policy requirements associated with use of USAF occupational specialties – history of USAF enlisted occupational structure
What are the main strengths and weaknesses of the current system?	<ul style="list-style-type: none"> • Extracted themes from discussions with three groups of USAF experts: <ol style="list-style-type: none"> 1. <i>system customers</i> (e.g., unit leaders and experts) 2. <i>enlisted assignment teams</i> at the Air Force Personnel Center (AFPC) 3. <i>process experts</i> responsible for contributing operational information to the skills management system (e.g., occupational competencies)
Are there modern skills management practices used by other organizations that could apply to the USAF?	<ul style="list-style-type: none"> • Reviewed literature on modern skills management in organizations
Can natural language processing (NLP) help the USAF identify skill requirements for enlisted USAF specialties? ^a	<ul style="list-style-type: none"> • Reviewed literature on use of NLP for occupational requirements • Applied NLP methods to infer skill requirements from occupational tasks for a select sample of AFSCs
How can the USAF improve how it tracks, develops, and maintains technical talent in the enlisted force?	<ul style="list-style-type: none"> • Reviewed literature on technical tracks and related concepts for managing technical talent • Designed, developed, and executed a workshop with USAF enlisted representatives to outline options for managing technical talent with an <i>advanced technical track</i> • Hosted a workshop postmortem session with AF/A1 representatives to identify considerations for implementing an enlisted advanced technical track

^aThe policy question about NLP is more narrowly scoped than the other policy questions in the table. The reason is that NLP is one approach to modernizing skills management.

The policy questions outlined in Table 1.1 address both breadth (across career fields) and depth (within career fields) of skills management. Most of the questions focus on breadth of skills because concerns about cross-AFSC and cross-functional skills³ management were the original focus of our project. As the project progressed, AF/A1 asked our team to address a question about depth of skills, specifically focused on the concept of an *advanced technical track* for managing enlisted technical talent. A *technical track* is a career path for personnel with technical skills who wish to continue to focus on applying and honing those skills while also advancing. A technical track runs parallel to a traditional career path, typically referred to as a *management track*, that requires personnel to take on supervisory and leadership positions in order to advance. At the time of our project, AF/A1 began exploring the use of technical tracks for officers and enlisted personnel. Our workshop (and postmortem discussion) was designed to help AF/A1 further refine the concept.⁴

Our project also details findings associated with enablers of both breadth and depth of skills management. Specifically, we identify how the USAF can improve its collection and use of information about airmen skills and competencies, as well as improvements to the infrastructure that would be needed to support use of that information. We also highlight how more flexible personnel management policies also enable better management of the depth and breadth of enlisted skills across the force. Figure 1.1 is a simple depiction of the relationships among the concepts of breadth and depth of skills, and the role of enablers. We offer this as a general framework to tie together the questions addressed by our project.

Figure 1.1. Framework for Managing the Breadth and Depth of Enlisted Skills



³ In this report, we use the term *cross-functional skills* to refer to technical skills that are not required by an airman’s specialty and would fall in other functional lines (e.g., an airman in a cyber AFSC who has skills in the nuclear domain).

⁴ At the same time as we conducted our project, AF/A1 was leading a working group of senior enlisted leaders (SELs) to develop policies for modernizing enlisted force management. The working group addressed several lines of effort, one of which was to implement an advanced technical track that would allow a select number of airmen to pursue a series of assignments and opportunities for developing and retaining technical expertise within their career fields.

Structure of This Report

The remaining chapters describe our analysis, findings, and conclusions about the structure and application of the USAF skills management system. The next two chapters provide baselining information on the current system. Chapter 2 summarizes the history and current state of the USAF enlisted skills management system by outlining law, regulation, and policy associated with the use of military occupations for managing enlisted personnel. Chapter 3 describes perceived strengths and weaknesses of the current USAF enlisted skills management system from perspectives of system customers (unit leaders and experts), assignment teams, and process experts. Chapter 3 mainly focuses on challenges in managing the breadth of skills and having key policies, data, and processes in place to enable flexible skills management.

Chapter 4 focuses on the data and infrastructure that would enable the USAF to adopt modern skills management practices. The chapter details a demonstration of NLP to infer the degree of overlap in tasks and skills both within and across a sample of USAF enlisted specialties.

Chapter 5 introduces a new enlisted career path structure that would help the USAF deepen the skills and capability of its technical talent. The chapter documents insights into a technical track for USAF enlisted skills management.

We conclude our report in Chapter 6, where we summarize key findings and conclusions and provide recommendations to improve how the USAF manages the breadth and depth of enlisted skills. The report contains appendixes with details on project methodologies or additional findings and background information that supplement the main chapters.

Law and Policy Affecting USAF Occupational Classifications

The U.S. government has found it useful to classify occupations to help match individual skills with requirements for jobs since as early as 1933, when passage of the Wagner-Peyser Act “established a nationwide system of public employment offices, now known as the Employment Service. The Employment Service seeks to improve the functioning of the nation’s labor markets by bringing together individuals seeking employment with employers seeking workers.”¹

As a result of that act, in 1934, the secretary of labor, Frances Perkins,² invited a group of “public spirited citizens” to serve as a technical board guiding the occupational research program of the Employment Service.³ The major objective of this group was “to get men [sic] and jobs together. In order to do this, common sense dictates that we must know as much as possible about the man [sic] and close-to-the-job factual information about the work that is being done.”⁴ By 1942 one product of the technical board was a *Dictionary of Occupational Titles*, with job descriptions of occupations in “most major industries” and techniques for the selection of appropriate workers—a document that listed 18,000 jobs.⁵

In this chapter, we first describe the development of U.S. *military* occupational classification systems since World War II. We then highlight public laws and Department of Defense (DoD) regulations that currently imply or mandate the use of occupational classifications in the military services for the management of personnel. We conclude with a discussion of USAF functions that rely on occupational classifications for effective management.

Development of Military Occupational Structures

World War II

The military attempted to match people with jobs during World War II through physical and aptitude testing of military inductees. A history of the Army Service Forces notes that after induction,

¹ See U.S. Department of Labor, “Wagner-Peyser Act of 1933, as Amended,” webpage, undated.

² Frances Perkins was the fourth U.S. Secretary of Labor and served from 1933 to 1945. She was the first woman to hold a cabinet position.

³ William H. Stead and W. Earl Masincup, *The Occupational Research Program of the United States Employment Service*, Public Administration, 1942, p. iii.

⁴ Stead and Masincup, 1942, p. xix.

⁵ Stead and Masincup, 1942, p. x.

men were given a number of tests, the most important of which was the Army General Classification Test, which divided men into five grades according to their ability to learn. Other tests for mechanical, technical, or clerical aptitude were administered to determine the type of work an individual could do, and “military occupation specialty” numbers were associated with different jobs.

With the specialized manpower needs of war . . . the classification process could not insure that all inductees would be placed at tasks related to their previous training and experience. It was very important in selecting specialists to fill Army needs to find men who had had equivalent civilian occupations.⁶

There was apparently some connection between the military’s system and the work that had been done by the Employment Service. A 1943 report states that “insofar as possible, assignments were made in accordance with a person’s previous experience and aptitude” and that a “sample survey made during the fiscal year 1943 showed that of enlisted men having a civilian occupational specialty—the job list of civilian skills useful to the Army—a little over 78 percent were being used in similar or related capacity by the Army.”⁷

Standardizing Occupations Among Services

From 1947 to 1949, the Army and Navy worked on standardizing personnel policy, and, in 1949, DoD hoped that a uniform policy could be created through a joint Army-Navy Personnel Board established to coordinate personnel policy common to the various services. However, USAF “dissented on the basis that a common structure failed to meet its specific needs.” Nonetheless, attempts continued through 1952 and several common career fields and progressions were developed.⁸

USAF-Specific Development of Occupational Classifications

Air Force concerns continued, however, about existing career field designations being incompatible with new technical jobs, so the service started a three-year study called Operation Searchlight in 1951 to develop a classification structure appropriate for USAF. A new structure was implemented in 1954, and it eliminated unneeded Army codes and defined new technology-based specialties.⁹ By the early 1960s a five-digit code for a member of the USAF specified the career field, the career field subdivision, the skill level, and the Air Force specialty, with the last digit tied to a letter

⁶ John D. Millet, *The Organization and Role of Army Service Forces*, Office of the Chief of Military History, Department of the Army, 1954, p. 100.

⁷ Army Service Forces, *Annual Report of the Army Service Forces for the Fiscal Year 1943*, War Department, August 15, 1943, pp. 135–136. Millet, 1954, p. 100, mentions that there were ten times as many occupation types in civilian life as in the Army but does not provide a citation for this claim.

⁸ Mark R. Grandstaff, *Foundation of the Air Force: Air Force Enlisted Personnel Policy 1907–1956*, Air Force Museums and History Program, 1997, p. 49.

⁹ Raymond E. Conley and Albert A. Robbert, *Air Force Officer Specialty Structure: Reviewing the Fundamentals*, RAND, TR-637, 2009, p. 13.

that designated the category of aircraft and specific weapon system for which the individual was qualified.¹⁰

According to the 1957 *Warrant Officer and Airman Classification Manual*, the purpose of the system was to “identify accurately the abilities of persons in terms of AFS’s [Air Force Specialties] as a basis for personnel management.”¹¹ Current USAF instructions state that

the military personnel classification system identifies duties and tasks for every position needed to accomplish the Air Force mission. The system is designed to identify qualifications and abilities necessary to accomplish these duties and tasks, as well as provide clear and visible career progression patterns. It links duties and tasks into cohesive job clusters used to match personnel requirements with personal aptitudes, attributes, and qualifications. The classification system also provides concise award, upgrade, and retention criteria for career progression.¹²

In response to the drawdown of forces resulting from the end of the Cold War, the USAF streamlined its organization and, as part of what it called a “Year of Training,” revamped its specialty-classification structure in October 1993 to better match specialties with the needs of the newly organized force. This restructuring reduced the number of officer AFSCs to 123 from 216, and enlisted AFSCs to 176 from 203, but salient features remained essentially unchanged.¹³

Law and Policy Related to Occupational Classifications

Occupational Classifications Explicit or Implicit in Public Law

Congress has implied the need for, or explicitly directed the development of, occupational classifications in several sections (§§) of Title 10 of the U.S. Code (10 USC), five of which are displayed in Figure 2.1. The first two laws in the figure allow the establishment of officer strengths in various categories and the commissioning of officers with special qualifications—both implying that military services can define occupations, establish qualifications for them, and manage them to ensure mission accomplishment. The third, 10 USC § 1143, requires the Secretary of Defense to provide members of the armed forces who are separating from military service with a certification or verification of job skills and experience which, as we discuss below, has led DoD to establish a standardized database of military job classification codes. This database makes it easier to associate skills gained in military service with civilian jobs that might interest individuals who are leaving the military. The last two laws in the figure relate to the USAF’s authority to prescribe the duties of

¹⁰ Grandstaff, 1997, p. 141.

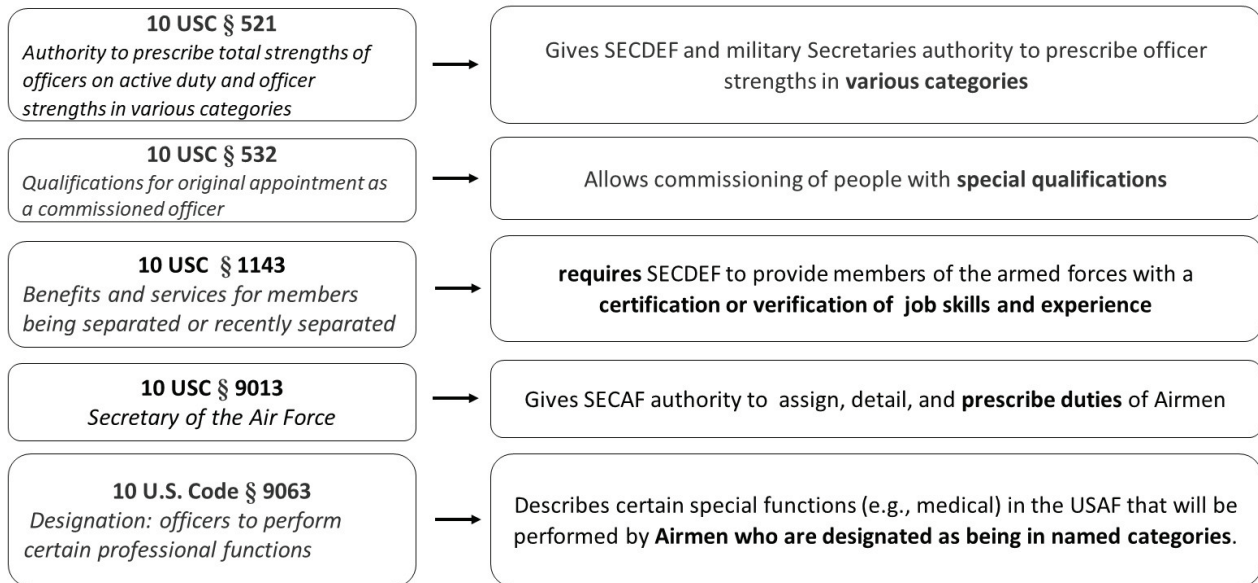
¹¹ Air Force Manual (AFMAN) 35-1G, *Warrant Officer and Airmen Classification Manual*, Department of the Air Force, August 30, 1957, Effective December 31, 1957, p. 3.

¹² AFMAN 36-2100, *Military Utilization and Classification*, Secretary of the Air Force, April 7, 2021, p. 9.

¹³ Conley and Robbert, 2009, also note the following:

The Air Force military specialty-classification structure is rooted in two fundamental concepts: functional area grouping, incorporated into the earliest Air Force specialty-classification directives . . . and practical specialization, integral to classification policy for more than 40 years.

Figure 2.1. Public Laws Related to the Establishment of Military Occupational Categories



SOURCE: RAND summary of descriptions in USC.

airmen and to specify that some functions will be performed by personnel in named categories—both recognizing the need to develop occupational classifications and implying the authority to do so.

Occupational Classifications Explicit or Implicit in DoD and USAF Documents

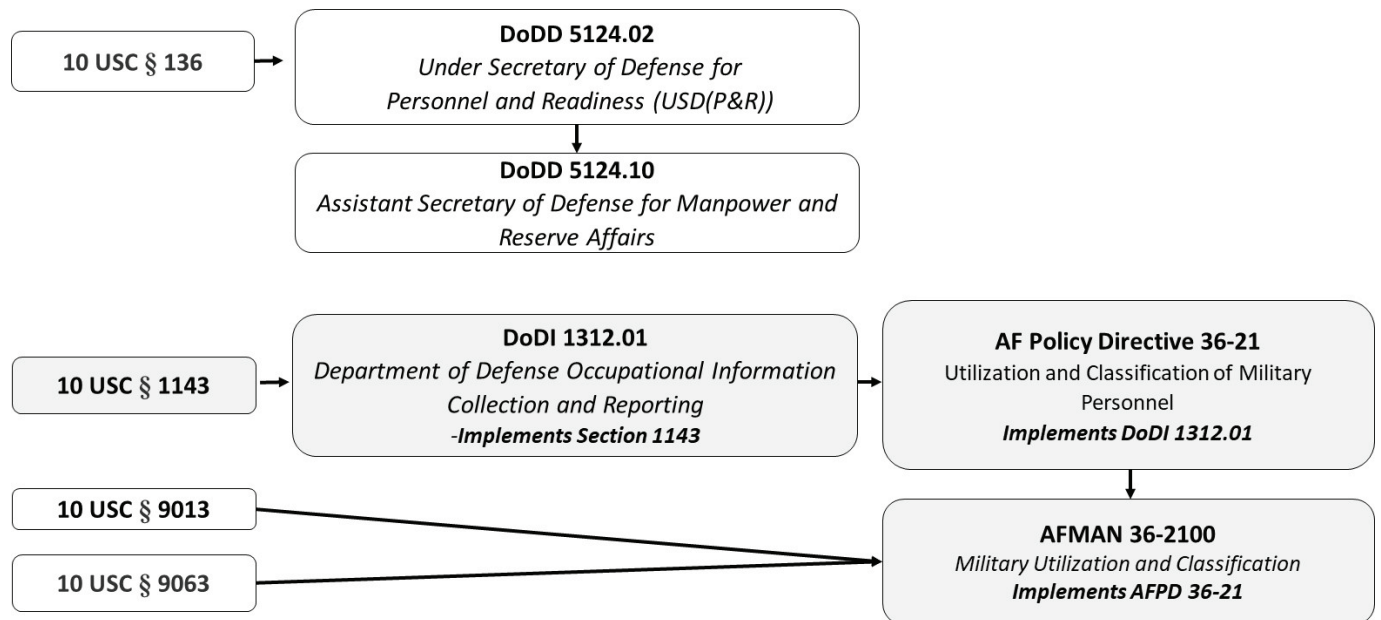
Figure 2.2 shows relationships among the USC, DoD, and USAF documents that apply or implement the directives of public law related to occupational classifications. Arrows in the figure from one rectangle to another indicate that the first document is authority for the second. For example, in the first row, USC § 136 establishes the position of the Under Secretary of Defense for Personnel and Readiness (USD(P&R)). Citing this law as the authority to do so, Department of Defense Directive (DoDD) 5124.02 describes the duties of the position.

DoDD 5124.02 specifies that the responsibilities of the office include determining the appropriate workforce mix and allocating personnel among the DoD components and between the active and reserve components “to ensure efficient and effective support of wartime and peacetime operations, contingency planning, and preparedness.”¹⁴ The directive then delegates some of the responsibilities of USD(P&R) to the office of the Assistant Secretary of Defense for Manpower and Reserve Affairs, which “issues guidance for establishing quantitative and qualitative requirements, utilization, and management of military and civilian personnel.”¹⁵ By requiring quantitative and qualitative criteria for management of personnel, these descriptions imply the expectation that personnel will be classified by occupation.

¹⁴ DoDD 5124.02, *Under Secretary of Defense for Personnel and Readiness (USD(P&R))*, Director of Administration and Management, June 23, 2008, para 4.1.1.

¹⁵ Authority of the Secretary of Defense to create the Assistant Secretary position comes from 10 USC § 138, which says that there are 19 Assistant Secretaries.

Figure 2.2. DoD and USAF Implementation of Public Laws



SOURCE: RAND summary of descriptions in USC, DoDDs, DoD instructions (DoDIs), and USAF policy directives and manuals.

The clearest direction for the use of occupational classifications for military personnel management in the USAF is highlighted in gray in Figure 2.2. As mentioned earlier, the Secretary of Defense is required by 10 USC § 1143 to “provide to members of the armed forces who are discharged or released from active duty a certification or verification of any job skills and experience acquired while on active duty that may have application to employment in the civilian sector.”¹⁶ This is meant to assist former military members and their spouses in locating civilian employment and training opportunities.

DoDI 1312.01 implements the law by directing the maintenance of a DoD-level master Occupational Database and directs secretaries of the military departments and the Commandant of the U.S. Coast Guard to establish procedures to provide occupational classification updates and a “crosswalk analysis of military occupations to . . . various civilian occupational classifications.”¹⁷

The USAF implements the DoD directive through its policy description in Air Force Policy Directive 36-21;¹⁸ Air Force Manual (AFMAN) 36-2100, which states that the goal of the classification structure is to link “duties and tasks into cohesive job clusters used to match personnel requirements with personal aptitudes, attributes, and qualifications,” provides more details on the

¹⁶ USC Title 10, Section 1143, Employment Assistance.

¹⁷ DoDI 1312.01, *Department of Defense Occupational Information Collection and Reporting*, Under Secretary of Defense for Personnel and Readiness, January 28, 2013, Incorporating Change 1, Effective April 22, 2020, encl. 1, p. 7.

¹⁸ Air Force Policy Directive 36-21, *Utilization and Classification of Military Personnel*, Secretary of the Air Force, August 22, 2019.

implementation.¹⁹ As shown in Figure 2.2, AFMAN 36-2100 also cites the authority of the Secretary of the Air Force under public law to prescribe the duties of airmen (10 USC § 9013) and to specify special functions to be performed by named categories of personnel (10 USC § 9063).

Thus, USAF not only has the authority to establish occupational classifications but is required by law to do so in some fashion, such that any changes to the existing classification system must satisfy the needs of the USAF and requirements of the law and DoD policy.

USAF Functions That Rely on Occupational Classifications

Occupational classifications play an important role throughout a member's career, influencing everything from the terms of their enlistment to opportunities for advancement, to options to leave the service. This section highlights some key instances where DAF regulations²⁰ reference occupational classifications in five areas of a member's career: entry, assignments and pay, mission execution, career development, and exit. Given recent changes in enlisted assignments processes, we provide information about these changes based on interviews with AFPC representatives directly involved in enlisted assignments process.²¹ Figure 2.3 shows some of the references that guide the management of career phases in ways that can vary by occupational specialty. The figure demonstrates just how interwoven USAF occupational structure is with USAF personnel policies spanning career phases, from entry through exit. The implication is that a major overhaul of the occupational structure would have several downstream effects on USAF personnel management policies. In the following sections, we provide more details about the importance of occupations to the policies and associated processes across USAF career phases.

Entry—Accession and Training

An individual's enlistment and initial skills training experience is highly dependent on their intended career field, starting with whether they can enlist at all. Each career field has requirements for entry, as specified in Attachment 4 of the Air Force Enlisted Classification Directory. These requirements include minimum aptitude test scores, physical strength, U.S. citizenship, and ability to obtain a security clearance. Most career fields allow individuals with a disqualifying offense to enlist with a waiver, but one—Religious Affairs (5RXXX)—does not.²²

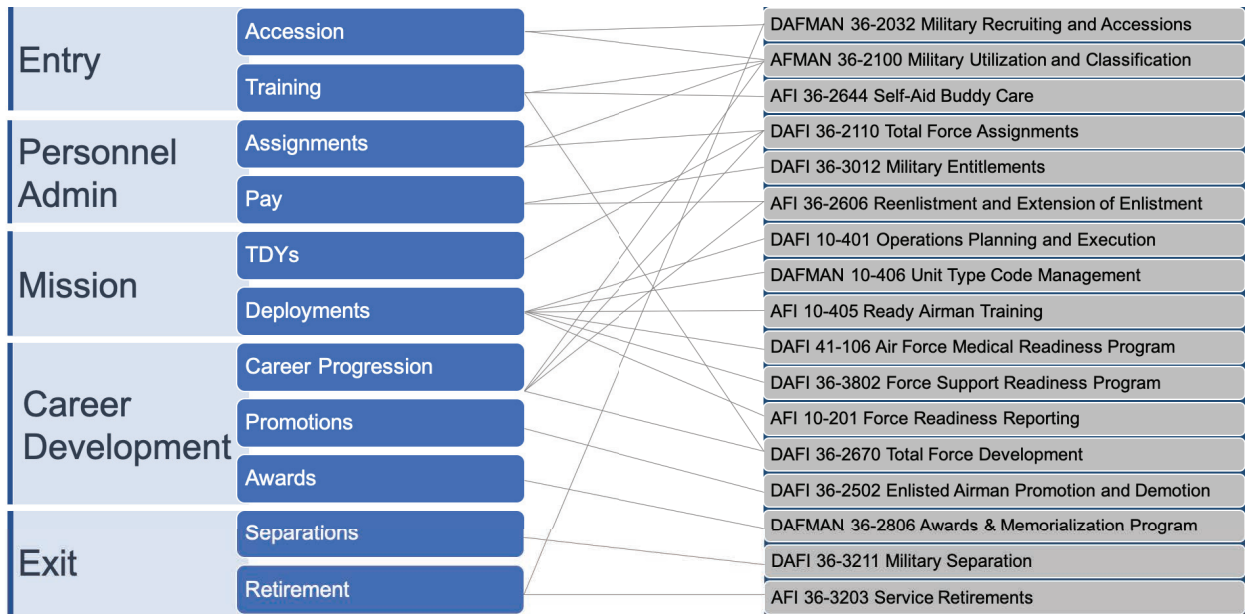
¹⁹ AFMAN 36-2100, 2021, p. 9.

²⁰ For this discussion we performed a broad, but not all-encompassing, search of Air Force Instructions (AFIs), AFMANs, Department of the Air Force Instructions (DAFIs) and Department of the Air Force Manuals (DAFMANs) for references to terms related to occupational classifications such as “career field,” “Air Force specialty,” “AFSC,” and “functional.”

²¹ Between April and May 2023, we held virtual discussions with 13 enlisted assignment representatives who provided details on current processes and recent changes. We provide more information about themes from these discussions in Chapter 3.

²² Alex Wagner, “Department of the Air Force Guidance Memorandum (DAFGM) to Department of the Air Force Manual (DAFMAN) 36-2032, Military Recruiting and Accessions,” memorandum, April 28, 2023, p. 38. Air Force Recruiting Service data show that as of mid-September 2023, USAF approved waivers for 5,946 out of 22,376 enlisted active duty accessions (27%) for FY 2023. In FY 2022, USAF approved waivers for 4,235 of 26,728 (15.8%) enlisted active duty accessions. For the ten fiscal years 2013–2022, the average percentage of enlisted active duty accessions with waivers was 18.5%.

Figure 2.3. Department of the Air Force Regulations That Describe the Impact of Occupational Classifications for Different Career Phases



SOURCE: RAND mapping of career phases (left side of figure) with relevant Department of the Air Force (DAF) policy instructions and manuals (right side of figure).

Even when an individual meets all entry requirements for a career field, the number of desired recruits each year is determined for each career field based on current manning levels and anticipated future demands,²³ so an individual might be able to enlist in certain career fields but not others. From a financial perspective, eligibility for enlistment bonuses is determined by career field. The two main programs for enlisted members—the Initial Enlistment Bonus program and Enlisted College Loan Repayment program—are intended to “incentivize enlistments into specific Air Force specialties.”²⁴

Upon enlistment, an airman’s early experiences in the USAF will vary widely with their career field. Thus, two individuals who enlisted at the same time in different career fields may have very different timelines for initial skills training (because of differences in length and content of training) and subsequent duty assignments.²⁵ Career field and corresponding training requirements are guided by thorough job analyses, which include Occupational Analysis Reports (OARs) and occupational competency models (OCMs). We describe each of these in turn.

Occupational Analysis Reports

USAF uses the Occupational Analysis Program to gather information about tasks that are performed by airmen within the same occupational specialty. The Occupational Analysis Flight in the Air Education and Training Command (AETC)’s Studies and Analysis Squadron executes the

²³ AFMAN 36-2100, 2021, p. 103.

²⁴ Wagner, 2023, p. 52.

²⁵ Annual quotas for training courses are partly determined by career field manning levels (see AFMAN 36-2100, 2021, p. 13).

Occupational Analysis Program, which is designed to do the following in support of three personnel programs:

1. inform personnel policies and occupational structures
2. develop and adjust training
3. develop the Weighted Airmen Promotion System (WAPS) tests which are used to inform enlisted promotions decisions.²⁶

Core activities of the Occupational Analysis Program involve

analyzing occupational tasks, knowledge, skills, abilities, occupational competencies, and their application to DAF occupations across an Airman or Guardian's force development lifecycle. Occupational Analysis . . . identifies the duties, tasks, and knowledge areas that are considered for formal training.²⁷

The analysis process is typically performed for a specific career field and generally involves two stages. In the first stage, experts from the career field are asked to review AFPC's existing task list for the career field and identify if any tasks are missing, obsolete, or need revision. Second, a survey using the revised task list is administered to all personnel in a career field. The survey includes a range of questions about the tasks (e.g., whether the airmen perform each task and how much time they spend on each task). An OAR is generated from the results and analysis of the survey responses.²⁸

Occupational Competency Models

In 2022, DAF published its first occupational competency handbook.²⁹ The handbook defines a competency as "observable, measurable pattern of knowledge, skills, abilities, behaviors, and other characteristics needed to perform institutional or occupational functions successfully."³⁰ It describes both *occupational competencies* (those that are specific to occupations) and what it refers to as *foundational competencies* (those that are applicable across all occupations such as Teamwork and Creative Thinking). Although the use of KSAOs and foundational competencies is not new, the establishment of a large-scale effort to develop occupation-specific competency lists across all USAF occupations is. As explained in the handbook, there is a desire to shift occupations away from the use of the tasks identified in the OARs and toward the use of competencies:

When making the transition towards building a competency-based construct, new ways of designing how the USAF develops and trains their Airmen must take hold. The USAF handles most of its training and development through task-based lenses. A task is a unit of work activity or operation that forms a significant part of a duty.

²⁶ DAFMAN 36-2664, *Personnel Assessment Program*, Secretary of the Air Force, January 18, 2023, Incorporating Change 1, August 2, 2023, p. 67.

²⁷ DAFMAN 36-2664, 2023, p. 67.

²⁸ Although most occupational analysis studies involve surveys, DAFMAN 36-2664 (2023) states that a survey is not always required.

²⁹ Air Force Handbook (AFH) 36-2647, *Competency Modeling*, Secretary of the Air Force, February 8, 2022.

³⁰ AFH 36-2647, 2022, p. 31.

These are singular in nature and are usually accomplished in one continuous action, which also can occur independently of other tasks. Conversely, outcomes are learning goals that typically consist of a multitude of tasks. These outcomes are actions and performances that embody and reflect the learner's competence in using content, information, ideas, and tools successfully. Focusing on learning outcomes allow learning organizations, supervisors, and trainers to incorporate soft skills into learning, which can then be used to create Airmen with the competencies needed for future challenges.³¹

AETC's Occupational Competencies branch has been charged with developing OCMs to help career fields determine which competencies airmen need to be successful in their career fields. This branch was established in 2018 and, as of October 2022, has completed over 40 models that cover approximately 60 AFSCs.³²

Personnel Management—Assignments and Pay

Airmen are selected for permanent change of station based primarily on their AFSC; other factors such as time on station, volunteer status, and assignment preferences are secondary.³³ For airmen who hold more than one AFSC, if one of those AFSCs is imbalanced,³⁴ that member can only serve overseas in the imbalanced AFSC.³⁵ An airman's AFSC can affect the minimum and maximum time they spend in an assignment, as well as limit opportunities to utilize airmen's skills outside of their Control AFSC (i.e., the AFSC in which the airman enlisted). If an airman is in a surplus AFSC, they may experience a permanent change of assignment (PCA) or permanent change of station earlier than expected³⁶ in order to even out manning levels. Airmen can perform duty outside of their Control AFSC for at most 130 days,³⁷ and airmen in a controlled duty assignment must be assigned "for a minimum specified period of time in the career field in which the Airman received training."³⁸ While base pay does not vary by career field, eligibility for special duty assignments programs³⁹ and selective

³¹ AFH 36, 2647, 2022, p. 19.

³² The number of AFSCs covered is higher than the number of models because some models are cross-functional (i.e., cover more than one related AFSC). According to our discussion with a representative from the branch in October 2022, AETC had plans to increase the size of the branch staff to increase production of competency models over the next few years.

³³ DAFI 36-2110, *Total Force Assignments*, Secretary of the Air Force, November 15, 2021, Incorporating Change 1, November 16, 2022, p. 117.

³⁴ "An AFSC which has more authorizations in the overseas area than in the CONUS" (DAFI 36-2110, 2021, p. 445).

³⁵ DAFI 36-2110, 2021, p. 117. An "imbalanced" career field is one for which overseas requirements are disproportionately large in comparison with continental U.S. requirements.

³⁶ DAFI 36-2110, 2021, p. 188. A surplus AFSC exists when an airman is assigned to a location that has zero manpower authorizations in the airman's career field (DAFI 36-2110, 2021, p. 458).

³⁷ AFMAN 36-2100, 2021, p. 47.

³⁸ DAFI 36-2110, 2021, p. 196.

³⁹ DAFI 36-3012, *Military Entitlements*, Secretary of the Air Force, April 6, 2023, p. 21.

retention bonus⁴⁰ is often based on AFSC. Changes to occupational categories will need to ensure that necessary assignment policies and incentive pays remain in place.

Traditional Assignment Process

The traditional assignment process occurs on a quarterly cycle, managed by AFSC-aligned enlisted assignment teams at AFPC.⁴¹ Based on interviews with 13 enlisted AFPC assignment personnel (AAPs), this quarterly process involves five main steps.

1. Find open assignments.
 - a. The process usually starts by obtaining an automated, computer-generated printout of assignments and manning gaps that need to be filled.
 - b. AAPs manually review the printout and fix it, send to major command functional managers (MFMs) for review, and make more changes based on their review.⁴²
2. Find airmen who are moving.
 - a. AAPs receive an auto printout of airmen who are supposed to be moving.
 - b. AAPs fix mistakes in printout (e.g., airmen not eligible to move etc.).
3. Perform initial matching of people to assignments.
 - a. A computer algorithm performs the initial matching of airmen to assignments.
 - b. AAPs manually fix mistakes in matching (not eligible for some reason) and manually rematch to backfill the mistakes.
 - c. AAPs hold out spouse movers and manually match them to a spouse move.
4. Send initial assignment matches for review.
 - a. AAPs send the tentative assignments to other sections of AFPC for Exceptional Family Member Program (EFMP)⁴³ and humanitarian review⁴⁴ and to MFMs for review.
 - b. These other AFPC sections and MFMs review, correct problems, and reject some of the tentative assignments.
 - c. AAPs manually redo matches for any that were rejected.
 - d. AAPs fix any other gaps that result from the redo.
5. Load the final assignments into the assignment system.

⁴⁰ AFI 36-2606, *Reenlistment and Extension of Enlistment in the United States Air Force*, Secretary of the Air Force, September 20, 2019, Incorporating Change 1, January 27, 2021, p. 31.

⁴¹ Based on our interviews with AFPC assignment personnel, the majority of assignments occur within the quarterly cycle, but some do occur out of cycle (e.g., when a position becomes vacant).

⁴² MFMs manage career fields for their major commands (MAJCOMs) and liaise with the career field managers (CFMs) and assignment teams.

⁴³ EFMP supports airmen with family members who have special needs (e.g., children). The program provides or coordinates services (e.g., medical referrals) for the airmen and families. For more details on EFMP, see AFPC, "Exceptional Family Member Program," webpage, undated.

⁴⁴ "The Humanitarian Reassignment and Deferment Program, run by the Air Force's Personnel Center, assists active-duty Airmen in resolving severe, short-term problems involving a family member while Airmen continue to meet the needs of the Air Force." Kat Bailey, "Humanitarian Assignments Considered for Airmen in Time of Need," *AFPC News*, September 20, 2017.

As these steps indicate, the traditional assignment process involves a mix of automated and manual steps and relies heavily on factors such as an airman's service commitment (retainability), time on station, shreds (for AFSCs with them),⁴⁵ spouse moves, and other humanitarian or family exceptions.⁴⁶ Additional factors like special experience identifiers (SEIs), would only come into consideration after mandatory factors.⁴⁷

Talent Marketplace Assignment Process

More recently, AFPC has been beta testing a talent management assignment process (TMAP) for 24 enlisted specialties.⁴⁸ TMAP uses an online platform known as Talent Marketplace. According to representatives from the AFPC office that oversees TMAP, TMAP generally follows nine steps:

1. TMAP assignment teams (called *beta teams*) put out a call to billet owners for *requisitions*, or the assignments that billet owners want filled by TMAP.
2. Billet owners post information about their requisitions in Talent Marketplace. Billet owners can also advertise them to airmen in Talent Marketplace.
3. MFMs for the AFSCs eligible for the requisitions review and validate the requisitions.
4. Once requisitions are validated, the beta team places them on a list to advertise to eligible airmen.
5. The beta team determines which airmen are eligible for the list of validated assignments and sends that list of eligible airmen to billet owners.
6. Billet owners review the list of airmen and can ask for reconsideration (*reclama*).
7. The final list of eligible airmen is approved by the assignment team and those airmen are allowed to see the list of eligible assignments in MyVector, another platform used for airmen career management.
8. Airmen can volunteer to fill positions for which they are eligible. They can also give location desirability ratings, fill out fields about spouses, and answer other questions about their intentions.
9. Beta teams review the airmen ratings and perform the airmen-assignment matches.

⁴⁵ A shred is a subspecialty within an AFSC. It is designated by a letter at the end of the AFSC (e.g., 2A3X5A is the F-22 shred for Advanced Fighter Aircraft Integrated Avionics specialty).

⁴⁶ These factors are described in more detail in DAFI 36-2110, 2021.

⁴⁷ For enlisted personnel, SEIs are "established when identifying experience or training is critical to the job and person assignment match, and no other identification is appropriate or available." AFPC, *Air Force Enlisted Classification Directory (AFECD): The Official Guide to the Air Force Enlisted Classification Codes*, Department of the Air Force, April 30, 2023, p. 394. SEI codes have three characters (numeric and/or alphabetic), but the "individual characters within the code have no specific meaning" (p. 394). A majority of SEIs authorized for use are awarded with specific AFSCs. For example, SEI 7DB is for a "Network Operations Specialist, Level III" and is only available for the Cyber Defense Operations (1D7XX).

⁴⁸ As of April 2023, the enlisted AFSCs participating in the beta testing of Talent Marketplace include Cyber Warfare Operations (1B4X1), six Command and Control Systems Operations specialties (1CXXX), three Cyber Defense Operations specialties (1D7XX), Aerospace Physiology (1H0X1), eight Intelligence specialties (1NXXX), Aircrew Flight Equipment (1P0X1), Safety (1S0X1), Weather (1W0X1), Religious Affairs (5R0X1), and Scientific Applications Specialist (9S100). For some of these specialties, only specific shreds are included.

Discussions with assignment teams and the AFPC office that oversees TMAP revealed that, despite use of the Talent Marketplace platform, TMAP itself is primarily a manual process because the beta teams have to review each individual airmen's file to match them to assignments. Information about special skills or experiences is limited to what airmen put in their records and is not considered until other mandatory requirements are met.

Mission Execution—Temporary Duty and Deployments

Requests for manning assistance temporary duty (TDY) support⁴⁹ are submitted for a specific AFSC based on manning shortfalls within a unit and managed by the CFM.⁵⁰ For deployments, AFSCs play a key role in conveying the demand (requirements) as well as determining the supply (an airman's eligibility for deployment). An airman could be identified for a deployment through Unit Type Codes⁵¹ or as an individual deployer using data from the Military Personnel Data System (MilPDS), both of which use AFSCs as a key reporting field.⁵² When units report their readiness levels, personnel deficiencies and critical personnel are identified by AFSCs.⁵³ Members with certain AFSCs can have predeployment training waived based on their prior training and experience.⁵⁴ Lastly, some career fields maintain specific readiness training requirements.⁵⁵

Career Development—Progression, Promotion, and Awards

An airman's career development depends on their career field or occupational specialty. For starters, a member's ability to stay in or change their career field depends on the relative manning levels across career fields. Career fields with low manning levels will accept retrainees from other career fields while not allowing their current members to switch. Conversely, career fields with high manning levels will allow their members to retrain into a different one but will not accept those seeking to retrain into that career field. In extreme cases, airmen may be directed to stay in or leave their career fields involuntarily.⁵⁶ Members holding an additional AFSC that has a shortage may be returned to that AFSC if "in the best interest of the AF [Air Force]."⁵⁷

⁴⁹ Manning Assistance TDY is intended to "provide short term manpower to AF units or AF positions within Joint units (with additional TDY resources) in the performance of its home base mission" (DAFI 36-2110, 2021, p. 99).

⁵⁰ DAFI 36-2110, 2021, p. 100.

⁵¹ DAFMAN 10-406, *Unit Type Code Management*, Secretary of the Air Force, October 6, 2021, p. 9.

⁵² Lt Gen Joseph T. Guastella, USAF, Deputy Chief of Staff, Operations, *Department of the Air Force Guidance Memorandum to DAFI 10-401, Air Force Operations Planning and Execution*, U.S. Department of the Air Force, January 18, 2022, para 7.3.3.

⁵³ AFI 10-201, *Force Readiness Reporting*, Secretary of the Air Force, December 22, 2020, pp. 19, 22, 23.

⁵⁴ Guastella, 2022, p. 10.

⁵⁵ DAFI 41-106, *Medical Readiness Program*, Secretary of the Air Force, July 29, 2020, Incorporating Change 1, April 25, 2023, p. 49; DAFI 36-3802, *Force Support Readiness Programs*, January 9, 2019, Incorporating Change 1, November 21, 2021, p. 43.

⁵⁶ AFMAN 36-2100, 2021, p. 131.

⁵⁷ DAFI 36-2110, 2021, p. 141.

A member's ability to progress within their career field also varies by AFSC. Upgrade to the 5- and 7-skill levels is accomplished via Career Development Courses (CDCs), which are specific to each AFSC.⁵⁸ The minimum upgrade time in training to 5 and 7 level varies by AFSC and is exempt for certain AFSCs.⁵⁹ Some AFSCs require additional training prior to enrolling in a CDC,⁶⁰ and the waiver authority for CDC failures varies by AFSCs.⁶¹ An enlisted career field's training and education requirements are specified in Career Field Education and Training Plans (CFETPs).⁶²

A member's ability to reenlist partially depends on their AFSC. All first-term airmen must receive a "career job reservation" (CJR) in order to reenlist, and for AFSCs that are "constrained" there is a quota of CJRs for a given fiscal year. All first-term airmen in their CJR window with that AFSC must compete for a CJR.⁶³ Beyond first-term airmen, an enlisted member who does not hold an AFSC skill level commensurate with their grade cannot reenlist.⁶⁴

Promotion to staff sergeant (E-5) and technical sergeant (E-6) is based on WAPS, which includes a test (called the Specialty Knowledge Test) on career field-specific information.⁶⁵ For promotion to master sergeant (E-7), senior master sergeant (E-8), and chief master sergeant (E-9), airmen are ranked in order of merit within their AFSC.⁶⁶ For both cases mentioned above, promotion allocations are established for each AFSC.⁶⁷ Members in "missing" status (missing in action or a prisoner of war) can be promoted for time in grade, but must meet or exceed the average time in grade for their AFSC.⁶⁸ Lastly, members can be demoted if they fail to hold a suitable skill level with their AFSC.⁶⁹

The type and number of awards an airman is eligible for varies widely depending on their AFSC. Headquarters USAF functional area managers manage and establish awards for their functional community.⁷⁰ For example, there are no awards in the USAF Awards Database Information System for which a staff sergeant holding the 1S0X1 (Safety) AFSC is eligible. In contrast, a staff sergeant with the 4P0X1 (Pharmacy) AFSC is eligible for one award at the USAF level and a staff sergeant

⁵⁸ DAFI 36-2670, *Total Force Development*, Secretary of the Air Force, June 25, 2020, Incorporating Change 4, March 31, 2023, p. 181.

⁵⁹ DAFI 36-2670, 2020, pp. 149–151.

⁶⁰ DAFI 36-2670, 2020, p. 187.

⁶¹ DAFI 36-2670, 2020, p. 185.

⁶² CFETPs are reviewed and updated by Specialty Training Requirements Teams (STRTs) and Utilization and Training Workshops (U&TWs). UT&Ws occur over several days and typically include representatives from the training schoolhouses and other AETC functions, the CFM, and other senior level career field members (e.g., chiefs) from various MAJCOMs or across the career field. For more, see DAFI 36-2670, 2020.

⁶³ AFI 36-2606, 2019, pp. 27–28.

⁶⁴ AFI 36-2606, 2019, p. 61.

⁶⁵ DAFI 36-2502, *Enlisted Airman Promotion and Demotion Programs*, Secretary of the Air Force, April 16, 2021, Incorporating Change 1, June 17, 2022, p. 26.

⁶⁶ DAFI 36-2502, 2021, p. 29.

⁶⁷ DAFI 36-2502, 2021, pp. 27, 49.

⁶⁸ DAFI 36-2502, 2021, p. 70.

⁶⁹ DAFI 36-2502, 2021, p. 65.

⁷⁰ DAFMAN 36-2806, *Military Awards: Criteria and Procedures*, Secretary of the Air Force, October 27, 2022, Incorporating Change 1, May 23, 2023, pp. 9, 38.

with 2M0X1 (Missile and Space Systems Electronic Maintenance) AFSC is eligible for three awards at the major command (MAJCOM) level and one award at the DAF level.⁷¹

Exit—Separation and Retirement

Airmen may be involuntarily separated if they are disqualified from their current AFSC and do not have retainability or eligibility to retrain into a needed AFSC.⁷² Conversely, airmen holding certain AFSCs may be prevented from separating due to the implementation of stop-loss.⁷³

Regular Air Force members in certain AFSCs who are deemed to be “indispensable” can enlist in the Ready Reserve upon retirement.⁷⁴ In instances when the processing of retirements is restricted, an airman may request a waiver of the restriction. Considerations of these waiver requests must take into account unit and wing manning levels of the airman’s AFSC and explain why approving the request would not adversely affect the unit’s mission.⁷⁵

Summary

The U.S. military has found occupational classifications to be a useful tool for personnel management since World War II. Although details of the USAF enlisted occupational classification structure have been adjusted, most notably in 1993, the most important structural features have remained since the 1950s. Our review of this history and current regulations and policies shows that occupational classifications have been important for numerous aspects of the USAF mission, from recruitment of airmen through the end of their USAF service.

Beyond internal personnel management, the USAF’s occupational classification system enables it to satisfy the public law mandate that DoD be able to provide departing soldiers, sailors, and airmen with certifications of the skills they developed while in the military to assist them in obtaining civilian employment. Thus, as the USAF considers changes to its occupational classification system to increase the flexibility of its management of airmen, it must address the impact of changes on all career phases as well as ensure that it will maintain the ability to comply with the law.

⁷¹ DAF, “Special Trophies and Awards,” webpage, undated.

⁷² DAFI 36-3211, *Military Separations*, Secretary of the Air Force, June 24, 2022, pp. 108–109.

⁷³ Stop-loss refers to the authority of the U.S. President to suspend laws relating to military personnel actions (e.g., separations) if deemed necessary for national security. USC Title 10, Section 12305, Authority of President to Suspend Certain Laws Relating to Promotion, Retirement, and Separation. For the USAF’s policy regarding stop-loss, see DAFI 36-3211, 2022, p. 300.

⁷⁴ Wagner, 2023, p. 51.

⁷⁵ AFI 36-3203, *Service Retirements*, Secretary of the Air Force, February 23, 2021, pp. 19–20.

Current State of Skills Management in the USAF

Before an organization can determine what to “fix” in its skills management system, it needs a baseline of the current skills management system’s strengths and weaknesses. To provide a baseline for the USAF’s enlisted skills management system, we gathered insights and perspectives from USAF stakeholders on whether the skills management system meets the needs of USAF units and USAF efforts to refine and apply skills-based information about airmen. We extracted themes from these insights and perspectives to identify potential strengths, weaknesses, and improvements to the way the USAF manages enlisted skills. In particular, we highlight here issues related to flexibly managing the breadth of enlisted skills, including examples of specific policies, data sources, and processes that might not fully enable flexible skills management.

Approach

To gather insights and perspectives on how the USAF manages enlisted skills, we held semistructured discussions with three groups:

- **System customers:** Thirty-five USAF unit leaders and experts across 22 interviews were asked for their perspectives on the skills and experiences their missions need, how they track and develop those skills and experiences, and whether the current system meets their needs.
- **Assignment teams:** Thirteen members of enlisted assignment teams across different AFSs were asked what processes and factors they use to assign airmen to different positions and the strengths and weaknesses of the assignment process.
- **Process experts:** Twelve experts who have roles in talent management processes (e.g., occupational analysis) from AETC, AFPC, or AF/A1 organizations described the policies and processes for their organization’s missions and offered insights into strengths and weaknesses of those policies or processes, or related processes.

Discussions were held between fall 2022 and spring 2023. Because the specific topics and analytic approach varied by group, we provide more details in Appendix A.

Perceived Strengths

Discussions with system customers suggest that the current occupational structure is sufficient to meet the minimum requirements for the current mission. In general, system customers did not point to

any major skills gaps due to the occupational structure and skills management system. One customer described the system as providing a “basic building block” for entry-level proficiency; that is, the system effectively produces three-level airmen with basic proficiency to perform in their career fields.

To build on this basic level of proficiency, system customers can and do use existing system features to track specialized skills and experiences. In particular, customers in 14 of the system-customer interviews indicated use of SEIs and a few mentioned using prefixes as well. For example, the 821st Contingency Response Group uses SEIs specific to its group and the 509th Medical Group uses SEIs for personnel administering the Personnel Reliability Assessment Program (PRAP), which is used as part of a process to certify personnel to work on nuclear missions.¹ If applied properly, SEIs can be particularly helpful for tracking airmen with experience in rare or unique mission sets, such as contingency response and PRAP.

The current skills management system is also scalable for the enlisted force. The enlisted force is large, and the occupational structure has over 150 specialties and shreds. The traditional assignment process is partially automated, providing initial openings, eligible airmen, and initial matches for the assignment teams to review. In general, this automation reduces the workload of assignment teams relative to a fully manual process.² By comparison, the current way that the TMAP is executed requires manual matching by assignment teams. The additional labor of TMAP limits its scalability for the entire enlisted force.

Overall, discussions with system customers and assignment process owners suggest that the current skills management system meets the USAF’s basic needs for producing junior airmen and efficiently moving them in and out of assignments. However, the current skills management system also has weaknesses that limit its flexibility and utility for managing cross-functional skills and deep technical expertise.

Perceived Weaknesses

System customers, assignment teams, and process experts also pointed to weaknesses with the current way that the USAF manages enlisted skills. Themes about weaknesses varied by participant category because the scope of discussions and perspectives varied by category. For example, assignment teams focused on challenges in making assignments, whereas system customers focused on challenges with validating position requirements and flexibly employing and training airmen. Because participants identified different themes, we grouped them into four topics: (1) defining the demand for airmen skills and experiences; (2) tracking the supply of airmen skills and experiences; (3) matching supply and demand in the assignment system; and (4) filling gaps between supply and demand at the unit level.

¹ See AFI 63-125, *Nuclear Certification Program*, Secretary of the Air Force, January 16, 2020.

² As we will discuss in the section on perceived weaknesses in the assignment system, assignment teams report that they have to manually check results of the automated matching process to remove errors. Manually checking the results limits the efficiency of the automated process in the traditional assignment system.

Defining the Demand

Two themes were associated with challenges in defining the demand: (1) SEIs can be cumbersome to use to define position requirements and (2) occupational information from AETC is at the occupational level, not position or mission level.

System customers and some process experts explained how SEIs can be difficult to use. Billet owners can use SEIs to indicate that certain positions on their manning documents require additional skills and experiences beyond AFSC, skill level (3/5/7/9), and paygrade. However, validating SEI billet requirements takes a lot of effort, especially for large career fields. A wing senior enlisted leader (SEL) explains the issue:

I think some type of way to identify airmen with special skill sets will be cool, but we already struggle using SEIs we have currently. I know some MFMs, for manning point E [positions] every one of those ad[vertisement]s, they [MFMs] have to hand-work. With as large as some of these career fields are, they don't have the ability to handle.

More generally, enlisted billet owners in the USAF are not required to produce position descriptions that outline key duties and the required skills associated with those positions.

As we described in Chapter 2, the USAF has two main programs to provide occupational information, both of which reside within AETC. However, occupational information from these AETC programs is used for career field management purposes, not for defining position requirements. For example, the Occupational Analysis Flight in AETC's Studies and Analysis Squadron develops and fields the occupational analysis surveys by career field. Because these surveys focus on duties and tasks across an entire AFSC or shred, they are used to inform career field training and education requirements, not specific position requirements.³ Similarly, the occupation-specific competency models developed by AETC's Occupational Competencies branch are not tied to specific position requirements but are instead intended to help career field leaders determine which competencies airmen need to be successful in their career fields.

Tracking the Supply

After airmen enter the service, tracking their specific skills becomes increasingly difficult. The current skills management system relies heavily on their AFSCs, shreds, skill level (3/5/7/9), and paygrade as proxies for their levels of skill proficiency. Attempts to get more individualized information about airmen skills are limited at a system-wide level. Our discussions with system

³ There are additional limitations for using the occupational analysis data. Based on our conversations with process experts familiar with how these surveys have been developed and used, task descriptions on the surveys are not standardized across career fields. This limits the ability to compare similar task requirements across career fields. Also, the surveys do not typically include questions about the knowledge, skills, and abilities that airmen would need to perform their tasks. This limits the utility of these data to provide insights for determining what airmen need to perform their jobs. The process experts we interviewed recognize these limitations and are working on implementing standards for survey development and meaningful metrics to increase the utility of the survey data.

customers and process experts resulted in two themes: (1) challenges in using SEIs to track airmen skills and experiences and (2) no official way to track specialized skills unless airmen report them.

In addition to challenges in using SEIs to define position requirements, SEIs have limitations when used to track airmen's prior experiences. Airmen choose which SEIs, if any, to keep in their official records.⁴ Some airmen might not record SEIs to avoid certain types of assignments, as this process expert describes:

Airmen don't want a SEI because that could force them into jobs they don't want. [They will say,] "Don't put that code on me." Airmen with language proficiency will let their proficiency levels drop even though they could get a bonus for maintaining it. They're willing to do that to avoid certain jobs.

Even if airmen want to claim SEIs, the system limits how many they can record at any one time. One system customer even described having his SEIs removed from his records and reentering them to ensure they were correct.⁵

Even if problems with SEIs were to be fixed, SEIs are tied to specific types of positions and imply skill information. For airmen who acquire special skills not tied to specific missions or requirements, the USAF does not have a way to track those special skills unless airmen choose to report that they have them. For example, during our discussions with system customers involved with innovation activities at their wing, we learned of maintenance airmen who are learning how to use 3D printers for added manufacturing. Unless the airmen choose to put in their records that they have learned 3D printing, the official system of record will not have that information. Units might track those specialized skills for their own purposes (e.g., identify training opportunities) but that information does not follow the airmen on to their next assignments. Therefore, emerging skill areas are difficult to identify in official systems of record.

Matching Supply and Demand in the Assignment System

The way that enlisted airmen are assigned to positions rarely accounts for specialized skills or experiences. Assignment team participants stated that special skills are only considered in rare occasions because there are no degrees of freedom left to consider skills after most of the mandated requirements like time on station or retainability are met. They also explained that the USAF's budget to move personnel and their families (i.e., the PCA budget) also constrains their ability to consider specialized skills when making matches.

⁴ Per the *AFECD*, airmen are awarded SEIs if they meet the experience and training requirements of a position that has been designated with a SEI on the unit manning documents (UMDs). See AFPC, 2023, p. 394.

⁵ USAF classification policy in AFMAN 36-2100, 2021, indicates that SEIs do not automatically get removed from airmen's official records in MilPDS and there is no defined limit on the number of SEIs that an airman can have. However, airmen do not see their full records in MilPDS. Instead, they view a snapshot of their records in what is known as a Single Unit Retrieval Form (SURF) that comes from the Assignment Management System. The information in a SURF might not provide the full list of SEIs in an airman's record and it might be subject to system errors because the information is derived from the Assignment Management System, which draws on MilPDS. For information about the Assignment Management System, see AFPC, "Assignments: Assignment Management System," webpage, undated.

Even when special skills are considered, they are usually limited to SEIs or shreds associated with manning requirements in the traditional assignment process.⁶ For TMAP, use of special skills that are not reflected in SEIs or shreds require manual review and vetting. A reason for this manual review is that MilPDS, which is the official personnel system of record, restricts the type and format of information that can be recorded.⁷ The TMAP teams have to contact both the billet owner to confirm the special requirement and the airmen who volunteered for the position to confirm whether they have the special skills listed in the advertised position.

In general, the enlisted assignment system is constrained by non-skill-based requirements, a limited PCA budget, and inflexibilities tied to official systems of record (e.g., MilPDS). A system customer describes the assignment system problems this way:

When we find individuals with extra skill sets, our system has not evolved fast enough to identify them. Our assignment system is not built off of using our talent. It's built off of the lowest level and I can plug you in that spot. We are beholden to an old methodology of structure that is not moving fast.

Filling Gaps Between Supply and Demand at the Unit Level

Some system customers identified challenges in filling gaps between what they need and what the assignment system provides. We identified two themes associated with challenges in filling gaps: (1) cross-functional utilization of airmen and (2) training for unique missions or when career fields change.

System customers pointed to limitations in utilizing airmen for cross-functional missions, such as contingency response, or across different mission design series when it comes to maintenance career fields. System customers point to CFMs and MFM as gatekeepers. For example, one system customer cited a case where a dental technician, who had training to use X-rays on the head, was not given permission by a CFM to take X-rays outside the head when a radiological technician was not available. Another system customer noted that, even when airmen manage to be assigned to unique missions, those airmen can face career advancement restrictions because they deviated from the traditional career path. The system customer described it this way:

We're having people work outside the career field, but the career field limits them later on [when they vector assignments], even though they say they value outside career field experience. It's frowned upon to leave. Career field won't give a vector if you left.

A few system customers also mentioned that their units face a training burden when their mission areas require cross-functional knowledge and skills. For example, one of the cyber units has developed a course to train intelligence personnel about the cyber domain and their wing's cyber weapon system.

⁶ Per DAFI 36-2110, 2021, p. 115, assignment teams can only use SEIs coded to positions. If teams want to use SEIs not coded to positions, they must receive approval from the AFPC assignment branch chief.

⁷ During our interview with representatives involved with TMAP, we also learned that the Talent Marketplace platform is not designed to allow its data to enter directly into MilPDS. Assignment teams therefore have to export Talent Marketplace data, adjust the formats, and enter them into MilPDS. Talent Marketplace also lacks back-end capabilities to allow for analysis of trends of special skills that would not appear in MilPDS.

Representatives familiar with this training argued that, while there will always be a need for units to fill training gaps, the USAF could do more to give intelligence personnel (1N) training on the cyber domain before they are assigned to cyber missions.

Another system customer raised the challenge of units having to scramble to provide training when a career field undergoes a major change, such as consolidation. This participant spoke to the challenges for the recent Avionics AFSC consolidation: “There’s no course built for Avionics personnel. They’ll show up to the new base and get an AFSC for something they didn’t go to school for. Right now, the [Avionics] tech school does not have curriculum to get us through.” This concern was echoed by a few other system customers from maintenance units. One cited the USAF’s previous maintenance consolidation effort in the 1980s and 1990s known as Rivet Workforce as a case where manning and training implications of AFSC consolidation were not fully addressed prior to consolidation.⁸

Suggested Improvements

We asked system customers if they would suggest changes or improvements to the current USAF skills management system. We highlight themes from these discussions but note that not all participants suggested changes and not all weaknesses described in the previous section are addressed. We describe four suggested improvements: (1) consolidating specialties but only after manning and training considerations are addressed, (2) providing more cross-functional training and utilization, (3) improving how skills are tracked and assignments are matched, and (4) increasing the adaptability of the training enterprise.⁹

More Specialty Consolidation but Only After Manning and Training Considerations Are Addressed

Several, but not all, system customers indicated that the enlisted classification system should be made more flexible. Some of these customers suggested specialty consolidation would be one way to improve the system. They noted benefits of having more flexible utilization of airmen for operations, such as for ACE. For example, participants from an operations group cited examples of operations (1X) career fields that could be consolidated (e.g., Airfield Management [1C7] and Radar, Airfield, & Weather Systems [RAWS, 1C8]) to allow work sections to take on duties that they are not allowed to complete now because those duties are part of other specialties’ requirements. A system customer in favor of consolidation puts it this way: “We’re not responsive enough to the operational needs. We need a Swiss Army Knife, not an exquisitely trained [airman] only on this air system.”¹⁰

⁸ For more information about lessons learned from Rivet Workforce, see Anna Jean Wirth, Thomas Light, Daniel M. Romano, Shane Tierney, Ronald G. McGarvey, Moon Kim, Michael J. Lostumbo, Amanda Nguyen, Paul Emslie, and John G. Drew, *Evaluating Alternative Maintenance Manpower Force Structure Concepts for the F-35A*, RAND, RR-4433-AF, 2020.

⁹ Assignment teams were also asked for suggested improvements to the assignment system, which are described in the section on skills tracking and assignment matching.

¹⁰ One system customer also suggested that consolidation would reduce the number of functional managers (MFMs, CFMs), which would mean fewer gatekeepers who can limit flexible utilization of airmen.

However, some system customers shared concerns about too much consolidation. The main concerns seemed to focus on consolidation without adequate preparation for training changes and manning consequences. A related concern was about the technology and infrastructure not being in place to support additional duties that would come from consolidation. This participant describes it as follows:

They basically want an airman to do everything, and I don't think that's a practical approach; you can only move as fast as technology improves. One day, we'll have a cellphone that's literally everything, and at that point, it'll make sense for an airman to do it all, but we have different systems for everything [right now].

The split between system customers in favor of more consolidation from those concerned about consolidation suggests the need to proceed with caution when consolidating—namely, to prepare for what airmen will need postconsolidation (e.g., different or additional types of training).

More Cross-Functional Training and Utilization

A few system customers specifically mentioned the need for the system to allow for more cross-functional (i.e., cross-AFS) training and utilization. Those who cited cross-functional utilization tended not to advocate for consolidation or specialization, but for a balance of the two. They also tended to reference ACE and the MCA concept, citing the need for airmen to learn additional skills, such as small unit tactics, in order to operate in contested environments and on small teams.

However, this participant noted that cross-functional utilization could be met with resistance by airmen:

I think the MCA needs to stay within career fields. You can't expect a Services [AFSC] airman to go to an aircraft job . . . once you step outside of the squadron is where you will get resistance. Like, Services airmen driving forklifts, which is a LRS [logistics readiness squadron] job. But it impacts our job and allows us to move our own equipment. It's both: we can sell it that way to our airman. But we're not going to say, "Go learn forklift so they [LRS] can use you if they need." We won't tell it to them like that.

Concerns about cultural resistance to MCA were also raised in a recent RAND study on MCA, which suggests that the USAF would need to provide airmen with additional clarification on MCA and its implications for cross-functionality.¹¹

Better Skills Tracking and Assignments Matching Process

Another theme from our interviews with system customers involved the need for better assignment policies and processes. One suggestion made was to have longer assignments, particularly for those

¹¹ See Shawn Cochran, Kirsten M. Keller, Mark Toukan, Maria C. Lytell, Matt Walsh, Andrea Abler, Isabelle Winston, Ryan Stallsworth, and Ryan Thulin, *The Forces We Need: Building Multi-Capable Airmen to Enable Agile Combat Employment*, RAND, RR-A1746-1, 2023. As noted earlier in this report, DAF leadership announced the concept of MRA in February 2024. As of March 2024, DAF leadership has not yet announced whether the MRA concept replaces the MCA concept, or if MCA still exists, how MCA will be defined in relation to MRA.

that require high levels of specialization (e.g., such as for PRAP in the 509th Medical Group). Another suggestion was for the USAF to make better use of SEIs and other skill and experience information to make assignment decisions. A system customer noted that the DAF is on the right track with the Talent Marketplace concept.

Discussions with assignment teams noted that two factors would need to be addressed to improve assignment matching based on skills: (1) reduce reliance on retainability, time on station, and PCA budget; and (2) improve data and systems used in making assignments. For the first point, the assignment teams argued that they are constrained from considering skills for assignment matching when factors like time on station take precedence and PCA budgets are limited. Although assignment team participants stated that they have requested waivers to policy to get more flexibility on some of these mandatory factors, there is no pattern to when waivers are granted. A more permanent change to policy would be needed to address these issues.¹²

For the second point, assignment teams noted that there is not much they can do beyond manual reviews of skill requirements until the data and systems are improved. These participants suggested that data systems and platforms (e.g., Talent Marketplace and MilPDS) need to connect with each other to share information directly; be able to integrate more information about airmen skills and position requirements; and have capabilities to update information automatically.

More Adaptive Training Enterprise

A few system customers suggested that the USAF training enterprise needs to be more adaptive to meet their needs. For example, participants from the 688th Wing noted that Air Combat Command decided to establish a squadron to provide gap training on their cyber weapon systems. As the participant put it: “The fact that the squadron exists is an indictment on the training enterprise. If it was dynamic enough and capable enough, we wouldn’t need it [the squadron] to meet needs.” Thus, some system customers felt that the units would not have to create as much training as they currently do if the USAF had a more responsive training system.¹³

¹² One policy change would be to allow assignment teams to use SEIs not tied to manning requirements without needing a waiver, per DAFI 36-2110, 2021. However, this change alone would not relieve constraints associated with mandatory factors like retainability. Air Force leadership has been exploring ways to increase the flexibility of the enlisted assignment system. For example, senior master sergeants and below can now apply to swap their assignments with other airmen. However, airmen can only swap assignments if they have the same AFSC, skill level, grade, SEI (if required), vector (if required), and security clearance (if required). The program was set to go into effect on June 1, 2023. See Secretary of the Air Force Public Affairs, “Air Force’s Enlisted Swap Assignment Program Starts June 1,” webpage, May 25, 2023.

¹³ Another example of where units take the lead in addressing training needs is the Master Technician program at 3rd Maintenance Group at Joint Base Elmendorf-Richardson in Alaska. The program provides seven-level maintenance airmen who have high levels of performance the opportunity to learn skills in another maintenance specialty and achieve recognition as master technicians. Based on our discussions with program representatives, the program has two main goals. One goal is to improve combat capability by developing airmen with multi-AFSC qualifications. The other goal is to retain high-performing maintenance airmen by giving them the opportunity to expand their technical skill set and receive recognition among peers as masters in their tradecraft.

Summary

Our discussions with system customers, assignment teams, and process experts suggest that the current occupational structure is working well enough to meet minimum requirements for mission effectiveness. Additional points emphasized that the current system is optimized for meeting initial skills training and manning requirements for junior enlisted personnel across the enterprise. Any efforts to leverage differences in skill profiles or proficiency among enlisted personnel are most likely to produce benefits among more experienced personnel (e.g., E-6 and above). However, the current infrastructure in the USAF is not designed to track the information necessary to adopt more advanced talent management practices. That is, there is limited information captured about position requirements and airmen skills beyond their AFSC, skill level, and SEIs. There is no centralized system for capturing unique skills outside of an AFSC, which limits enterprise-wide insights (e.g., how many airmen have skills programming in Python).

These challenges are not unique to the USAF. Civilian organizations face similar challenges, which has led to the adoption of artificial intelligence (AI) and related machine-learning technologies to improve skill tracking and talent management more broadly. (See Appendix B for more details.) In the next chapter, we demonstrate how AI in the form of sentence transformer models (STMs) could be applied by the USAF to gain insights on the similarities and differences between enlisted occupational specialties. This application reflects one of many areas where modern technology can be applied to improve talent management in the USAF.¹⁴

¹⁴ David Schulker, Nelson Lim, Luke J. Matthews, Geoffrey E. Grimm, Anthony Lawrence, and Perry Shameem Firoz, *Can Artificial Intelligence Help Improve Air Force Talent Management? An Exploratory Application*, RAND, RR-A812-1, 2021; Peter Schirmer, Amber Jaycocks, Sean Mann, William Marcellino, Luke J. Matthews, John David Parsons, and David Schulker, *Natural Language Processing: Security- and Defense-Related Lessons Learned*, RAND, PE-A926-1, July 2021.

Demonstrating Natural Language Processing to Enable Modern Skills Management

As described in Chapter 3, organizations including the USAF are looking to modern approaches for skills-based talent management to identify skill demands, track supply, and ensure talent is used effectively to meet current and emerging requirements (see Appendix B for additional discussion). According to a McKinsey reskilling survey of organizations, “Fewer than half of respondents say their organizations have a clear sense of their current skills.”¹ Even technologically advanced organizations such as NASA have raised similar concerns when trying to identify who has specific skill sets:

One of the biggest challenges has been to identify where our data science skills are within NASA. It’s not a terminology or an occupation that’s been labelled data science within the government. It’s still something that’s in development to have a work role or an occupation of ‘data science’. . . There’s a wide range of things that we do within NASA. So we have a wide range of data sets and skill sets that we need to identify and make sure that we have the right people in the right place.²

To address these challenges, organizations have invested resources to leverage AI and other machine learning technologies as part of a more robust infrastructure to enable skills management. Touted as helping with a wide range of talent management issues, AI is described as improving efficiency and quality of personnel decisions, producing better and faster matching of skills to jobs, and providing employees with more self-service options.³ The key differences between the new technology and past approaches to skills management are the increased emphasis on the use of machine algorithms to make decisions and produce solutions and the increased complexity and sophistication of those algorithms.

Organizations are generally using the term AI loosely to refer to any computer-based tool that helps automate talent management decisions. This includes the use of *machine learning*, where preexisting information about decisions is used to train a computer program to make similar decisions when it is given new information. NLP models are included under the umbrella of AI, as are other types of complex predictive modeling programs. These AI programs can be trained to help screen résumés or extract information from work histories, for example. The programs can also potentially be used to extract information about jobs from job descriptions, task inventories, job training guides, or other existing materials. The extracted information can then be used to help match people’s skills to

¹ McKinsey & Company, “Beyond Hiring: How Companies Are Reskilling to Address Talent Gaps,” 2020, p. 4.

² Mark Samuels, “NASA Is Using Data Science to Fill Its Data Science Skills Gap,” ZDNet, June 29, 2021.

³ See, for example, IBM, “IBM Talent Business Uses AI to Rethink the Modern Workforce,” webpage, November 28, 2018.

jobs or even specific project requirements. They can also potentially be used to help identify commonalities across jobs for purposes of merging occupations or allowing for job sharing or rotation.

Advances in computer technology are also increasingly being incorporated into skills management in more straightforward or simplistic ways. For example, organizations are seeking ways to use automation to simplify and improve the process of searching, retrieving, matching, and posting of skill and job information within their organizations. Organizations now gather a wealth of information about their personnel and about the jobs that they hold. In the past, much of this information has been disconnected, residing in databases that are not accessible to decisionmakers or not connected across platforms.

As one example on how AI and machine learning have been used to improve skills management, NASA developed a skills-centered database using NLP and knowledge graphs to infer skills of employees based on the positions they hold. This approach can be used to identify similarities between employees and determine which skills they may need to develop before moving to another position. Although the model has high potential to help cross-agency comparisons, the model outputs need to be validated by subject-matter experts familiar with the target positions and employees to evaluate the accuracy of the extracted skills. In the next several sections, we extend the concept used by NASA to USAF enlisted occupational specialties. We begin with an introduction to the potential benefits and limitations of STMs. STMs are related to but different than large language models such as GPT-4 (e.g., ChatGPT), which are designed to generate human-like text. Both types of models are based on a type of deep learning model known as a transformer.

Overview of Skill Matching Using Sentence Transformer Models

Identifying relevant skills (or competency models) is a time-consuming task, typically conducted manually through job observation, reviews of job documentation, interviews, and surveys of skill requirements. Recent advances in language modeling hold promise for economizing on this analytical work. More specifically, sentence embeddings, a type of NLP, are numerical representations of words that facilitate analysis of similarity between different bodies of text. Embeddings represent words as numerical vectors, which allow analysts to perform operations on texts that typical character representations of words do not allow. These vectors capture the contextual meaning of words and sentences and analysts can use them to identify the degree of similarity between two texts by comparing vectors.⁴

For example, the word “maintenance” might have similar embedding vectors across two texts where it is used in the first text in the context of vehicle maintenance and in the second text in the context of aircraft maintenance. In contrast, its embedding vector in a third text where it is used in the context of physical fitness would be dissimilar from its vectors from the first two texts. By representing entire texts as word embeddings, you can compare texts by performing functions on the embeddings they contain (e.g., by comparing averages of embeddings across texts).

Following are three alternatives to STMs that can be used to develop insights from text:

⁴ Similar vectors point in similar directions and are of similar magnitude. Mathematical functions can be used to characterize vector similarity.

- **Direct text matching:** This is a naïve approach that identifies matches based on texts sharing the same text strings (e.g., if a competency model specifies “aircraft maintenance” as a core competency, matches in a skill database would need to contain the exact phrase). This approach is unable to account for synonyms, variations in word usage, or the broader context of the texts in which words occur.
- **Stem matching:** This method uses NLP techniques to reduce words to their stems before matching. For example, “aircraft maintenance” might be stemmed, depending on the algorithm used, to “air” and “maintain.”⁵ This approach can capture variation in word usage across texts but does not capture the context in which words are used or account for many synonyms (e.g., “jet maintainer”).
- **Partial or fuzzy string matching:** These methods can create scores of text similarity using parts of strings. For example, one approach might be to produce a similarity score for “aircraft maintainer” and “aircraft maintenance” based on the number of edits required to make the two strings match exactly.

Of all these approaches, STMs are the only ones that consider context and can handle synonyms, including colloquialisms, and multiple word meanings (polysemy). For example, an STM might recognize “fast-jet maintenance” and “fighter aircraft mx” as being closely related, while none of the above methods would return a close match.

There are distinct limitations of STMs, however. First, they can be computationally expensive for very large tasks. Second, they reflect the patterns, including biases and data-quality issues, of the text data on which they are trained. They are therefore prone to replicating the shortfalls of the data used to produce them. Third, as an unsupervised learning model, STMs are inherently imperfect, sometimes producing embeddings that suggest similarity of meaning and context where there is a weak relationship between texts. In contrast, a supervised learning model is trained to predict the “right” answer, which would require a training dataset of text or task statements that are labeled by subject-matter experts as a “match” or “no match.” Although embedding models can integrate supervised learning as a method of fine-tuning, we focus on pretrained, unsupervised STMs as a first step toward understanding the similarities between occupational specialty tasks and skills.

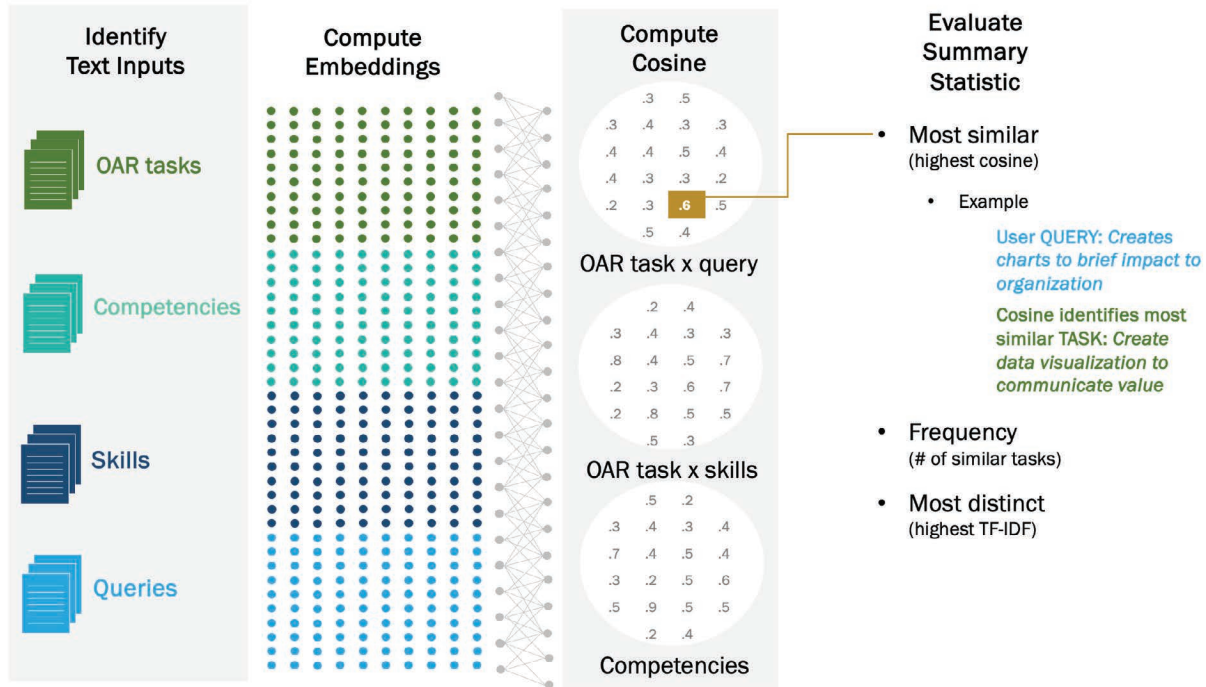
STMs and USAF Data: A Demonstration

In the following sections, we explore the potential uses of STMs to provide insights about enlisted occupational specialties. Specifically, we present an approach for inferring and comparing skills for a sample of AFSCs using STM embeddings (using all-MiniLM-L6-v2 STM)⁶ and an open-access skills library. The general approach for these analyses is illustrated in four main steps (Figure 4.1).

⁵ For an overview of stemming algorithms, see Anjali Ganesh Jivani, “A Comparative Study of Stemming Algorithms,” *International Journal of Computer Application in Technology*, Vol. 2, No. 6, 2011.

⁶ Nils Reimers and Iryna Gurevych, “Sentence-BERT: Sentence Embeddings Using Siamese BERT-Networks,” *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing*, Association for Computational Linguistics, November 2019.

Figure 4.1. Steps for Using STMs to Provide Insights into Enlisted Occupational Specialties



NOTE: TF-IDF stands for “term frequency–inverse document frequency.” It is a numerical statistic that is used to evaluate the importance of text in a document or a corpus of documents. The term frequency (TF) component of the statistic measures how frequently text appears in a document. The more often the text appears in a document, the higher its TF score will be. The inverse document frequency (IDF) component of the statistic measures how rare or unique the text is across all documents in a corpus. Texts that are common across all documents will have a lower IDF score, while texts that are unique to a specific document will have a higher IDF score. The TF-IDF score is calculated by multiplying the TF score by the IDF score. This results in a score that reflects how important a text is to a specific document, relative to its importance in the entire corpus. Texts with high TF-IDF scores are considered to be more important or unique to a specific document, while texts with low TF-IDF scores are considered to be less important or common across all documents.

In the first step, we identified the relevant texts for comparison. In Step 2, we computed STM embeddings for the target text inputs. These embeddings form the basis for the third step, which computes the cosine similarities between the numerical representations of two different sets of text.⁷ In the final step, summary statistics can be used to evaluate different policy questions, such as which occupational specialties have the most overlap in task requirements. In the remainder of this chapter, we present specific examples of how this workflow was applied to address different questions. For each example, we focus on the policy question and output, with specific steps and filters detailed in footnotes.

⁷ Cosine similarity refers to the size of the cosine of the angle between two vectors of text. It is a common measure used to determine how semantically similar two texts are to each other independent of their size. Values range from -1 to 1, with 1 indicating a perfect match and 0 indicating there is no relationship.

To demonstrate this process, we used data from USAF OARs and created sample task queries to return a list of occupational specialties and corresponding tasks that best match each query. These types of analyses can help determine personnel across the DAF who may be best suited to perform a task or set of tasks (i.e., skill breadth).

For example, the first query we created was “Inspect anti-ice system components” (Table 4.1).⁸ This query was perfectly matched to a task performed by personnel in the Aerospace Propulsion AFSC and almost perfectly matched to a task performed by Remotely Piloted Aircraft (RPA) Maintenance personnel. Generally, higher cosine thresholds indicate greater task similarity. That is,

Table 4.1. Examples of Tasks and AFSCs Matched to a Query

Query	Matching Task	AFSC	Cosine Similarity
Inspect anti-ice system components	Inspect anti-ice system components	Aerospace Propulsion (2A6X1H)	1.00
	Inspect anti-ice systems or components	RPA Maintenance (2A3X8)	0.98
	Inspect anti-ice or de-ice system components, other than non-electrostatic application anti-ice system components	Aircraft Electrical & Environmental Sys (2A6X6)	0.93
	Inspect anti-ice or deice systems	Aerospace Maintenance Apprentice (2A5X1)	0.90
	Inspect anti-ice or deice systems	Refuel and Bomber Aircraft Maintenance (2A5X4)	0.90
	Operationally check anti-ice or de-ice systems	Flight Engineer (1A1X1)	0.83
Inspect engine compressors	Inspect engine compressors	Aerospace Propulsion (2A6X1H)	1.00
	Inspect gas turbine compressors	Aerospace Maintenance (2A5X1)	0.92
	Inspect air compressors or hoses	Water and Fuel Systems Maintenance (3E4X1)	0.87
	Inspect or clean air compressors	Electric Power Production (3E0X2)	0.84
	Inspect shaft driven compressor components	Aircraft Electrical & Environmental Sys (2A6X6)	0.82
	Inspect instrument air compressor components	Missile Facility Manager (8S000)	0.81
	Monitor engine compressor section operations	Flight Engineer (1A1X1)	0.81
Troubleshoot engine systems	Troubleshoot engines	Tactical Aircraft Maintenance (2A3X7)	0.91
	Troubleshoot engines	Helicopter/Tiltrotor Maintenance (2A5X2)	0.91
	Troubleshoot engine components	RPA Maintenance (2A3X8)	0.84
	Troubleshoot engine malfunctions	Refuel and Bomber Aircraft Maintenance (2A5X4)	0.83
	Troubleshoot engine malfunctions	Aerospace Maintenance (2A5X1)	0.83

⁸ After computing the cosine similarity between each query and all AFSC tasks, we filtered to the top matching task for each AFSC. We limited the output in this table to the top five AFSC-task matches for each query.

the higher the cosine similarity, the more closely the tasks are likely to match in terms of meaning (i.e., semantic similarity).

As demonstrated in Table 4.1, cosine similarities using sentence transformer embeddings can effectively support the identification of AFSCs performing similar tasks. Although higher cosines indicate better matches, there is no established threshold for what determines an accurate match. Depending on the purpose of the matching, a higher or lower threshold may be desired. For example, a higher threshold may be needed when trying to select airmen from a different AFSC who can perform the same task. Alternatively, if there was a need to identify airmen with a background performing related tasks for retraining, a lower threshold may be desired to allow for more matches. In the following analyses, we use lower cosine thresholds to match potential skills to tasks. When evaluating the right threshold to select, it is important to review tasks near the threshold to determine if the outputs are informative to the question of interest. That is, subject-matter experts should review skills that are inferred for a range of cosines to help inform the most appropriate threshold. Furthermore, these subject-matter experts should review the final outputs generated using embeddings and cosine similarity to ensure the results are meaningful and accurately reflect the skills required. Considering these points, we emphasize that the following analyses are exploratory and meant to demonstrate the potential benefits of STMs to augment and support human decisionmaking.

Skill Matching Analyses

In the following sections, we present analyses demonstrating how STMs could be used to infer possible skill or experience requirements and to compare the similarity among AFSCs. Similar approaches exploring task similarities have been used to determine how related different occupations are to each other.⁹ We extend this concept by matching tasks to skill labels for seven target AFSCs, which have the most complete occupational requirements data (i.e., an OCM¹⁰ and an OAR):

- Safety (1S0X1)
- Aerospace Ground Equipment (2A6X2)
- Logistics Plans (2G0X1)
- Heating, Ventilation, Air Conditioning, and Refrigeration (3E1X1)
- Education and Training (3F2X1)
- Bioenvironmental Engineering (4B0X1)
- Religious Affairs (5R0X1).

Our Approach

Using occupational data from the seven target AFSCs, we explored five questions addressing depth of skills (Q1 and Q2), breadth of skills (Q3 and Q4), and linking organizational functions (Q5). These questions were selected to demonstrate the range of capabilities that can be gained using these

⁹ Jeffrey A. Dahlke, Dan J. Putka, Ori Shewach, and Phil Lewis, "Developing Related Occupations for the O*NET Program," National Center for O*NET Development, April 2022.

¹⁰ Although occupational competency models had only been completed for a small number of enlisted occupational specialties at the time this report was drafted, the USAF has implemented plans to expand efforts to complete models for all specialties.

types of models for skills management. We discuss the relevance of these questions for informing policy in subsequent sections where we also provide results.

- Q1. What are the most frequently inferred skills for an AFSC?
- Q2. Which skills are most unique among the target AFSCs?
- Q3. What frequently occurring skills are shared across the target AFSCs?
- Q4. Which AFSCs are performing tasks needing a specific skill type?
- Q5. How well do STMs extract skills related to existing USAF competency models?

To address these questions, we needed to identify a set of skills that could be embedded using the same STM that we used to embed the OAR tasks. Because USAF does not have a centralized database of skills (see Chapter 3), we reviewed publicly available options to include O*NET and Lightcast (formerly Burning Glass).¹¹ O*NET provides a well-structured taxonomy of knowledge, skills, and abilities but may lack the specificity needed to describe similarities and differences between enlisted Air Force occupational specialties. Therefore, we decided to use the skills available from Lightcast, which consisted of 33,400 skills at the time we downloaded from their application programming interface (API). These skills are regularly updated and form the basis for in-demand (hot) technologies reported by O*NET.¹² Following a similar set of steps as described for the demonstration, we embedded the skills using the same STM and then computed cosine similarities between each OAR task ($n = 66,308$) and each Lightcast skill ($n = 33,040$), which yielded a total of almost 2 billion task-to-skill comparisons ($n = 1,992,576,320$ cosines). For each question, we focus on possible insights generated by comparisons followed by a table or figure to illustrate how AFSCs, tasks, and skills are connected to each other.

An important consideration of STM skill inference is an assumption that performing a task implies some amount of skill. Furthermore, inferring skills from tasks does not provide any information on the amount of skill gained by performing the task. Therefore, the approaches we present should be viewed as a first step for identifying possible skill demands and supply across the USAF. Additional assessments and sources of information (e.g., supervisor evaluations) will be needed to evaluate differences between airmen who occupy the same AFSC and position.

Finally, the types of skills inferred are limited to those that have similar context embedding. Therefore, these models may be deficient in inferring skills that do not share common text or meaning with the task statements. As a hypothetical example, problem-solving may be required to design and implement a water filtration system in a forward operating base. However, problem-solving for this task statement is not identified as a strong match as the cosine similarity score is very low (0.05). In contrast, the skills *water treatment* and *water purification* share common text and context and are identified more likely as relevant skills indicated by a much higher cosines (0.47 and 0.53).

¹¹ O*NET stands for the Occupational Information Network and is sponsored by the U.S. Department of Labor. The O*NET database provides standardized information about occupations across the U.S. economy. For more information, see O*NET Resource Center, "About O*NET," webpage, undated. Formerly known as Emsi Burning Glass, Lightcast is a U.S.-based company that sources and analyzes big data on the labor market. Lightcast crowdsources labor market data from online sources (e.g., job posting websites) and employs data engineers and taxonomy personnel to maintain an occupational skills library. For more information about this library, see Lightcast, "Lightcast Open Skills Taxonomy," webpage, undated.

¹² Phil Lewis and Jeremiah Morris, *Hot Technologies and In Demand Technology Skills Within the O*NET System*, National Center for O*NET Development, November 2022.

Exploring the Depth of Skills

The first two questions, Q1 and Q2, can be used to inform insights about the depth and uniqueness of skills provided by an AFSC and to guide decisions about how personnel from a specific AFSC are assigned and utilized. If a skill is linked to many tasks for an AFSC, we can infer that airmen are more likely to possess that skill. Consequently, the USAF could use this information to develop career paths, inform assignment decisions, and evaluate where there may be possible skill gaps or skill atrophy (e.g., skill not utilized in a specific position). It is important to note that insights made using these data assume that tasks in position descriptions and OARs are accurate and reflect work performed by those airmen.

Q1. What are the most frequently inferred skills for an AFSC?

To identify frequent skills in each AFSC, we used a cosine threshold of 0.65, then extracted skills with the highest cosine for each task, and finally counted the total number of skills occurring within each AFSC.¹³ We present the most frequent skills for Safety (1S0X1) in Table 4.2.

Table 4.2. Most Frequent Skills Inferred from Safety (1S0X1) Tasks

Skill	Number of Tasks Requiring Skill	Example Task	Cosine
Safety Training	26	Evaluate safety training for personnel other than supervisors	0.81
Facility Inspection	21	Perform safety spot inspections	0.70
Basic Safety Training	17	Conduct unit safety representative training	0.74
Safety Standards	15	Develop safety checklists	0.73
Safety Trained Supervision	14	Conduct supervisor safety training	0.82

NOTE: Skills are extracted from Lightcast's skills library, and tasks are extracted from the USAF OARs.

Q2. Which skills are most unique among the target AFSCs?

To address this question, we focused on skills that were inferred for an AFSC at least five times to highlight the most unique but common skills for each AFSC.¹⁴ The most unique skills for each AFSC are presented in Table 4.3. The higher the TF-IDF, the more likely that skill is relevant and unique to a specific AFSC. The highest TF-IDF among the target AFSCs was Certified Chaplain, which was matched to 15 tasks for Religious Affairs (5R0X1). For other AFSCs, the TF-IDF was relatively

¹³ Other thresholds should be explored to ensure that extracted skills and tasks are accurately matched. Setting a higher threshold may be needed to reduce irrelevant matches. In contrast a lower threshold may be needed to ensure that tasks relevant to a skill are being matched.

¹⁴ After computing cosines between tasks and skills, we filtered the data using a cosine threshold of 0.50, then counted the number of occurrences for each skill and the number of skills for each AFSC. Next, we calculated the TF-IDF score for each skill matched to each AFSC. Finally, we used the TF-IDF score to select the most unique skills for each target, and selected the final set of skills that were matched to tasks at least five times.

Table 4.3. Most Unique Skills Matched to Target AFSCs

AFSC	Skill	N	TF	IDF	TF-IDF
Safety (1S0X1)	Safety Training	25	0.037	1.922	0.071
	Basic Safety Training	18	0.027	2.615	0.070
	Safety Trained Supervision	15	0.022	2.615	0.058
	Safety Standards	9	0.013	1.979	0.026
	Confined Spaces Regulations	6	0.009	2.866	0.025
Aerospace Ground Equipment (2A6X2)	Hydraulic Testing	8	0.024	1.378	0.032
Logistics Plans (2G0X1)	Military Logistics	7	0.041	1.554	0.063
Heating, Ventilation, Air Conditioning, and Refrigeration (3E1X1)	HVAC Controls	14	0.022	4.119	0.089
	Heating Systems	17	0.026	2.510	0.066
	Water Heaters	13	0.020	3.020	0.061
	Boilers	8	0.012	4.812	0.060
	Evaporative Cooler	8	0.012	4.812	0.060
Education and Training (3F2X1)	Instructional Design	14	0.017	3.714	0.064
	Career Development	7	0.009	3.020	0.026
	Test Management	6	0.007	2.866	0.021
Bioenvironmental Engineering (4B0X1)	Air Sampling	12	0.014	3.426	0.048
	Occupational Health	11	0.013	3.714	0.048
	Chemical Hazards	12	0.014	3.020	0.042
	Ionizing Radiation	7	0.008	4.812	0.039
	Water Quality Studies	9	0.010	3.714	0.039
Religious Affairs (5R0X1)	Certified Chaplain	15	0.044	4.119	0.181
	Memorandum of Understanding	5	0.015	2.414	0.035

NOTE: N indicates the number of times the skill was inferred from each OAR.

lower but may have been linked to an even higher number of tasks. For example, Safety Training was matched to 25 tasks, but the TF-IDF was somewhat lower compared with the Certified Chaplain example. This lower TF-IDF and high TF suggests that Safety Training may not be entirely unique to the Safety (1S0X1) specialty.¹⁵ Overall, the skills identified as most unique (high TF-IDF) to each AFSC appear to have face validity and on the surface make sense. For example, HVAC Controls matches and is more specific for the Heating, Ventilation, Air Conditioning, and Refrigeration (3E1X1) enlisted specialty. This type of analysis could help the USAF to plan decisions about

¹⁵ We included all the AFSCs in our dataset and not just the target AFSCs to ensure we generated a more accurate TF-IDF and comparisons of skill relevance and uniqueness.

workforce structure, potential consolidation among AFSCs, and plan cross-functional training to ensure the right skills are available when needed.

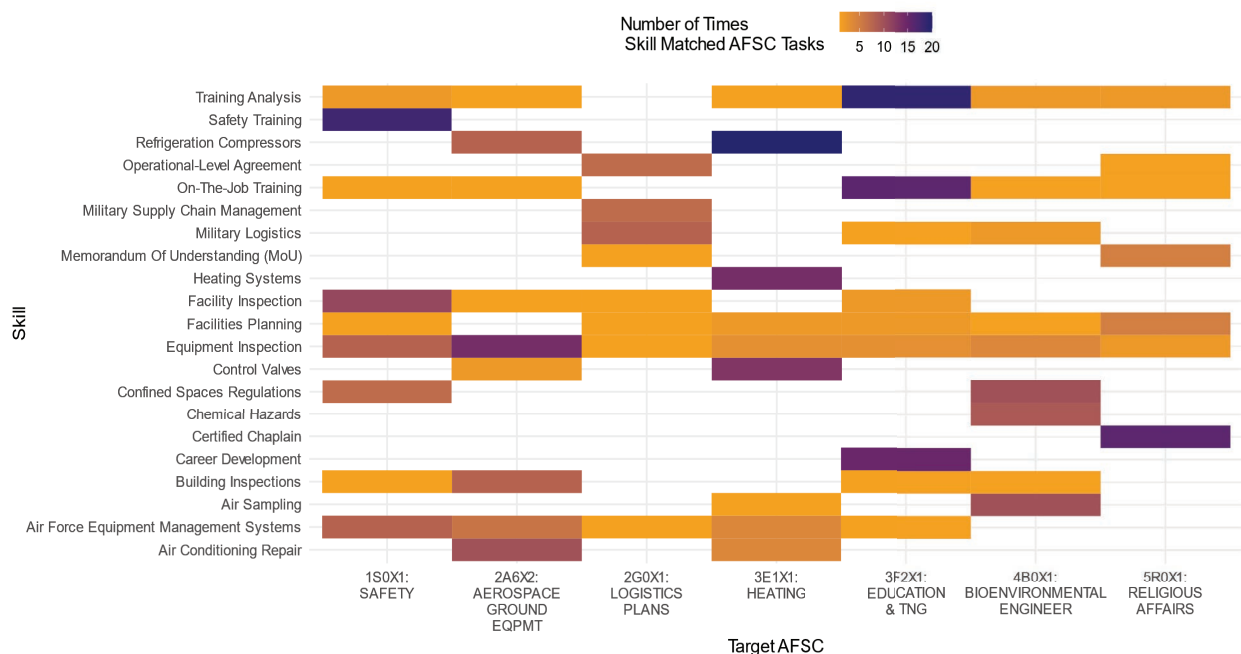
Exploring the Breadth of Skills

The next two questions, Q3 and Q4, focus on creating insights that can inform decisions about the breadth of skills across multiple AFSCs, which can be used to guide policies about cross-training, consolidation, and team composition. More specifically, Q3 provides an example of steps that can be used to determine which skills are potentially shared across multiple AFSCs and how frequently that skill is matched to an AFSC compared with other AFSCs. This type of analysis can help the USAF training efforts by assigning airmen who may have basic proficiency for a skill to a position that provides multiple opportunities to use and further develop that skill. In Q4, we extend this concept to show how the USAF can search for broader categories of skills (e.g., Data Management), which could be used to develop training programs that apply to multiple AFSCs or to guide insights about which skills might be retained or lost if AFSCs were consolidated.

Q3. What frequently occurring skills are shared across the target AFSCs?

To address this question, we focused on the most frequently inferred skills for each AFSC and then compared the frequency of those “top” skills for each target AFSC.¹⁶ The heatmap in Figure 4.2

Figure 4.2. Comparison of Skills from Each Target AFSC



NOTE: EQPMT stands for Equipment and TNG stands for Training.

¹⁶ After extracting the skill with the highest cosine for each AFSC task, we then filtered out task-skill comparisons that had a cosine below 0.5. We then counted the total number of skills occurring within each AFSC and finally compared the frequency of the top three skills from each AFSC.

shows the number of times a skill was matched to skills for each of the target AFSCs. The darker cells indicate that the skill on the *y*-axis was identified more frequently for the AFSC on the *x*-axis. For example, an examination of the first column for Safety (1S0X1) reveals that Safety Training followed by Facility Inspection were the most frequently inferred skills across tasks in that OAR. The heatmap also shows which skills are shared across AFSCs. For example, training analysis is potentially required by six of the seven AFSCs. In some instances, skills common to an AFSC were not shared with other AFSCs. For example, Safety Training was unique to Safety (1S0X1), Heating Systems to Heating, Ventilation, Air Conditioning, and Refrigeration (3E1X1), and Certified Chaplain to Religious Affairs (5R0X1).

Q4. Which AFSCs are performing tasks needing a specific skill type?

To address this question, we explored the skill categories and subcategories available from Lightcast’s open skills library. For example, the skills library contained 118 skills organized into the Data Management subcategory and the higher-order Information Technology (IT) category. This hierarchical organization allowed us to explore which skill subcategories might be matched to an AFSC. To demonstrate the potential insights that can be gained through this approach, we selected three different skill subcategories: Data Management, Power Generation, and Medical Support and identified the AFSC tasks that had the highest cosines (Table 4.4).¹⁷ As shown in the first row, there were four AFSCs that performed the same task matched to Data Management. There was less overlap among the other skill subcategories selected for this demonstration.

Table 4.4. Data Management Skills Inferred for Target AFSCs

Skill Subcategory	Matched Task	AFSC
Data Management	Compile data for records, reports, logs, or trend analyses	1S0X1, 2A6X1, 3F2X1, 4B0X1
	Maintain plan data	2G0X1
	Perform inquiries, reviews, or updates on information management systems	3E1X1
	Process or discard equipment, such as automated data processing equipment	5R0X1
Power Generation	Inspect fuel cell facilities	1S0X1
	Operate small gas turbine engines	2A6X1
	Operate generators	3E1X1
Medical Support	Load or unload patients on patient transportation vehicles	4B0X1
	Support emergency family assistance control centers	5R0X1

¹⁷ For the purpose of the use case, we used a cosine threshold at 0.60 to focus on the highest quality matches. A lower cosine could be considered but would likely result in more false matches (i.e., tasks that do not align well with a particular skill subcategory).

Linking Organizational Functions

Information to support talent management is spread across multiple organizational functions within the USAF. In some cases, organizations are under one command (e.g., AETC) but they execute functions aligned to different objectives. As we mentioned in Chapter 3, the Occupational Analysis Flight in AETC’s Studies and Analysis Squadron creates detailed reports on the tasks performed by enlisted specialties. These tasks provide a foundation for initial and upgrade skill training. Other organizations, such as AETC’s Occupational Competencies branch, use these reports with other data sources to define occupational competencies. However, there is no direct linkage between occupational competencies and tasks performed by an airman in an AFSC. STMs could potentially support developing these linkages more explicitly, helping to provide the USAF with more comprehensive roadmaps for career development.

Q5. How well do STMs extract skills related to existing USAF competency models?

The final analysis used similar steps to other analyses but also integrated our professional judgment to determine whether the inferred skills were a true match to a competency definition.¹⁸ Table 4.5 summarizes the results of the skill-matching analysis for the sample of AFSCs. There is wide variation in the percentage of competencies matched across AFSCs. Safety (1S0X1) and Education and Training (3F2X1) have the highest match rate. In the middle of the range between 70 and 80 percent of competencies were matched, while Heating, Ventilation, Air Conditioning, and Refrigeration (3E1X1) and Logistics Plans (2G0X1) had the lowest match rate, at 62 and 53 percent, respectively.

Table 4.5. Share of Competencies Matched to Skills by AFSC

AFSC	Share Matched	Example Skills Matched
1S0X1	0.91	Safety assurance; risk management; resource management
2A6X2	0.70	Occupational safety; quality control; readiness and mobility
2G0X1	0.53	Communication; force generation; data analytics
3E1X1	0.62	Colling; electrical; heating; hydronics
3F2X1	0.82	Coaching; curriculum management; instruction; program effectiveness
4B0X1	0.77	Data collection; emergency response; personnel management
5R0X1	0.75	Community care; crisis intervention; personnel; unit engagement

¹⁸ We used a similarity score greater than 0.5 to first filter skill matches to competency statements. Using this filtered set, we then applied a stricter rule by coding only skills as matching a competency statement where the same phrase is used or where synonyms are used. Matches were not coded in cases where one statement covers a much broader space than the other (e.g., “Promotion and Education” versus “Educational leadership”). In other words, matches require a similar level of abstraction or specificity. Statements that share a common domain relationship but address a different part of the domain were also not coded as matches (e.g., “Equipment management” vs. “Equipment maintenance”). This step is a proxy for verifying the accuracy of the model to reproduce competencies similar to what trained job analysts and career field experts had documented.

One common reason for the lack of competency to skill matches is that competency statements are, in some cases, combinations of what could be thought of as separate competencies (e.g., promotion and education). Some competency statements use acronyms (e.g., RSO&I or WRM Management), which resulted in nonmatches, though some skills are not in the database (e.g., mission support, mission generation). Some competencies are too broadly formulated to produce specific skill matches, such as Readiness. In this instance, the skill database contains information that points to relevant skills (e.g., skills applied to use of the Defense Readiness Reporting System) but not an overarching skill that shares the name or otherwise denotes readiness, broadly construed.

Evaluating Model Outputs

Before results from embedding models can be incorporated into talent management practices, the outputs should be carefully reviewed by subject-matter experts who represent each target career field. Subject-matter experts could include CFMs, training pipeline managers, and other professionals familiar with occupational requirements. At a minimum, subject-matter experts should consider the following questions: (a) what cosine thresholds provide meaningful matches, (b) what matches produced by the model are inaccurate, (c) under what conditions does the model produce correct or incorrect matches, (d) what unintended consequences could occur from using results (e.g., what effect do incorrect matches have on talent management decisions for the career field or for an airman's career), and (e) do the outputs from the model provide value beyond existing business processes (e.g., reduce time required to accurately address policy question).

Systematically evaluating the outputs for any specific policy question is time-consuming but a necessary step to promote transparency and more effective decisionmaking. Periodic audits may also be needed to evaluate the quality of the data inputs. Changes to any text input (e.g., new occupational tasks) could have downstream effects on how results are interpreted. Therefore, investments in monitoring and iteratively improving data quality and statistical models are particularly important steps for any workflow incorporating NLP.

Summary

NLP and related technologies are advancing at a rapid pace, providing new opportunities for advancing skill management. In this chapter, we demonstrated how the USAF can use pretrained STMs to convert tasks and skills into numerical representations (i.e., embeddings). These embeddings can then be used to compute similarity scores between task statements from different occupational specialties. The primary advantage of using such an approach is that embeddings are computed based on the full context of the task statement, therefore two tasks that share the same underlying meaning will have a high similarity score even when the tasks may be written using different words (e.g., evaluate versus assess). Beyond task-to-task comparisons, the USAF can also infer skills to facilitate the development of competency models, identify potential overlaps between different enlisted specialties, and guide training and development efforts.

Even though the accuracy of NLP models continues to improve, including modern large language models such as GPT-4, subject-matter experts will need to verify and validate the outputs from these

models. The models are imperfect and can produce similarity scores that incorrectly suggest a task match or skill requirement. There are strategies to decrease potential errors in matching (e.g., increasing details in task or skill descriptions that are embedded), but results are unlikely to reach 100-percent accuracy. The USAF will need to experiment with these strategies and identify a workflow that incorporates subject-matter expert review. Such workflows have the potential to significantly decrease workload while improving the range of talent management insights that can be made within and across enlisted specialties.

A Technical Track for Enlisted Personnel

The DAF leadership is not only interested in broadening the skills of airmen to realize its goal of developing MCA or MRA, it is also concerned about developing and retaining airmen with deep technical skills. The DAF's concern about technical depth for USAF personnel primarily focuses on highly technical career fields, such as those in cyber. These career fields require at least some of their airmen to develop the advanced technical skills needed to address complex technical problems. As we mentioned in Chapter 1, a *technical track* is a career path for personnel with technical skills who wish to continue applying and honing those skills in technical roles while also having opportunities for advancement and promotion. A technical track is typically differentiated from the traditional career advancement path, called a *management track* or an *institutional track*.¹ Personnel on institutional tracks advance into supervisory and leadership positions that require oversight of people and resources. In contrast, technical track personnel advance into technical roles in the organization, performing activities in areas such as the development of new products and evaluation of research and innovation strategies. Technical tracks often have different salary and reward structures, as well as different titles (e.g., Technical Lead instead of Supervisor), from institutional tracks.

Technical tracks have been used by U.S. organizations for decades, typically to manage talent in technical career fields such as engineering, computer science, and information technology (IT). Organizations use technical tracks to increase retention of technical experts, provide a better match between technical skills and role requirements, increase innovation, and increase the level of technical expertise in the organization. However, the popularity of technical tracks has ebbed and flowed since their introduction in the 1950s. They are currently enjoying a resurgence, with the USAF planning to pilot the concept for personnel in technical career fields, starting with officers.² We provide more background on the history and use of technical tracks in Appendix C.

In the remainder of this chapter, we discuss our findings and conclusions about an enlisted technical track. Our findings and conclusions derive from a workshop conducted with USAF representatives to define a technical track for the enlisted force and a postmortem discussion with AF/A1 representatives who would be involved with policy changes to implement a technical track.

The findings in this chapter predate the February 2024 announcements by DAF leadership to introduce a technical track for enlisted personnel and a warrant officer (WO) corps for personnel in

¹ Although private sector organizations tend to refer to the traditional career path as a *management track*, AF/A1 representatives from the enlisted force management working group used the term *institutional track* instead. We use *institutional track* here but will refer to *traditional* or *management tracks* when discussing findings from literature.

² DAF, "Reoptimizing for Great Power Competition," webpage, undated.

technical career fields such as those in cyber and IT.³ The findings from the workshop and postmortem discussion should still provide useful insights as DAF leadership moves forward with plans for technical tracks and WO corps.

Technical Track Workshop

We hosted a workshop to assist the USAF to further refine its concept of a technical track for the enlisted force.⁴ Specifically, we hosted a 2.5-day, in-person workshop at RAND's Washington Office in June 2023. Our core participants were 22 USAF enlisted personnel representing three enlisted career fields: Avionics (2AX), Cyber Defense Operations (1D7), and Cyber Warfare Operations (1B4). We also invited several AF/A1 representatives to offer policy expertise to the core participants. In total, 32 individuals participated in the workshop. The overarching goal of the workshop was to assist the USAF in developing a roadmap for an *advanced technical track* for the USAF enlisted force.⁵ We provide details on our methods, including workshop agenda and activities, in Appendix D.

Motivations for Technical Tracks

A key question that we raised at the workshop was about motivation: why should the USAF implement a technical track for its enlisted force? We asked participants this question in a large-group discussion, capturing themes in our notes. On the final day of the workshop, we confirmed the following list of six key motivations or objectives for a technical track:

- Retain technical expertise.
- Increase first-term reenlistment.
- Increase job satisfaction.
- Build better generalists (“raise the floor”).
- Develop deeper expertise.
- Increase innovation and solve “wicked problems.”⁶

We first asked participants to rate each of the six objectives in terms of how important they are for the USAF to address. Participants used a 5-point Likert-type scale, with ratings from 1 (not at all important) to 5 (critical or extremely important). We calculated the percentage of the 16 participants

³ DAF, “Reoptimizing for Great Power Competition,” webpage, undated.

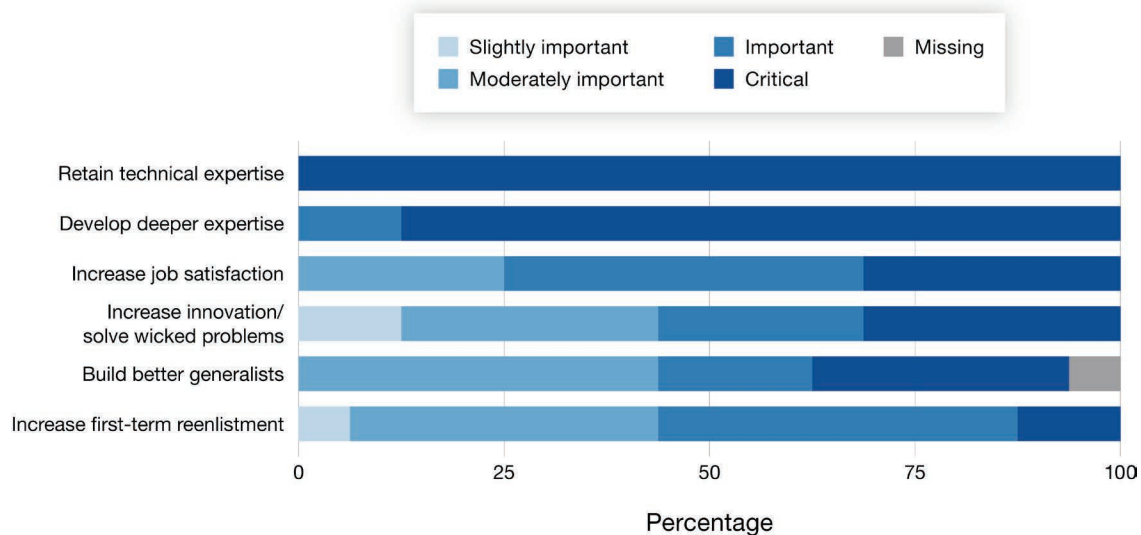
⁴ Workshop design and development was led by senior researchers who have workshop expertise. These researchers worked with AF/A1 representatives to identify dates and to iron out other logistics for the workshop. Several other members of the project team assisted in reviewing design elements and in facilitating workshop sessions and taking notes. Workshop facilitators had prior experience facilitating workshop sessions or focus groups.

⁵ As mentioned in Chapter 1, an AF/A1-led working group of SELs had been exploring the concept of a technical track prior to our workshop. In their concept development, they used the adjective *advanced* before *technical track* because technical career fields, such as those in cyber, would be expected to have technical personnel in the management track.

⁶ Wicked problems generally refer to policy problems that are very difficult to address because they are ill-defined, involve different stakeholders who can have very different views, and experience changing requirements. For a history of theory and research on wicked problems in public policy, see Brian W. Head, “Forty Years of Wicked Problems Literature: Forging Closer Links to Policy Studies,” *Policy and Society*, Vol. 38, No. 2, July 9, 2018.

who selected each of the five importance ratings. As shown in Figure 5.1, a majority of participants rated each objective as *important* or *critical*. The highest percentages of critical ratings were given to the two objectives at the top of Figure 5.1: retain technical expertise and developing deeper expertise. These two objectives align with findings from our literature review on key reasons that organizations implement technical tracks (see Appendix B).

Figure 5.1. Workshop Participant Ratings of Importance of Technical Track Objectives



NOTE: Sixteen participants completed this rating exercise. The ten AF/A1 participants were not included in this exercise and some of the AFS group participants were no longer in attendance at the workshop when this exercise was completed. One of the 16 participants who completed this exercise did not complete ratings for the objective *Build better generalists*. The rating scale also had *not at all important* as an option but no one selected it.

Types of Positions

We also asked participants to identify the types of roles and specialty areas that would be good candidates for technical tracks. We then asked participants to identify the types of criteria or factors to consider in determining which positions should be a part of a technical track for their career fields. We held these discussions as small groups with individuals from the same AFS so that participants could provide specifics about their career field requirements.

Not surprisingly, the types of roles and specialty areas varied by the three AFS groups. Table 5.1 provides examples of roles and specialty areas by AFS group. The three groups varied in how they discussed criteria for selecting positions for a technical track. Only the Avionics group identified specific data fields in unit manning documents (UMDs) that could be used to identify technical track positions. Specifically, they pointed to the functional account code, which identifies specific USAF work centers, as a useful field to begin to identify positions.⁷ They also suggested using SEIs and acquisition codes, the latter of which can identify specific organizational types (e.g., USAF Wings).

⁷ For a description of a work center, see AFMAN 38-102, *Manpower and Organization Standard Work Processes and Procedures*, Department of the Air Force, September 4, 2019, p. 18.

Table 5.1. Examples of Roles and Specialty Areas for USAF Enlisted Technical Tracks

Air Force Specialty Group	Roles	Specialty Areas
Avionics (2AX)	Lead Technician, Maintenance Superintendent, Dedicated Crew Chief, Section Chief, Inspector, Liaison, Subject Matter Expert, Innovator, Weapon System Support Team/Support Manager	Operational and developmental testing, quality assurance, combat shields electronic warfare, mission design series avionics expertise, engineering, weapon systems support
Cyber Defense Operations (1D7)	Technical Specialist, Engineer, Operator, Analyst, Architect, Instructor, Planner, Manager	Network, host systems, satellite communications, information systems security, electromagnetic spectrum operations, mission defense team, advanced supplemental training
Cyber Warfare Operations (1B4)	Analyst, Operator, Engineer, Programmer, Instructor, Mission Director, Specialist	Threat hunting, reverse engineering, malware analysis, cryptographic systems, cyber capabilities development, DevSecOps (i.e., Development, Security, Operations)

Although the two cyber groups did not review UMD data fields, they discussed factors that would help identify technical track positions. For Cyber Defense (1D7), discussion focused on industry standards in IT and related fields as a way to identify and define technical roles. They also discussed using SEIs and Defense Cyber Workforce Framework (DCWF) codes to identify candidate billets.⁸ Although some 1D7 participants suggested that the decisions about which specific billets are technical track positions should be left to billet owners, they also suggested that the 1D7 CFM could provide a catalog of position types (e.g., network engineer) that billet owners could consider for technical track positions. That is, 1D7 participants suggested that billet owners be given basic parameters to identify technical track positions.⁹

Like the Cyber Defense (1D7) group, the Cyber Warfare (1B4) group noted that the type of mission matters for determining technical track positions. For example, an organization with a capabilities-development mission would require a majority of its 1B4 positions to be technical track because advanced technical skills are needed to develop cyber tools. In contrast, organizations with support missions involving cyber might only require a small number of technical track positions. The 1B4 group also tended to focus on offensive cyber operations instead of defensive cyber operations requirements, partly to distinguish their community from defensive cyber requirements in the 1D7 community. However, in general, the 1B4 participants wanted to focus more on how to identify airmen (personnel) for a technical track than on identifying billet requirements.

⁸ During the workshop, the 1D7 CFM team shared that they had been reviewing 1D7 billets and updating UMDs to tag billets with SEIs and DCWF roles.

⁹ In draft documentation shared by the 1D7 CFM team prior to the workshop, we learned that the 1D7 CFM team determined that most squadrons with 1D7 personnel would only have two to three technical track billets but that some squadrons have missions that could require more of those billets. This implies that the type of unit mission and force structure would factor into determining which billets would be in a 1D7 technical track.

Selecting Airmen

On the second day of the workshop, we asked participants to identify key criteria and mechanisms for selecting airmen for a technical track. Participants agreed that not all airmen would be eligible for a technical track and suggested a competitive selection process be used to select airmen. Although the three AFS groups varied somewhat in the types of criteria they suggested be used, all three agreed that airmen need to already have higher levels of technical competence than their peers to enter the technical track. As a 1B4 participant put it, “We’re all 1B4s, but I don’t think of everyone as advanced technical track. I want a tech track for the super nerds.”

Other selection criteria mentioned by at least one AFS group include

- specific types of educational credentials or certifications (all three)
- nomination from peers (1B4 and 1D7)
- successful completion of a capstone event (1D7 and 2AX)
- existing standardized tests (e.g., the Armed Services Vocational Aptitude Battery [ASVAB] test) (1B4)
- personality characteristics (1B4)
- standards and evaluation check ride (1D7)
- experience with industry (1D7)
- minimum time in specific technical positions (1D7).

All three AFS groups recommended that airmen would not enter a technical track until they reach at least a minimum grade or time in service. The minimum thresholds varied by AFS but could start as early as the E-4 grade (senior airmen) to encourage airmen to apply before the end of their first term of enlistment. However, participants indicated that entry would more likely occur at E-5 (staff sergeant) or E-6 (technical sergeant) and would require an additional service commitment. The eligibility window would extend all the way through 15 years of service, or when airmen are in the grade of E-7 (master sergeants).

Career Paths and Incentives

On the second day of the workshop, we also asked participants to outline features of the career path for a technical track: promotions, professional development, and any movement between technical and institutional tracks. Although AFS groups differed on the specifics (e.g., types of professional development), they agreed on some features of the technical track path. We outline these features in Table 5.2.

Table 5.2 shows that, except for separate promotion boards, key features were generally agreed upon by all three AFS groups.¹⁰ Deviations (in lighter gray cells) were a matter of degree, not type. For example, both Avionics (2AX) and Cyber Defense (1D7) argued for technical track personnel not to compete for traditional leadership positions within the institutional track. Cyber Warfare (1B4)

¹⁰ Although Avionics (2AX) participants did not call out the need for separate promotion boards for technical and institutional tracks, they did articulate a desire for a separate grade structure for the two tracks. A document provided by 1D7 career field management prior to the workshop suggests that career field is also open to a separate grade structure, known as “T grades,” for the technical track.

Table 5.2. Common Technical Track Features Across AFS Groups in Workshop

Feature	Avionics (2AX)	Cyber Defense Operations (1D7)	Cyber Warfare Operations (1B4)
A separate promotion board from the institutional track		++	++
Professional military education requirements	++	++	++
Special programs and assignments for career broadening (e.g., Education with Industry)	++	++	++
No competition for traditional leadership positions (e.g., SEL)	++	++	+
Unique technical leadership and instructor opportunities	+	++	++
Crossflow with institutional track allowed	+	++	++

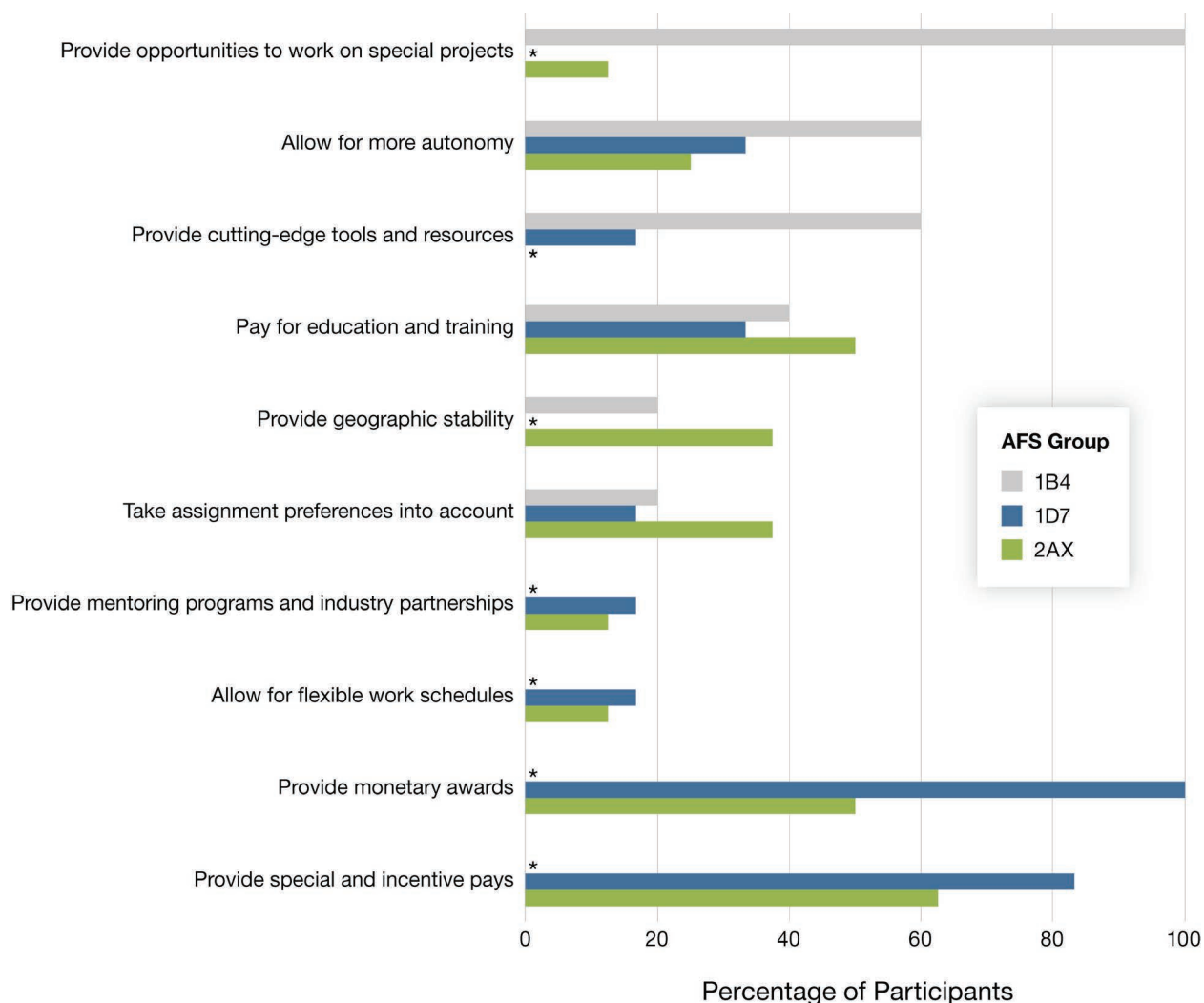
NOTE: Cells with “++” mean that AFS group discussed that career path feature for the technical track; cells with “+” mean that AFS group discussed a variation of that feature; a blank cell means that AFS group did not identify that as a specific feature for the technical track.

participants indicated that technical track personnel could compete for institutional track positions but only by exception. Therefore, all three AFS groups were mostly in agreement that technical track personnel would not be expected to fill institutional track leadership positions. Similarly, all three AFS groups agreed that technical track personnel could go back to the institutional track, but two AFS groups (1B4 and 1D7) indicated that there should be a limit on how late in one’s career an airman can move back to the institutional track.

In addition to outlining features of a technical track’s career path, workshop participants also discussed incentives to attract and retain airmen for a technical track. We asked participants to rank order a list of 15 incentives based on their importance for a technical track. Participants discussed their rankings and could reprioritize after the discussion. We analyzed the participants’ final rankings, focusing on incentives that they rated as one of the top three in terms of importance. Figure 5.2 shows the percentages of each AFS group that voted for each incentive as one of their top three.

A key takeaway from Figure 5.2 is that there is substantial variation between AFS groups in terms of what they consider to be top incentives. A majority of Cyber Defense (1D7) and Avionics (2AX) participants ranked monetary incentives (awards, special and incentive pays) within their top three incentives, whereas none of the Cyber Warfare (1B4) participants ranked monetary incentives within their top three. Discussions with 1D7 and 2AX participants suggested that having higher baseline pay for technical track personnel would be important for the success of the technical track. These two AFSs have some comparable jobs in the civilian sector (e.g., IT positions for 1D7, aircraft avionics for 2AX), which might partly explain the focus on ensuring technical personnel have compensation closer to that in the civilian sector. For 1B4 participants, opportunities to work on special projects, work

Figure 5.2. Technical Track Incentives: Participants’ Top Three Rankings by AFS Group



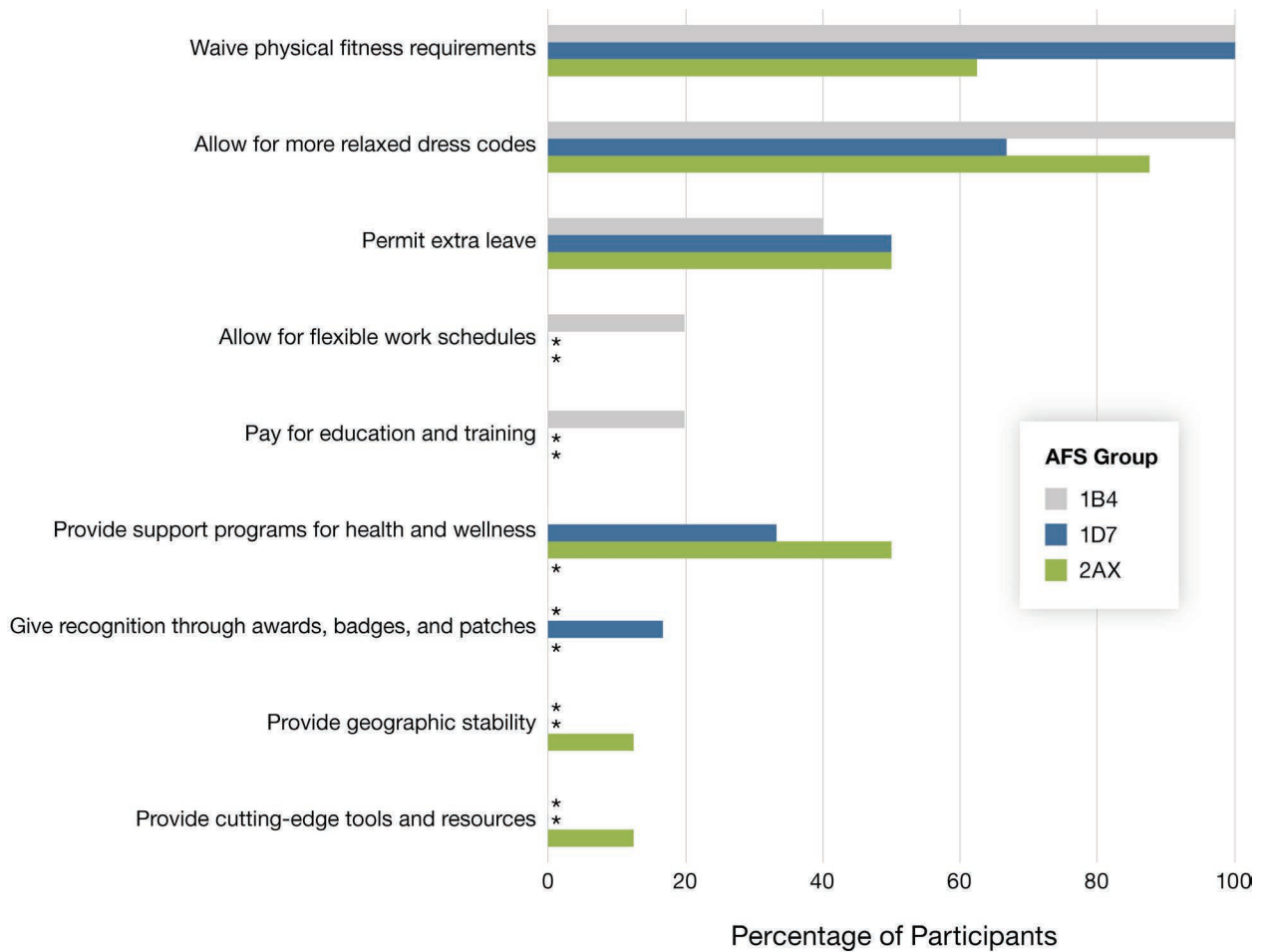
NOTE: We calculated percentages within each AFS group because group sizes varied (Avionics [2AX] *N* = 8; Cyber Defense [1D7] *N* = 6; and Cyber Warfare [1B4] *N* = 5). An asterisk (*) means that no one in that AFS group ranked the incentive in the top three.

autonomy, and cutting-edge tools and resources were ranked among the most important incentives for a technical track.¹¹ These participants noted that the satisfaction of performing the mission in an area where you excel would motivate 1B4 technical track airmen more than pay.

We also examined the bottom three ranked incentives to determine if there were any discernible trends. All three groups placed physical fitness waivers, relaxed dress codes, and extra leave among the least important incentives (Figure 5.3). These findings are interesting because a previous study on attracting and retaining USAF cyber personnel indicated that cyber personnel cited “red tape”

¹¹ The 1B4 participants described autonomy and special projects in terms of having more ownership over the missions they supported and rotations that they would accept. For example, a capability developer would be assigned to the Air Force Research Laboratory to lead a cyber capability development project, which helps that developer advance into a future workroom as a team technical lead.

Figure 5.3. Technical Track Incentives: Participants' Bottom Three Rankings by AFS Group



NOTE: We calculated percentages within each AFS group because group sizes varied (Avionics [2AX] $N = 8$; Cyber Defense [1D7] $N = 6$; and Cyber Warfare [1B4] $N = 5$). An asterisk (*) means that no one in that AFS group ranked the incentive in the bottom three.

requirements such as those associated with physical fitness could reduce retention.¹² Figures 5.2 and 5.3 indicate that, while there were some areas of agreement, the three AFS groups varied in how they prioritized incentives for a technical track.

Other Considerations and Options

On the final day of the workshop, we asked participants to rate how well three courses of action (COAs) could address the six main motivations they had previously listed for having a technical track. The COAs were derived from the prior two days of discussion when it became clear that several

¹² Chaitra M. Hardison, Leslie Adrienne Payne, Julia Whitaker, Anthony Lawrence, and Ivica Pavisic, *Building the Best Offensive and Defensive Cyber Workforce: Volume II, Attracting and Retaining Enlisted and Civilian Personnel*, RAND, RR-A1056-2, 2021, p. 24.

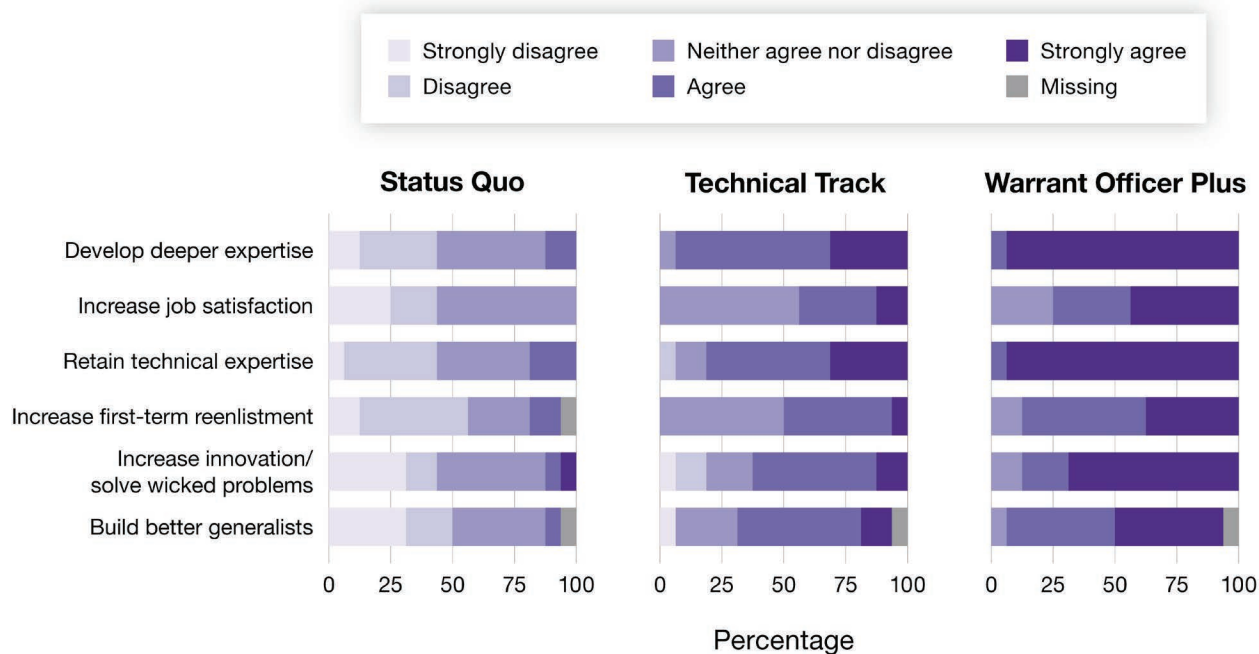
participants thought that an alternative to an enlisted technical track would be to establish a WO corps in the USAF. Therefore, we asked participants to rate three COAs that reflect alternative ways to manage technical talent from the enlisted force:

1. **Status Quo:** Do not make any significant structural changes to enlisted force management and use existing skills management tools to the greatest extent possible (e.g., expand use of SEIs to tag billets and airmen).
2. **Technical Track:** Establish a technical track in the enlisted force along the lines of what the workshop discussed.
3. **Warrant Officer Plus:** Establish a WO corps, limited duty officer (LDO) system, or another enlisted-to-officer structure that would move enlisted personnel into a technical officer workforce structure.¹³

Participants were asked to rate the degree to which they agree that each COA would address each of the six objectives. Figure 5.4 shows the results of this rating exercise.

The trend in Figure 5.4 is clear: participants rated COA 3 the highest across the board, followed by COA 2. COA 1 (status quo) did not fare well, suggesting that very few of the participants considered the status quo as being able to meet the six objectives.

Figure 5.4. Workshop Participant Ratings of Courses of Action Against Objectives



NOTE: Sixteen participants completed the COA rating exercise. The ten AF/A1 participants were not included in this exercise and some of the AFS group participants were no longer in attendance at the workshop when this exercise was completed. One of the 16 participants who completed this exercise did not complete ratings for the objective *Build better generalists* and the Status Quo COA for *Increase first-term reenlistment*.

¹³ See Appendix B for more details on the Navy's LDO system.

Participants in favor of the WO corps option argued that it would lend legitimacy and respect to technical personnel who would otherwise be in a technical track. They expressed concerns that a technical person in an enlisted rank would not be taken as seriously as a WO, especially among officers. They noted that WOs exist in other military services (Army, Navy, Marine Corps) so that would make USAF WOs easily recognizable in joint military assignments. They also cited the benefit of the WO corps having a separate pay and rank structure from the enlisted force.

It was beyond the scope of our project to analyze the trade-offs of a WO corps for retaining technical talent from the USAF enlisted force. However, in the next section, we describe insights from a workshop postmortem discussion with AF/A1 representatives who are familiar with these issues from a policy perspective. Their insights provide some qualitative information on the trade-offs of establishing a WO corps.

Postmortem Review of Advanced Technical Track Concept

In August 2023, we hosted a 60-minute meeting with four representatives from AF/A1 who would be involved in addressing policies for implementing an advanced technical track for the enlisted force. The purpose of the discussion was to receive a postmortem review of the technical track concept outlined at the workshop. In particular, we sought to identify potential barriers and implementation challenges for an advanced technical track for the enlisted force.

Representatives were given an overview of the June workshop and briefed on high-level takeaways and findings from the workshop. We framed the discussion around four guiding questions to gather reactions on our findings and implementation considerations:

- Who would oversee implementation of a technical track?
- What legal or policy enablers might be required to implement a technical track?
- What resources and level of effort might be involved in implementation?
- How would the USAF know if implementation is successful?

Clarifying the Need for Technical Tracks in the Enlisted Force

The AF/A1 representatives were first presented with the workshop participants' ratings of the importance of technical track objectives, shown previously in Figure 5.1. When asked whether those objectives represented what the USAF is trying to address with an advanced technical track for the enlisted force, representatives noted there could be some differences in priorities depending on who within the USAF is asked. The discussion pointed to the need for clarifying the need for technical tracks. We highlight themes from this discussion.

What Is Considered Technical Expertise Needs to Be Clarified

Participants noted that what is considered *technical expertise* could depend on the objective. Workshop participants focused on deeper technical skills within their career fields (e.g., a 1D7 airman developing from a network analyst to a network engineer). One participant in the postmortem discussion noted that technical expertise could also be interpreted as having a broader set of technical skills within a functional area (e.g., an electrician who can work on both aviation electronics and

computer electronics). This representative speculated that the force could become more function-oriented and less career field-oriented in the future.

Leaders Need to Message Role of Technical Tracks

Postmortem representatives further noted that the USAF will need to carefully message the role of technical tracks given previous focus on MCA (and now, MRA), a concept wherein airmen are expected to develop and apply skills outside their core AFSs. USAF leadership had viewed MCA as a culture shift for the USAF, in the hopes that MCA could help the USAF develop a more adaptable, innovative culture. Technical tracks, however, would incentivize specialized capability or skill development. Postmortem representatives noted that the USAF will need to consider trade-offs in incentivizing airmen with depth of technical expertise compared with those with a breadth of cross-functional skill sets.

Research on technical tracks in other organizations highlights the need for senior leaders to provide a clear message on the value of technical tracks. Technical tracks can fail if personnel on those tracks become demotivated because they do not believe the organization truly values and awards their technical expertise.¹⁴

Previous Overpromotion Contributes to Concerns About Retaining Technical Experts

Representatives were also asked to discuss what might have contributed to the technical expertise shortage. One representative mentioned that the USAF recently restructured its enlisted grades after years of growth in enlisted end-strength. The prior end-strength growth resulted in overpromotion of airmen. Overpromotion results in airmen spending less time in more junior grades developing their technical competence, hence the USAF's concern about developing and retaining technical talent.¹⁵

Promotion System and Bonuses Not Sufficient to Demonstrate Value of Technical Expertise

Representatives also noted that the USAF currently lacks the ability to show it values technical expertise beyond promoting airmen. However, those promotions lead to positions of increasing responsibility to manage airmen (i.e., the institutional track). The USAF might attract technical experts who do not have the will or skills to lead large numbers of personnel. Participants also mentioned that, while signing bonuses can be a good recruiting incentive, they do not retain technically talented personnel who have little desire to assume unit leadership roles.

¹⁴ Patrick Hoffmann, Martin Hoegl, Miriam Muethel, and Matthias Weiss, "A Contemporary Justice Perspective on Dual Ladders for R&D Professionals," *Journal of Product Innovation Management*, Vol. 33, No. 5, 2016. Also see Appendix C for more details on findings on technical tracks in organizations.

¹⁵ This participant also gave a short history on what led to the overpromotion of airmen from 2015 to 2021. Prior to that period, the USAF had reduced its enlisted force. This force reduction meant fewer airmen were available when the USAF had to increase enlisted end-strength in the 2015 time frame. This led to more promotion opportunities for available airmen. For more information about the goals of the force reduction in the mid-2000s, see Doug Troyer, "Program Budget Decision 720, Force Shaping: Why Now??" webpage, Vance Air Force Base, August 28, 2007. For more information about USAF efforts to rebalance the enlisted force, see Secretary of the Air Force Public Affairs, "Air Force Expects Lower Enlisted Promotion Rates," webpage, July 7, 2022.

Impediments to Warrant Officer Plus Option

During the June workshop, participants were given three potential COAs and asked to evaluate how well they think each COA would address the six objectives for managing technical talent. As shown in Figure 5.4, workshop participants generally preferred a “Warrant Officer Plus” option, noting that WOs would be easily recognized as technical experts with authority across the joint force. We asked the postmortem participants for their inputs on the tradeoffs for a Warrant Officer Plus option for the USAF. Representatives suggested that a WO corps could have risks that outweigh the benefits. We briefly outline their rationales in the following sections.

Leadership Has Not Always Been Open to a Warrant Officer Solution

Representatives highlighted that there has historically been a lack of senior USAF leadership desire for a WO corps, implying there would be issues setting appropriate pay scales. One representative further indicated that having WOs could detract from the USAF’s ongoing challenge in developing commanders from its commissioned officer corps.

Warrant Officer Option Might Not Be Only Viable Option for the USAF

Representatives were also concerned that workshop participants might have focused on a WO corps because it is a known concept in the other military services, not because it is the best fit for the USAF. Representatives, however, were sensitive to workshop participants’ argument that WOs would have credibility in the joint environment. They argued that the technical track could borrow language from its officer program counterpart and refer to an enlisted technical expert as a “highly specialized NCO [noncommissioned officer].”

The Debate About Implementing USAF Warrant Officer Corps Is Not New

A representative noted that the discussion about WOs, or a similar concept such as the Navy’s LDO, is not a new one for the USAF. The debate has ebbed and flowed for decades with similar arguments resurfacing on either side. In a 1986 article on the evolution of NCOs in the USAF, Bruce Callandar, a retired USAF information officer, noted that the USAF placed senior NCOs into many of the types of positions that other services would fill with WOs, LDOs, or commissioned officers.¹⁶ He argued that this was “the best management bargain any service has found” because of the lower pay for NCOs compared with WOs, LDOs, and commissioned officers. He also argued that, although senior NCOs would like to see their pay rise to match their level of responsibilities, they would likely not see WO or LDO status as an advancement. As he put it, “For many, anything short of direct commissioning into the field grades would amount to stepping from the top rung of one rank ladder to the bottom of another.” Interestingly, Callandar also mentioned that the USAF had considered the idea of two separate enlisted tracks, one for leaders and the other for technical specialists, in the early 1950s but abandoned the idea. The author argued that this was a “fortunate” outcome. Although this

¹⁶ Bruce D. Callandar, “The Evolution of the Air Force NCO,” *Air & Space Forces Magazine*, September 1, 1986.

article is nearly 40 years old, the main arguments for why the USAF had not implemented a WO corps might have continued to resonate up until very recently.

Limits on Flexibility for Technical Track Incentives

Representatives also discussed incentives that would make a technical career track more attractive to airmen. As discussed earlier in this chapter, and as depicted in Figures 5.2 and 5.3, there was variation between the workshop's AFS groups in terms of their prioritization of incentives. We asked the postmortem participants whether career fields will have flexibility to manage incentives for technical tracks. Themes from their responses are below.

Size of the Technical Track Will Matter

When asked about incentives for technical tracks, representatives first expressed the concern that career fields will need to determine how large their technical track can be while maintaining the health of the career field. Too much specialization can threaten manning requirements. Representatives did suggest that the degree to which specialization can be accommodated will vary by career field.

Similar Incentive Structures Across Career Fields Is Preferred but Flexible Application Will Vary by Incentive Type

Although the representatives noted that career fields can vary in terms of the size of their technical tracks, they advocated for similar incentive structures initially so that the USAF can better understand if changes are having their desired effects.

When asked what categories of incentives could be applied flexibly by career fields with technical tracks, representatives provided the following insights:

- **Pay and monetary incentives:** Representatives agreed these incentives are important but might be challenging to address. In particular, they noted that pay or additional monetary incentives might be more difficult to implement because they could involve seeking additional authorities.
- **Assignment incentives:** One representative noted that geographic stability was important for some airmen who enjoyed their jobs and wanted to remain (or *home base*) at a particular location. This representative noted that the USAF might have more flexibility to offer for the home basing options to offer airmen geographical stability. This incentive also has support within AF/A1 and AFPC, according to one of the representatives.
- **Education with industry and academic education:** Other incentives discussed were education with industry and further academic education. Education with industry was noted as an already established program that could be expanded to include more partners if applied to a technical track.
- **Work autonomy:** They suggested that greater autonomy could be among the least resource-intensive incentives to offer and provide the highest value. Autonomy was mentioned during the June workshop in terms of airmen having more ownership in defining the kinds of missions they support, although specifics could differ among career fields.

- **Temporary promotions:** Representatives discussed offering temporary promotions to highly skilled airmen in certain instances. This would allow a particular airman to be promoted into a billet for which they are well suited. This would address some monetary matters as the billet is already funded to provide pay. One representative further speculated this could address concerns of promoting airmen to a level at which they are no longer expert. There is also a military culture aspect that is addressed wherein the right technical expert is temporarily promoted and is thus the same rank with other authority figures. Frocking was also noted as an option that came with little or no cost.¹⁷

Getting Inputs from Airmen to Make Sure Technical Tracks Succeed

Throughout the postmortem review, AF/A1 representatives had questions about the representativeness of the workshop sample. We clarified that, although we asked CFMs to nominate individuals who could provide expertise on their career field needs for technical tracks, the workshop sample might not fully represent the desires of the entire career field. Moreover, the workshop included only three career fields. The variation among those three career fields in terms of incentive priorities would suggest that other career fields could have different priorities for incentives. The USAF would need another approach (e.g., survey of a representative sample of airmen from various career fields) to get a fuller picture on the attractiveness of a technical track to airmen.

Summary

To manage technical talent in its enlisted force, the USAF is considering implementing technical tracks. As we learned from a 2.5-day workshop with representatives from three candidate career fields, Avionics (2AX), Cyber Defense Operations (1D7), and Cyber Warfare Operations (1B4), the details on implementing technical tracks will matter. Workshop participants generally agreed on several key features of a technical track to include: a selection process for entry, professional military education requirements, technical leadership and developmental opportunities, and some amount of movement allowed between technical and institutional tracks. However, the three AFS groups varied somewhat in the particulars regarding objectives, and especially, incentives for a technical track. As our postmortem discussion with AF/A1 representatives suggests, there will be limitations on how much flexibility career fields can have in using different incentives for their technical tracks, at least upon initial rollout of a technical track. The postmortem representatives also made clear that USAF leadership will need to clearly communicate the goals for technical tracks, which emphasize depth of technical experience, against other USAF goals that emphasize breadth of skills (e.g., MCA or MRA). The implication of the postmortem discussion is that the USAF will need to decide how it will evaluate whether the technical tracks are meeting their objectives of managing and retaining technical talent, especially when

¹⁷ Frocking is the practice of allowing a military member who has been selected for promotion to “pin on” for their next rank before their official date of promotion. Pinning on the next rank means that person takes on the title and responsibilities of the new rank but does not yet receive the higher compensation associated with the new rank. Until 2017, the USAF only used frocking for a small number of officers promoting to field grade and general officer ranks. To account for a growth in joint assignments, the USAF began to allow some chief master sergeant–selects to pin on early. For more details, see Stephen Losey, “New ‘Frocking’ Rules Allow Some Chief-Selects to Wear New Rank Early,” *Air Force Times*, November 17, 2017.

the USAF is trying to balance those objectives against the desire for more cross-functional skills in the enlisted force.

Workshop participants generally agreed that an option that moves beyond the enlisted force structure would meet the objectives of managing technical talent better than other options, including a technical track within the enlisted force. However, the AF/A1 representatives at the postmortem discussion indicated that DAF leadership did not plan to pursue a WO corps or similar concept (e.g., LDOs) at the time. Since then, DAF leadership has shifted course, announcing plans for both a technical track option and WO option for technical career fields in cyber and IT.

Key Findings and Recommendations

This final chapter presents the key findings and recommendations about improving enlisted skills management in the USAF. The findings and recommendations align to the general framework shown in Figure 1.1: (1) cross-cutting issues that relate to key *enablers* of enlisted skills management, (2) managing skills across career field and functional lines (*breadth of skills*), and (3) managing skills within career field or skill areas (*depth of skills*). The chapter describes the findings and recommendations summarized in Table 6.1.

Table 6.1. Summary of Findings and Recommendations

Focus	Finding	Recommendation
Cross-cutting	<ul style="list-style-type: none"> • Current processes for determining skill requirements are useful but limited. • Talent Marketplace is a step in the right direction but has room for improvement. 	<ul style="list-style-type: none"> • Invest in infrastructure and workflows that automate skill tracking and support cross-functional comparisons.
	<ul style="list-style-type: none"> • Assignment system is constrained by policy and resources. 	<ul style="list-style-type: none"> • Simplify waiver authority for assignments in high-value skill areas to increase assignment flexibility.
Breadth of skills	<ul style="list-style-type: none"> • Career field structure is deeply embedded in regulation and policy. • Skills management system is optimized within, not across, career fields. 	<ul style="list-style-type: none"> • Determine if cross-functional requirements are translated into enlisted career field plans.
Depth of skills	<ul style="list-style-type: none"> • Institutional track does not meet needs for managing technical talent. 	<ul style="list-style-type: none"> • Continue to pursue an advanced technical track for enlisted career fields.

Cross-Cutting Issues

We outline two cross-cutting issues associated with infrastructure to support modern skills management and one that highlights constraints on the assignment system that limit its flexibility.

Infrastructure to Support Modern Skills Management

Findings and recommendations in this section address cross-cutting issues related to limitations of current infrastructure for managing enlisted skills.

Finding: Current Processes for Determining Skill Requirements Are Useful but Limited

As described in Chapters 2 and 3, skills across the USAF are recorded in various career field documents. For example, enlisted career field leadership and subject-matter experts meet periodically to review and update the career field education and training plans. Although career field documents provide the foundation for initial qualification and upgrade training within an AFS, there are limitations to which skills are recorded. These skills are meant to be used primarily within a career field. Therefore, skills are not centrally managed by any single USAF-wide system, making it difficult to compare skill supply and demand across AFSs. Although commands and units track other skills outside career field documents (e.g., mission qualification training), the skills are not consistently documented in USAF systems of records so they can be analyzed to identify skill trends.

An additional constraint on current processes for determining skill requirements is the limited information from the demand side of the house; that is, the billet owners. As we discussed in Chapter 3, enlisted billet owners do not have to create position descriptions that describe key duties and required skills. Without more detailed information about the specific skill sets required across different positions, the USAF will be constrained in determining trends in skill requirements across the force.

Finding: Talent Marketplace Is a Step in the Right Direction but Has Room for Improvement

As we describe in Chapter 2, the USAF is continuing to develop and beta test the Talent Marketplace platform to enable better matching of airmen to available positions. Talent Marketplace provides a foundation for advancing enlisted talent management practices but barriers for a scalable and sustainable solution still exist. Currently, Talent Marketplace has been rolled out for about 25 enlisted AFSs. However, there are currently no plans to enroll additional enlisted AFSs. The lack of automation in Talent Marketplace appears to be a major limiting factor. To use TMAP in Talent Marketplace, the AFS assignment teams manually review and match for each individual position and airman in the cycle. Although this process is meant to increase potential fit of airmen to positions, it is more time-intensive than the (mostly) automated processes used by AFSs not enrolled in Talent Marketplace.¹

As we learned from discussions about Talent Marketplace's capabilities (see Chapter 3), in addition to the lack of automation for assignment matches, the Talent Marketplace platform does not have back-end analytic capabilities to extract and analyze data across positions and AFSs that would enable enterprise-level analysis of skill demands and supply. Even if these limitations are addressed, the information currently collected by Talent Marketplace might be insufficient to track emerging skill demands. Beyond specialty, skill level, and any required special experience identifiers, information about the position's duties and corresponding skills and experiences are optional.

¹ For enlisted personnel not enrolled in Talent Marketplace, there is an automated process that matches airmen to locations based on eligibility criteria (e.g., minimum time on station).

Recommendation: Invest in Infrastructure and Workflows That Automate Skill Tracking and Support Cross-Functional Comparisons

We offer the following COA to consider as a way forward when making future updates to Talent Marketplace:

- **Identify and address Talent Marketplace design features** that need to be modified to ensure information collected in Talent Marketplace can support analytic processing.
- **Evaluate options for centralizing new information on skill requirements.** Although existing information from USAF policy documents, OARs, competency models, and training materials could provide a foundation for extracting relevant skills, additional sources of information will be needed to estimate future skill demands. One option that could be tested is to require billet owners to enter position description information. Currently, Talent Marketplace only requires limited inputs from billet owners (e.g., specialty code). Talent Marketplace could be designed to prompt billet owners by presenting lists of skills that are either preferred or required, with additional fields to capture emerging skills not currently listed. To maximize return on investment, implementation should start with grades E-6 and above where skill differentiation within career fields is believed to be more prominent.
- **Leverage NLP and STMs to extract and synthesize skill demands.** Using NLP and STM will allow the DAF to combine skill entries that appear different but are semantically similar. For example, an STM could extract and combine “3D Printing” and “Additive Manufacturing” as a single concept for the knowledge and skills to design and use 3D printing technologies. This step would allow the USAF to compare skills more readily across AFSs.
- **Estimate changes in skill demands.** Using a general workflow similar to those used by large occupational programs (e.g., O*NET)² to track emerging skill requirements, the DAF could develop standardized reports that track which skills and experiences are most critical and where these demands are greatest.

As we conclude at the end of our STM analysis in Chapter 4, USAF experts will need to review outputs of any NLP or STM analysis prior to using those outputs in talent management decisions. However, it is important to note that if the USAF does not invest in the infrastructure to leverage NLP and STM workflows, further standardization of competencies and competency definitions will be required to make cross-functional comparisons. To implement these options, a combination of offices within AFPC, with policy direction from AF/A1 and AETC, would need to provide technical and subject-matter expertise for skill tracking and management. The most critical offices to support design and implementation would include AETC’s Force Development Competencies Division and the Occupational Analysis Flight under AETC’s Studies and Analysis Squadron.

Assignment System Constraints

Findings and recommendations in this section address the constraints to the enlisted assignment system that limit its ability to manage airmen within and across AFSCs.

² Lewis and Morris, 2022.

Finding: Assignment System Is Constrained by Policy and Resources

Talent management requires managing individual differences in talent. However, airmen with the same AFSC, skill level (3/5/7/9), and grade are generally treated as interchangeable by the assignment system. Airmen who graduate from the same technical training are awarded a 3-level for their AFSC and assumed to be similarly capable at performing the baseline functions aligned to their AFSC. As we heard from some of the USAF stakeholders about the weaknesses of the current skills management system (see Chapter 3), this assumption of similar skill proficiency levels can become problematic as airmen progress through their careers, especially as airmen develop specialized skills not required by their career fields or take on special duties that deviate from the typical career field path.

Existing USAF policy would seem to allow more flexibility in addressing the needs of the USAF—and individual airmen—when it comes to specialized skills and experiences (e.g., through SEIs). For example, DAF policy for USAF is to “assign Airmen with the necessary skills to valid manpower requirements in order to meet Air Force mission objectives,”³ and if approval is “in the best interests of the Air Force from the standpoint of operational necessity,”⁴ waivers to limits such as time on station and retainability can be granted. However, as noted in Chapter 3, assignment teams attempt to take advantage of this flexibility, but there is no pattern to when waivers are granted. Moreover, assignment teams pointed to constraints posed by PCA budgets as another limitation on their ability to go beyond mandatory requirements for assignments.

Recommendation: Simplify Waiver Authority for Assignments in High-Value Skill Areas to Increase Assignment Flexibility

To leverage skill-based information for assignment matches, the USAF needs to address the time on station, retainability, and PCA budgets. This is not easy to do, especially in a fiscally constrained environment. As it continues to test Talent Marketplace for a select number of enlisted career fields, the USAF could identify a select number of high-demand AFSCs or high-value skill areas aligned to specific functional lines to provide simplified waiver procedures that would accelerate their approval. The Air Force Talent Management Innovation Cell (AF/A1H), which was established to lead talent management life-cycle policies and procedures,⁵ could lead an effort to coordinate with other AF/A1 offices (particularly the Air Force Directorate of Force Management Policy [AF/A1P] as the office of primary responsibility for assignment policy) and relevant functional stakeholders to identify the high-value skill areas and the simplified waiver process for talent-based assignments. If it is difficult to identify a set of high-value skill areas, AFPC could assist by analyzing cases where waivers of assignment restrictions were requested and/or denied. These data could help determine if specific AFSCs request waivers more frequently than others—implying a need for more assignment flexibility.

³ DAFI 36-2110, 2021, p. 14, para 1.2.

⁴ DAFI 36-2110, 2021, p. 108, para 5.4.1.

⁵ Headquarters Mission Directive 1-32, *Deputy Chief of Staff of the Air Force Manpower, Personnel, and Services*, Secretary of the Air Force, September 13, 2019, pp. 7–8, para A.2.2.2.

Breadth of Skills

Findings and recommendations in this section address enlisted skills management across career fields and functional lines. Here we address enlisted occupational structures, and associated processes and policies, and how they limit flexible management of enlisted skills across functional areas.

Finding: Career Field Structure Is Deeply Embedded in Regulation and Policy

As we describe in Chapter 2, the USAF use of AFSCs as its core career field specialization structure is deeply embedded in policies related to recruitment, accessions, career development, retention, and personnel management. They also enable the USAF to comply with congressional and DoD mandates related to the utilization and classification of military personnel and to meet its commitment to assist airmen when they transition to civilian life. Structural modifications intended to improve talent management must not only address USAF and individual needs at each stage of an airman's career, but also maintain compliance with existing mandates.

Finding: Skills Management System Is Optimized Within, Not Across, Career Fields

Although the USAF's enlisted occupational structure and associated policies and processes provide a baseline of airmen skills to meet USAF mission needs, the system is not designed to manage airmen across functional lines that span different career fields. Technical training, assignment teams, and career field management staffing, resourcing, and policies provide support to specific career fields. Even data and guidance for airmen fall within career field lines (e.g., CFETPs, which provide key guidance on training and experiences that airmen need to proceed in their careers). These structures, policies, and processes have served the USAF well in providing the foundational sets of occupational skills needed to execute USAF missions. The challenge comes when there is a need for airmen to work across functional lines, such as in contingency response missions or on missions associated with newer operating concepts such as ACE. As we explain in Chapter 3, airmen who are assigned to unique missions can face career advancement restrictions because they deviated from the traditional career path, and units might struggle to find adaptive training options to ensure airmen are prepared for those unique missions.

As we describe in Chapter 3, system customers we interviewed were split on whether consolidating AFSCs could resolve some of the inflexibilities associated with career field-driven structures, policies, and processes. Those in favor of consolidation thought it would serve the USAF's goals regarding ACE and MCA by removing some of the bureaucratic layers that limit flexible utilization of airmen. However, those who were not in favor of consolidation cited prior attempts at consolidation that did not address manning and training concerns prior to implementation. Although our interviews were not with large samples of system customers, the findings indicate that there is disagreement as to whether having fewer occupational categories would alleviate inflexibilities in how airmen are assigned, trained, and utilized.

Recommendation: Determine If Cross-Functional Requirements Are Translated into Enlisted Career Field Plans

As noted in Chapter 1, the USAF seeks to balance the need to manage technical talent more carefully with the need to train, assign, and utilize airmen across career field and functional lines. ACE

and MCA increase the importance of this goal. As part of their responsibility to establish development goals for career fields, functional advisory councils are directed to consider cross-functional requirements and situations that would allow releasing airmen for opportunities outside their core AFSC, which implies the authority to consider more flexibility in management of high-demand skills for individual airmen in specific career fields.⁶ However, as we describe above, career field and functional management might not place as much value on cross-functional assignments and utilization when it comes to career planning.

AF/A1 should review the cross-functional requirements identified by the advisory councils, such as enlisted functional advisory councils, and how those are being translated into career field management plans. For example, the review should determine the degree to which cross-functional skills to address requirements are reflected in CFETPs. If there are disconnects between what the advisory councils recommend and what is put into career field plans, AF/A1 should work with those career field and functional management teams to determine the sources of the disconnect.

Depth of Skills

Findings and recommendations in this section address enlisted skills management within career fields and functional lines. Specifically, we address how the USAF might better manage its technical talent in the enlisted force.

Finding: Institutional Track Does Not Meet Needs for Managing Technical Talent

Career management of airmen is currently aligned to an institutional track that requires them to become supervisors and leaders of airmen as they move into and through the NCO grades. These supervisory and leadership positions focus on managing personnel and resources, and providing guidance to airmen, not on applying specific technical skills to address complex, technical missions. As we described in Chapter 5, participants at our workshop on an advanced technical track expressed concerns that the institutional track does not provide enough opportunities for airmen with advanced technical skills to continue performing in technical roles and honing their technical skills as they advance. They also expressed concerns that the institutional track limits the ability of career fields to increase the baseline of technical skills among junior airmen so there is sufficient technical skill among more senior grades. Although participants across the three career fields that participated in the workshop—Avionics (2AX), Cyber Defense Operations (1D7), and Cyber Warfare Operations (1B4)—placed different levels of emphasis on the concerns of managing technical talent, they agreed that the status quo of the institutional track does not adequately address those concerns and that the USAF needs another path for managing technical talent.

Recommendation: Continue to Pursue an Advanced Technical Track for Enlisted Career Fields

As described in Chapter 5, AF/A1 is already exploring the implementation of an advanced technical track for its enlisted force, following its program for officers. The decision is primarily driven by a desire to retain and manage technical expertise within the force. The AF/A1-led working group

⁶ See DAFI 36-2670, 2020.

on enlisted force management is leading the way in detailing a roadmap for implementing an advanced technical track for the enlisted force. Our workshop highlights some factors that need to be considered as AF/A1 moves forward.

- **Primary objectives of the technical track:** The career fields participating in our workshop had somewhat different concerns regarding reenlistment and retention and how it would align with the objectives of an advanced technical track. Whether the focus should be on first-term reenlistment or on career retention beyond the first reenlistment point needs to be decided before implementing technical tracks. These decisions will help decide at what point airmen should enter a technical track (earlier if first-term reenlistment is a concern), the service commitment required to enter a technical track, and the incentive structure to attract and retain airmen for a technical track.
- **Degree of flexibility with incentives:** The three career fields in our workshop varied in priorities for incentives for a technical track. AF/A1 will need to determine where career fields will have flexibility to adjust incentives for technical tracks and where uniformity will be necessary.
- **Minimum size of career field:** Prior research on technical tracks in the military suggest that career fields need to be large enough to sustain separate career tracks. For smaller specialties, such as Cyber Warfare, the USAF will have to manage technical tracks carefully to mitigate imbalances in senior enlisted grades, particularly for the institutional track.
- **Clear expectations about technical tracks:** Research on technical tracks in industry suggests that technical tracks can fail when expectations about the tracks are not clear. Participants can become demotivated if they believe their technical contributions are not valued by the organization and if they perceive they do not have equitable advancement opportunities to the institutional track. The USAF will need to clearly communicate the purpose of technical tracks, the types of roles that airmen would fill in those tracks, and career path features (e.g., promotion opportunities) of technical tracks. Communication will be needed not just for airmen pursuing a technical track but for all airmen in the career field.

The USAF will likely test the enlisted technical track concept to address the considerations we outline. We agree that this is likely the best approach. We also strongly suggest an evaluation plan be developed and implemented as part of the test program. For example, the USAF could survey a representative sample of airmen from the career field(s) in the test program to determine what incentives and features of a technical track they consider to be most important. This can help determine which incentives to include in the test program. Some outputs will be easier to measure (e.g., reenlistment rates) but may require time to capture, whereas others might require new assessments (e.g., measuring satisfaction with technical roles in the technical track). Decisions on what to evaluate will affect the required timeline for a technical track test program and resources needed for evaluation.

Although USAF leaders have not expressed an appetite to pursue alternative personnel systems such as a WO corps in the past, the February 2024 announcement by DAF leadership to introduce a WO corps option indicates a major shift in perspective. Although our workshop did not describe implementation considerations for a WO option in detail, the insights from the workshop and postmortem discussion can help DAF leadership as they implement a WO corps.

Final Thoughts

The USAF is making strides to improve how it manages enlisted talent as it also modernizes its talent management infrastructure and policies. Our recommendations are intended to highlight areas where the USAF should continue its efforts to improve and modernize. A key challenge for the USAF going forward will be determining what changes are working because the effects of those changes can take years to fully manifest. Embracing modern technological tools and practices, such as those we demonstrated using STMs to infer enlisted skill needs, will not only require infrastructure investments but a commitment to ensuring that the personnel policy landscape provides sufficient flexibility to realize the return on those investments. Technology is also improving at a rapid pace, and other types of NLP models, including GPT-4 and others yet to be developed, should be explored and systematically evaluated to further modernize talent management practices across the USAF.

Interview Methods

In this appendix, we describe our methods for conducting interviews described in Chapter 3. Because we used somewhat different methods for the three interview samples (i.e., system customers, assignment teams, and process experts), we describe each in turn.

System Customers

To identify perceived strengths and weaknesses of the current enlisted classification system and improvements for the future, we held 22 discussions with 35 USAF unit leaders and experts. To produce a representative sample of units across the Regular Air Force, we sampled two groups each from six wings across five MAJCOMS. These MAJCOMs, wings, and groups include the following:¹

- Air Combat Command (ACC): 55th Wing and 688th Cyberspace Wing
 - 55th Maintenance Group and 55th Mission Support Group
 - 5th Combat Communications Group and 690th Cyberspace Operations Group
- Air Force Global Strike Command (AFGSC): 509th Bomb Wing
 - 509th Medical Group and 509th Operations Group
- Air Mobility Command (AMC): 621st Contingency Response Wing
 - 621st Air Mobility Advisory Group and 821st Contingency Response Group
- Pacific Air Forces (PACAF): 3rd Wing
 - 3rd Maintenance Group and 3rd Operations Group
- U.S. Air Forces in Europe (USAFE): 86th Airlift Wing
 - 86th Logistics Readiness Group and 86th Maintenance Group.

We held discussions in two phases, first at the group level and then at the squadron level (or, in three cases, at the wing level).² Group-level discussions included group commanders and/or group SELs. At the end of group-level discussions, we asked for points of contact to identify additional leaders and experts who could provide more details on enlisted assignments, training, and skills tracking. These secondary interviews were primarily at the squadron level and were generally with squadron commanders or squadron SELs but also included a few other types of experts (e.g., unit training managers and instructors). Table A.1 provides the numbers of interviews and participants by level (wing, group, squadron).

¹ Only one group was not available to participate in our discussions. We do not identify the group as it could identify the individual group leaders.

² The three wing interviews varied in content and were held with three different wings. One interview focused on an innovation cell, the second on a training program, and the third on enlisted skills tracking.

Table A.1. Organizational Levels of System Customer Participants

Organization Level	Number of Interviews^a	Number of Participants
Wing	3	6
Group	14	18
Squadron	7	11

^aTwo interviews included participants from two different organizational levels, which is why the number of interviews in the table adds to 24 instead of 22 interviews.

These discussions were held between January and March 2023. They lasted anywhere from 30 to 60 minutes and were conducted virtually (by Microsoft Teams or phone). Discussions were semistructured, meaning that we used discussion protocols but asked additional questions on topics that participants raised. Although protocols varied somewhat by organization level and subject-matter expertise, topics included

- current and future mission requirements (mainly at group level)
- enlisted specialties, skills, and experiences needed to perform the group’s current mission(s)
- how special skills or experiences are developed, maintained, and tracked
- perceptions about how well the current enlisted skills classification system is working and any suggested changes to the system (e.g., consolidating AFSCs)
- details on training programs and activities that address cross-functional or special skill areas (e.g., multi-capable airmen training)
- skills needed to meet future mission requirements.

To analyze the discussion notes, we used the following four-step approach:

1. **Generate category list:** One team member created a list of categories to align with the main discussion topics. Other team members reviewed this list and offered minor revisions, leading to the final category list.
2. **Conduct analysis:** The 22 notes files were split across four team members, all of whom had participated as discussion facilitators and have expertise on USAF personnel topics. Each of the four team members independently reviewed their assigned notes, extracting and summarizing relevant content to map onto the categories developed in Step 1.
3. **Review analysis results:** The 22 notes files were split again across the four team members, but assignments were made so that each team member received notes files that they did not review in Step 2. The purpose of this step was to provide a secondary review to fill in gaps or errors from Step 2.
4. **Summarize themes and review:** The team member who produced the initial category list in Step 1 summarized themes from Step 3. The other three team members independently reviewed the themes to reconcile any gaps or errors.

Assignment Teams

To better understand the enlisted assignments system, we interviewed USAF personnel who manage the assignments process for various career fields. There are over 30 enlisted assignment teams.

To scope our effort, we prioritized career fields currently participating in the TMAP beta test and larger career fields, such as those in Maintenance (2X) and Security Forces (3P). Between April and May 2023, we contacted 20 personnel for interviews and received responses from all but one person. Due to scheduling constraints for some participants, we were only able to conduct 12 interviews with a total of 13 participants. Some of the participants were responsible for assignments across multiple AFSCs, whereas others managed assignments for a single AFSC. To avoid identifying individual participants by inference, we grouped the 57 participating AFSCs into six career field categories: Cyber (1B and 1D; 4 AFSCs), Maintenance (2X; 20 AFSCs), Civil Engineering (3E; 12 AFSCs), Force Support (3F; 3 AFSCs), Security Forces (3P; 1 AFSC), and Medical (4X; 17 AFSCs).

The interviews covered the following topics:

- what the assignment process entails from start to finish
- who is involved in the process
- which parts are automated
- types of information considered in making assignment decisions
- existing feedback systems
- improvements that could be made to the process
- obstacles to improvements.

Similar to our discussions with system customers, we held virtual discussions with assignment team participants where one team member facilitated the discussion and another took notes. Because of the small number of discussion sessions, one team member familiar with USAF enlisted force management reviewed the notes and summarized key points to align with the topics listed above. Another team member reviewed the summaries and integrated the themes with those from our other two sets of interviews.

Process Experts

Between October 2022 and April 2023, we held virtual discussions with 12 process experts across eight interviews. These experts represented organizations that provide analysis and operational support to skills management system for enlisted airmen. We held five discussions with representatives from AETC organizations that conduct occupational analysis, develop competency models, or develop occupational (promotion) tests. We also held one discussion each with representatives from AF/A1P (personnel policy), the AFPC office that oversees Talent Marketplace assignment operations, and DAF's Office of Labor and Economic Analysis.

We held semistructured discussions, but the protocol questions varied by organization. In general, we asked experts to describe their organization's main mission and activities (i.e., what they do); any changes that are occurring or planned that would affect the skills management system and associated policies; any challenges or barriers they see within the system; and what other organizations they would recommend we contact to learn more about skills management processes for enlisted airmen. To capture and analyze the data, we used a similar process as we did for the assignment team interviews.

Skills Management Lessons from Industry and Academia

When employers talk about skills-based talent management, or simply *skills management*, they are generally referring to ways to measure, develop, and track employee skills and experiences and align them with requirements of the full range of jobs across their organization. Skills management itself is not a new concept. It has been a central goal of human resource management practices for more than three-quarters of a century.¹ However, in the past decade it has been receiving renewed attention because of advances in AI that are now being leveraged to support refinements to skills management practices. In this appendix, we discuss traditional approaches to skills management and changes being influenced by cutting-edge technology.

Traditional Approaches to Skills Management

The field of industrial and organizational psychology has well-established guidelines for how to assess and manage a workforce's skills. Many of these guidelines have been codified in documents commonly referred to as the *Standards* and the *Principles*, which reflect the culmination of decades of practical applied experience and agreed upon best-practice approaches from experienced practitioners and academics alike.² The guidelines include agreed-upon definitions of key terms like competencies and KSAOs and established methodologies that organizations can use for determining what types of skills are needed on the job, and technical issues that organizations should address (e.g., reliability, validity, bias, and fairness) in their approaches to skills management.

Job analysis is one example of a foundational methodology that is discussed in those guidelines. *Job analysis* is a systematic process for gathering and analyzing information about a job or position within an organization. Its purpose is to identify the KSAOs required to successfully perform the job. This information is used to develop job descriptions, select candidates, develop training programs, and design performance evaluation criteria. Job analysis is a fundamental tool for ensuring that an organization's jobs are performed effectively and efficiently.

¹ Even back in the 1950s, the field had established best-practice approaches for employee skills management. For example, in 1959 Mason Haire provided an overview of efforts that researchers and practitioners had undertaken in the past to measure and classify personnel in organizations according to their KSAOs. Mason Haire, "Psychological Problems Relevant to Business and Industry," *Psychological Bulletin*, Vol. 56, No. 3, 1959.

² See American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, *Standards for Educational and Psychological Testing*, American Educational Research Association, 2014; and Society for Industrial and Organizational Psychology, *Principles for the Validation and Use of Personnel Selection Procedures*, 5th ed., American Psychological Association, August 2018.

By identifying the KSAOs required for a job, organizations can better select employees who are well suited for the job and provide appropriate training and support to help them succeed. Job analysis typically involves multiple methods, including observations, interviews, and surveys of key members of the workforce. These methods are used to gather information about the job tasks, work environment, and required KSAOs or competencies.

In the context of skills management, organizations focus on defining and measuring the KSAOs that employees are expected to have prior to starting a job; on building skills that an organization hopes its employees will gain over time through training, education, and employee development; and on matching employees with key skills or levels of skills to the key skills or levels of skills needed in particular jobs, roles, positions, or assignments.

Applications of Emerging Technologies Being Applied to Skill Management

For example, a manager posting a job announcement traditionally has been limited in their ability to identify and contact specific individuals with skills that align with that job. Instead, they typically post a position and hope qualified personnel see it and apply. They might use word of mouth, or existing knowledge of skills of those they have worked with in the past, to help ensure that people with the right skill sets are identified. Today, however, many organizations are seeking to use information that they gather on employees much more strategically by linking it across databases and human resource contexts. They are even seeking to use information in social media and other published sources to help make inferences about people's skills and interests and about the skills and interests needed on the job. The linking of information and developing of systems that can reach into multiple databases and leverage the information contained in them is changing the way that organizations are approaching skills management.

Vendors and researchers alike have described ways that these advances in technology may be able to reduce costs to organizations over the traditional methods used in the past. For example, researchers are beginning to explore the use of AI technology to reduce the costs of some of the traditional approaches required to support skills management. Replacing or augmenting traditional job analysis methods is one potential use:

Traditional job analysis methods (e.g., SME [subject-matter expert] interviews, workshops, surveys) are feasible on a small scale, but they can become unwieldy to implement enterprise-wide. For example, consider a large organization interested in creating and maintaining KSAO ratings for hundreds or even thousands of jobs in its workforce to facilitate enterprise-wide recruiting, workforce planning, and career exploration and pathing. The resources required to develop and maintain such ratings for all those jobs through workshops and surveys can quickly add up. Even in small organizations, job analyses can be viewed as burdensome as they often involve incumbents and supervisors taking time off their jobs to participate in job analysis activities. Complicating matters, new jobs are added to organizations over time, and jobs change with varying levels of frequency.³

³ Dan J. Putka, Frederick L. Oswald, Richard N. Landers, Adam S. Beatty, Rodney A. McCloy, and Martin C. Yu, "Evaluating a Natural Language Processing Approach to Estimating KSA and Interest Job Analysis Ratings," *Journal of Business and Psychology*, Vol. 38, 2023, p. 386.

Advocates for the use of these new technologies talk about how they can be beneficial for reskilling and closing the skill gap and how shifting to skills-based management practices can help organizations be more agile and responsive to changes in the marketplace, which many organizations desire—Deloitte is one such example.⁴ New technologies also can be used to help establish a common language for skills that is shared across jobs and to shift the focus to managing talent globally rather than locally by enabling talent to be considered for jobs across the entire organization.⁵ Some are also talking about using technology to shift its work to be project focused rather than job focused. For example, a recent survey of organizations found that 89 percent of human resource leaders surveyed report “experimenting with or using skills-based internal talent marketplaces, in which workers are matched to projects and tasks anywhere in the organization for a portion of their time.”⁶

Another benefit of AI technologies mentioned during our interviews is that, although they can help reduce the bias that is inherent in human decisions,⁷ standards would be needed to ensure such outcomes.⁸ These technologies also have the potential for increasing transparency of decisions and awareness of position openings. Such transparency can help to ensure that applicants perceive the process as fair.

AI technologies can support a more flexible system, one that can be tailored to suit each manager and each employee’s unique needs. NASA’s automated system, referred to as Talent Marketplace, offers such flexibility in an agency-wide market:

The Talent Marketplace supports breaking down center barriers and stovepipe operations, and enhances the culture of employee mobility, engagement and innovation required to achieve the NASA mission. Managers can identify and create flexible, targeted opportunities based on skills, grade, onsite or remote location and more. They can select from internal candidates from across the agency and can also use the Talent Marketplace as a resource when discussing development opportunities with employees.⁹

Skills-based talent management is also referred to as the management tool of the future. For example, in a 2021 *Harvard Business Review* article, Ryan Roslansky, the CEO of Linked In, writes:

By taking a skills-based approach to the hiring process, diplomas and titles can sit alongside assessments, certifications, endorsements, and other alternate methods for determining the capability and fit of a candidate. What’s more, by focusing on skills, employers can increase the size of their talent pools, allowing them to pinpoint quality

⁴ Deloitte, *Building the Future-Ready Workforce: Unleash the Potential of Your Organization and People*, 2021.

⁵ John W. Boudreau, *IBM’s Global Talent Management Strategy: The Vision of the Globally Integrated Enterprise*, Society for Human Resource Management, 2010.

⁶ Deloitte, 2021.

⁷ See, for example, Deloitte, 2021; and Irineo Cabreros, Joshua Snoke, Osonde A. Osoba, Inez Khan, and Marc N. Elliott, *Advancing Equitable Decisionmaking for the Department of Defense Through Fairness in Machine Learning*, RAND, RR-A1542-1, 2023.

⁸ See Cabreros et al., 2023; and Alex Engler, “Auditing Employment Algorithms for Discrimination,” Brookings, March 12, 2021.

⁹ Nick Skytland, “The Future of Work,” *NASA Blogs*, October 17, 2019.

applicants for hard-to-fill roles. Once you've hired them, keep your employees engaged and your company ready to adapt to changing demands by creating a culture of learning. It's how we'll start hiring and developing talent for the future, not the past.¹⁰

Summary

Managing workforce skills is not a new concept. For decades, academics and organizations have used job analytic methods to collect information on job tasks and demands, and employee characteristics to determine which types of skills are required for jobs. However, these traditional analytic methods are labor-intensive, requiring subject-matter expertise and analytic skills to analyze large volumes of information. Organizations have begun exploring more modern analytic technologies, primarily through AI and machine learning applications, to collect and analyze skills among their workforces. Although these technologies have considerable potential to automate skill identification and tracking, further experimentation and research may be needed to verify and validate that the AI and machine learning outputs are supporting talent management decisions in ways that are transparent, fair, and objective.

¹⁰ Ryan Roslansky, "You Need a Skills-Based Approach to Hiring and Developing Talent," *Harvard Business Review*, June 8, 2021.

Technical Tracks in Organizations

This appendix describes our review of technical tracks in U.S. organizations. We start with a short description of technical tracks, followed by a brief history of their use in U.S. companies and in the military. We also provide a brief overview of military WO and related technical leadership concepts. A short review of potential benefits and limitations of technical tracks, the lessons learned about addressing those limitations, and other implementation considerations for technical tracks is also included.

Our review is based on literature from peer-reviewed sources from journals and reports as well as trade publications. We included trade publications to identify specific examples of what private sector organizations are doing with technical tracks. We searched several databases, including ProQuest Military Database, Google Scholar, Aviation Weekly Intelligence Network, Defense Technical Information Weekly, EBSCO's Military and Government Collection, Inside Defense, and established media publications (e.g., *Harvard Business Review*, *New York Times*) to identify relevant sources, limiting our review to sources that addressed technical tracks or related concepts, such as dual ladders and WOs (for military populations). Although most of our review was limited to a 20-year time frame (2003–2023), articles published from 1950 to 2023 were used to find details on the history of technical tracks.

What Is a Technical Track?

A technical track is a career framework that establishes a second hierarchy in the organization.¹ This type of track serves to advance employees who have deep technical skills but no aptitude or desire to pursue management. Professionals on a technical track can be granted higher salaries, recognition, and autonomy without having to take on additional supervisory roles. Personnel on more traditional management tracks remain responsible for tasks such as adjusting processes, timelines, and people management.

Technical track personnel generally possess advanced skills in a technical field, such as engineering, computer science, or IT. They tend to work on roles centered around technical operations, the development of new products, the evaluation of research and innovation strategies, and the capture and dissemination of technical knowledge. As a reward for good performance, they may be granted higher salaries, more autonomy, and specific titles (e.g., technical lead, fellow, senior scientist). In contrast, a traditional management track focuses on building management competencies for overseeing personnel, functions, and resources.

¹ Thomas J. Allen and Ralph Katz, "The Dual Ladder: Motivational Solution or Managerial Delusion?," *R&D Management*, Vol. 16, No. 2, 1986; Hebert Shepard, "The Dual Hierarchy in Research," *Research Management*, Vol. 1, No. 3, 1958.

History

The first use of a technical track was in the British Civil Service in 1956. The following year, Robert McMarlin, the executive officer of the U.S. Army's Engineer Research and Development Laboratory (ERDL), proposed implementation of a "parallel progression career for non-supervisory engineers and scientists" at ERDL to Congress.² At the time, no known federal establishment and few private sector organizations employed a nonsupervisory path for scientific career fields. McMarlin's proposal was accepted and, as a pioneering effort, ERDL allowed General Schedule (GS)-13 civilians the option to advance in either the supervisory or nonsupervisory career ladder.

Throughout the 1960s and 1970s, technical tracks became more popular among U.S. firms. Early adopters include DuPont, 3M, and IBM. Positive results from these corporations helped foster increased use of technical tracks. 3M was one of the first corporations to institute a technical track.³ If 3M had not instituted a technical track, it might not have developed one of its most famous inventions: the Post-it Note. The Post-it Note's creator, Arthur Fry, worked at 3M from his undergraduate years until his retirement as a product development researcher. In interviews, Fry has credited his decision to stay at 3M with his ability to stay focused on invention and education.⁴

Despite early successes, implementation of technical tracks declined in the 1980s as corporate America focused on corporate growth through mergers. However, the emergence of e-commerce in the late 1980s led to a resurgence in technical track popularity. The fiscal and creative success of technology companies like Microsoft, which used nonsupervisory promotions, helped restore an interest in technical tracks in the corporate world that remains today.⁵ Technical tracks remain a recommended management device for technical personnel in both the practitioner and academic literature.⁶ In the corporate environment following the end of the COVID-19 pandemic, technical tracks have become attractive to employers for their ability to not only attract employees seeking to develop technical expertise, but also to provide flexibility within an individual career journey.⁷ Several well-known companies, such as Procter and Gamble, Honeywell, and NASA, all use versions of technical tracks for this reason. Figure C.1 shows the ebb and flow of technical track popularity in the United States from the 1950s to the 2020s.

² Robert D. McMarlin, "Parallel Progression: Careers for Nonsupervisory Engineers and Scientists," *Congressional Record*, Vol. 103, No. 13, Pt. 24, August 28, 1957.

³ Claudia Deutsch, "Holding On to Technical Talent," *New York Times*, November 16, 1986.

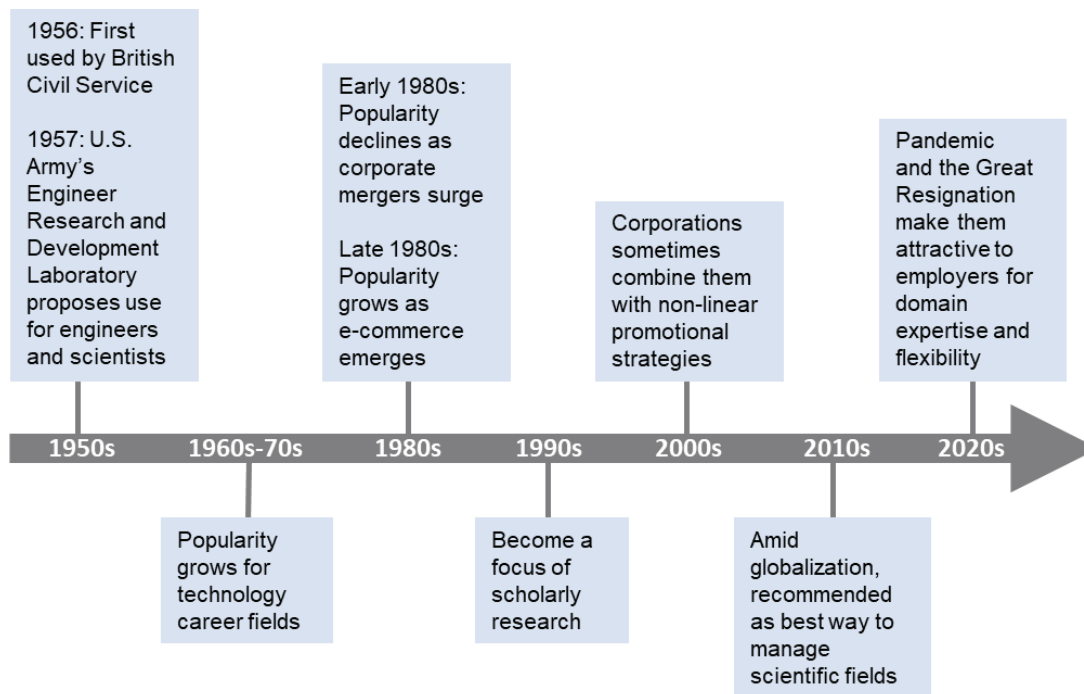
⁴ Deutsch, 1986.

⁵ Deutsch, 1986.

⁶ Natalia Bobadilla and Patrick Gilbert, "Managing Scientific and Technical Experts in R&D: Beyond Tensions, Conflicting Logics and Orders of Worth," *R&D Management*, Vol. 47, No. 2, 2017.

⁷ Hoffman et al., 2016.

Figure C.1. History of Technical Track Use Since the 1950s



Military Interest and Applications

U.S. military organizations have also expressed interest in exploring the use of technical tracks, or similar designs, to deepen expertise. In recent years, technical tracks have been focused on military officers because of recent legal changes that provide greater flexibility in how officer promotions are managed.⁸ For example, a 2019 RAND report indicated that U.S. military service leaders were interested in incrementally exploring the use of the new legal authority for officer promotions to develop capabilities in technical career fields.⁹ A 2021 RAND report on USAF officer management described the finding that officers are open to differentiating promotions across competitive categories.¹⁰ One particularly interested group were officers in cyber career fields.¹¹ Another 2021

⁸ Changes to officer promotion authorities were introduced in the 2018 and 2019 National Defense Authorization Acts. See Public Law 115-91, National Defense Authorization Act for Fiscal Year 2018, December 12, 2018; and, Public Law 115-232, John S. McCain National Defense Authorization Act for Fiscal Year 2019, August 13, 2019.

⁹ Albert A. Robbert, Katherine L. Kidder, Caitlin Lee, Agnes Gereben Schaefer, and William H. Waggy II, *Officer Career Management: Steps Toward Modernization in the 2018 and 2019 National Defense Authorization Acts*, RAND, RR-2875-OSD, 2019, pp. 27–29.

¹⁰ A competitive category is “a separate promotion category established by a Service Secretary for specific groups of officers whose specialized education, training, or experience and often relatively narrow utilization, makes separate career management desirable.” RAND Project AIR FORCE, “DOPMA/ROPMA Policy Reference Tool, Promotion and Appointments, Competitive Categories,” webpage, undated.

¹¹ Albert A. Robbert, Caitlin Lee, William H. Waggy II, Katherine L. Kidder, Natasha Lander, and Agnes Gereben Schaefer, *Officer Career Management: Additional Steps Toward Modernization*, RAND, RR-4337-OSD, 2021.

RAND report cites interviews with USAF cyber officers, reporting that these officers “often want to do technical work for longer in their career” and had concerns that “critical technical acumen may be atrophying as a result of not allowing cyber professionals to stay in technical roles or not providing adequate continuation training.”¹²

Although a fly-only technical track for USAF officers was discontinued in 2020 due to lack of interest,¹³ the USAF continues to explore technical tracks and similar concepts as the need to retain technical expertise remains.

Warrant Officer and Limited Duty Officer Corps

Versions of technical tracks have been employed within other branches of the military. Other U.S. military services besides USAF and the U.S. Space Force have WOs and chief warrant officers (CWOs), who are specialized officers that provide comprehensive knowledge and management in a technical specialty. WOs and CWOs typically come from the service’s enlisted corps. Although authorized by Congress, the U.S. Navy, U.S. Marine Corps, U.S. Army, and U.S. Coast Guard utilize WOs and CWOs in slightly different ways, as outlined in Table C.1. The Navy and the Marine Corps also have what are known as LDOs. LDOs are specialized officers who perform tasks similar to WOs, but with subtle differences in authority and expertise. An LDO can progress to command activities in cases where the primary function corresponds to the LDO’s specialty. LDOs are considered more of an officer and less of a technician than WOs and CWOs.

Table C.1. Warrant Officer, Chief Warrant Officer, and Limited Duty Officer Corps Across the U.S. Military Services

Branch	Titles	Grades	Distinct Features
Navy	<ul style="list-style-type: none"> • Warrant Officer • Chief Warrant Officer • Limited Duty Officer 	<ul style="list-style-type: none"> • WO1 • CWO2–CWO5 • O6 	<ul style="list-style-type: none"> • Programs make up over 11 percent of the officer corps • CWO competitive categories include Surface, Submarine, Aviation, General Line, and Information Warfare • LDO competitive categories include Surface, Submarine, Aviation, and General Line • After selection, all WO/CWO/LDO candidates attend a three-week course at Officer Training Command, Newport
Marine Corps	<ul style="list-style-type: none"> • Warrant Officer • Chief Warrant Officer • Limited Duty Officer 	<ul style="list-style-type: none"> • WO1 • CWO2–CWO5 • O6 	<ul style="list-style-type: none"> • WOs are further divided in Regular, Recruiter, and Gunner roles • Marine Gunners are infantry weapons specialists that advise on the tactical employment of organic weapons systems. • Recruiters are career recruiters for the Marines • After selection, all candidates attend the Basic School

¹² Hardison et al., 2021, pp. xi–xii.

¹³ Stephen Losey, “Air Mobility Command Ends Flying-Only Career Track,” *Air Force Times*, March 5, 2020.

Branch	Titles	Grades	Distinct Features
Army	<ul style="list-style-type: none"> Warrant Officer Chief Warrant Officer 	<ul style="list-style-type: none"> WO1 CW2–CW5 	<ul style="list-style-type: none"> Composed of specialties including Aviation, Cyber and Intelligence, Science and Medicine, Mechanics and Engineering, Support and Logistics, and Ground Forces After selection, all candidates attend the Warrant Officer Candidate School
Coast Guard	<ul style="list-style-type: none"> Chief Warrant Officer 	<ul style="list-style-type: none"> CWO2–CWO4 	<ul style="list-style-type: none"> CWOs often fill command roles due to the small size and decentralized structure of the U.S. Coast Guard After selection, all candidates must complete a Chief Warrant Officer Professional Development Course to assist with transition into the officer ranks

SOURCES: Department of Defense, “U.S. Military Rank Insignia,” webpage, undated; My Navy HR, “LDO/CWO Community Manager,” webpage, undated; My Navy HR, “Limited Duty Officer/Warrant Officer/Chief Warrant Officer Academy,” webpage, undated; MARADMIN 319/22, *Fiscal Year 2024 Limited Duty Officer Program*, Department of the Marine Corps, June 22, 2023; Marine Corps Order 1040.42B, *Warrant Officer and Limited Duty Officer Accession Programs*, Department of the Marine Corps, July 16, 2019; Department of the Army, “Warrant Officers,” webpage, undated; Coast Guard Commandant Change Notice 1420, *Appointing Warrant Officers*, Department of the Coast Guard, September 18, 2020.

Potential Benefits and Limitations

Benefits

We highlight four key benefits of technical tracks: increased retention of senior technical personnel, better match between roles and skills, increased focus on innovation, and greater integration of technical expertise in organizational decisionmaking.

Technical tracks are designed to retain technical experts. Allowing technical personnel to stay in technical roles and develop their technical skills can increase their job satisfaction because there is better alignment between interests and job tasks.¹⁴ Higher satisfaction in technical tracks can help retain senior technical personnel.¹⁵

Technical tracks provide a better match between technical roles and skills. This better match allows technical personnel who have no aptitude or interest in management to advance into technical leadership roles where they can contribute meaningfully to the organization.

Technical tracks place a focus on innovation. They give personnel more time to develop and hone their technical skills, and the time to use those skills for technical problems. This can promote innovation, with technical experts contributing to new capabilities and mission areas.¹⁶

¹⁴ Terry Anthony Byrd, Chetan S. Sankar, and Lawrence Loh, “Strategies to Improve Job Satisfaction of US Technical Personnel,” *Engineering Management Journal*, Vol. 8, No. 4, 1996; Teresa M. Amabile, “How to Kill Creativity,” *Harvard Business School Magazine*, Vol. 87, September–October 1998.

¹⁵ Deutsch, 1986.

¹⁶ Amrit Tiwana and Ephraim R. McLean, “Expertise Integration and Creativity in Information Systems Development,” *Journal of Management Information Systems*, Vol. 22, No. 1, 2005.

Finally, technical tracks promotion integration of technical expertise into decisionmaking processes that affect organizational capabilities. When requirements are developed without input from technical experts, the organization faces the risk that it will not have the right level or type of technical capabilities.¹⁷ Incorporating the inputs of technical leaders into those discussions can help organizations tackle challenging technical problems and provides intrinsic authority to technical leaders.¹⁸

Limitations

Findings from industry and military literature point to three common limitations for successful management of technical tracks: Unclear roles, expectations, and criteria for selection and advancement; lack of meaningful incentives; and limited communication between technical and managerial tracks.

Unclear roles, expectations, and criteria for selection and advancement hamper technical tracks. Without clear expectations for contributions, the technical track can reward mediocrity and be misused as a reward for organizational loyalty.¹⁹ Also, a lack of clearly defined strategic roles for technical leaders can result in technical track personnel losing influence in the organization.²⁰ Finally, a lack of clear, distinct criteria about selection and promotion can create resentment from employees not chosen for promotions or from managers who feel technical track professionals aren't "earning" their pay because they are not managing other employees.²¹

Meaningful incentives are not provided to technical track personnel. Technical innovators are intrinsically motivated by outcomes—they are driven because they want to see their ideas become breakthrough products.²² When organizations do not have incentives aligned to providing meaningful work and developmental opportunities for technical employees, motivation can decrease and affect retention.

Limited communication between technical and managerial tracks can lead to misunderstandings. As noted above, a lack of clear expectations and requirements between the two tracks can lead to resentments about perceived inequalities between tracks. In a cross-level study of 32 research and

¹⁷ Tiwana and McLean, 2005.

¹⁸ David Blair, Jason Hughes, and Thomas Mashuda, "From DOPMA to Google: Cyber as a Case Study in Talent Management," *Eurasia Review*, June 23, 2019.

¹⁹ Benjamin Cabanes, Philippe Galy, Pascal Le Masson, and Benoit Weil, "Technical Staff Management for Radical Innovation in Science-Based Organizations: A New Framework Based on Design Theory," paper presented at the R&D Management Conference, Cambridge, UK, July 2016.

²⁰ Thomas J. Allen and Ralph Katz, "Managing Engineers and Scientists: Some New Perspectives," in Paul Evans, Yves Doz, and Andre Laurents, eds., *Human Resource Management in International Firms: Change, Globalization, Innovation*, Macmillan, 1990.

²¹ Hoffman et al., 2016.

²² John M. Hebda, Bruce A. Vojak, Abbie Griffin, and Raymond L. Price, "Motivating and Demotivating Technical Visionaries in Large Corporations: A Comparison of Perspectives," *R&D Management*, Vol. 42, No. 2, 2012; John M. Hebda, Bruce A. Vojak, Abbie Griffin, and Raymond L. Price, "Motivating Technical Visionaries in Large American Companies," *IEEE Transactions on Engineering Management*, Vol. 54, No. 3, 2007.

development organizations, perceived equality and transparency of the technical and management tracks increased professionals' organizational commitment and career satisfaction.²³

Lessons Learned and Implementation Considerations

For technical tracks to be successful, the literature points to lessons learned about their limitations. It also presents other considerations before implementation.

Lessons Learned

Clear communication about roles and expectations is needed. To ensure the expectations of those entering the track will be properly formed, roles of technical track personnel need to be clearly defined and communicated. Clear descriptions of organizational arrangements can support coordination of the activities and missions between technical and management track personnel. Easily accessible information and requirements for allocation decisions, promotions, and roles has been shown to help improve perceptions of equity between technical and managerial tracks.²⁴

Industry recommendations also emphasize the importance of setting clear evaluation standards and expectations for promotion.²⁵ This typically involves determining criteria for promotion, identifying the range for each factor being considered, and then developing career path descriptions. Criteria for promotions in a technical track will likely have to include factors to ensure it accurately reflects the uniqueness of the role.²⁶ Transparent criteria for advancement can help personnel feel valued for their contributions.²⁷

Meaningful incentives should address what motivates technical experts. For example, 3M uses regular structured discussions between supervisors and reports to identify which assignments best motivate and engage individual employees.²⁸ Other organizations give technical experts greater autonomy, which aids in retention.²⁹ For example, Google engineers can spend 20 percent of their time pursuing independent projects. Over 50 percent of Google's largest revenue-generating products have come out of this practice, including Gmail, Google Maps, and Google Earth.³⁰ Autonomy can

²³ Hoffman et al., 2016.

²⁴ Hoffman et al., 2016.

²⁵ Cabanes et al., 2016; Hoffman et al., 2016; Yeonsoo Kim, Rachele Williams, William J. Rothwell, and Paul Penaloza, "A Strategic Model for Technical Talent Management: A Model Based on a Qualitative Case Study," *Performance Improvement Quarterly*, Vol. 26, No. 4, 2014.

²⁶ Robbert et al., 2021; Albert A. Robbert, John S. Crown, Agnes Gereben Schaefer, Matthew Walsh, Diana Y. Myers, Anthony Lawrence, and Ignacio A. Lara, *Emerging Options for Field-Grade Officer Promotions in the U.S. Air Force*, RAND, RR-A989-1, 2023.

²⁷ Kim et al., 2014; Hoffman et al., 2016.

²⁸ Vijay Govindarajan and Srikanth Srinivas, "The Innovation Mindset in Action: 3M Corporation," *Harvard Business Review*, Vol. 6, 2013.

²⁹ Bobadilla and Gilbert, 2017.

³⁰ Steven Kotler, "Why a Free Afternoon Each Week Can Boost Employees' Sense of Autonomy," *Fast Company*, January 20, 2021.

also come in the form of decisionmaking authority, especially when it comes to providing input in domain-specific operational and development decisions.³¹ Finally, communication of impact can provide motivation.³² Tesla frequently communicates a clear “why” behind projects, highlighting that working for the company can change the world.³³ Contribution to the mission might be particularly meaningful to USAF personnel.

In addition to incentives aligned to meaningful work roles and autonomy, technical tracks should provide professional development resources, including formal education, experiential learning through networks and collaborations, and cutting-edge resources. Professional development best practices also highlight benefits of experiential learning.³⁴ Networks that facilitate collaboration across organizational and institutional boundaries can promote sharing, reduce risk, and benefit innovation.³⁵ Working with peers can enhance feelings of belonging and boost job performance.³⁶ This type of learning can be formalized through capstone projects (such as a cohort working together to solve a real-life problem) prior to the completion of training. It also could take form as internships with industry partners or rotations to a base or another branch with a relevant mission set.

Technical personnel should develop some managerial skills, which can promote communication between tracks. Technical personnel still benefit from developing communication and managerial skills. These skills are needed when performing activities like communicating with customers, providing technical guidance, and managing projects. A literature review of research and development associations found that project success is associated with technical leaders who communicate vision and develop high-quality relationships in teams.³⁷ To promote versatility in technical leaders, industry best practices recommend providing technical personnel with opportunities to take on leadership roles that have a set term (i.e., a performance cycle or project).

Provide opportunities for personnel on both tracks to communicate. Formal and well-defined touch points for interaction between management and technical can boost understanding of organizational activities.³⁸ These meetings also provide opportunities for technical personnel to speak up if they feel current procedures are not just.³⁹

³¹ Teresa M. Amabile, Regina Conti, Heather Coon, Jeffrey Lazenby, and Michael Herron, “Assessing the Work Environment for Creativity,” *Academy of Management Journal*, Vol. 39, No. 5, 1996; Dale Feuer, “Two Ways to the Top?,” *Training*, Vol. 23, No. 2, 1986.

³² Amabile et al., 1996.

³³ Blair, Hughes, and Mashuda, 2019.

³⁴ Douglas T. Hall, “Project Work as an Antidote to Career Plateauing in a Declining Engineering Organization,” *Human Resource Management*, Vol. 24, No. 3, 1985; Kim et al., 2014.

³⁵ Eva Sørensen and Jacob Torfing, “Enhancing Collaborative Innovation in the Public Sector,” *Administration & Society*, Vol. 43, No. 8, 2011.

³⁶ Hebda et al., 2012.

³⁷ Teri Elkins and Robert T. Keller, “Leadership in Research and Development Organizations: A Literature Review and Conceptual Framework,” *Leadership Quarterly*, Vol. 14, No. 4, 2003.

³⁸ Cabanes et al., 2016.

³⁹ Cindy Rottman, Doug Reeve, Serhiy Kovalchuk, Mike Klassen, Milan Maljkovic, and Emily L. Moore, “Counting Past Two: Engineers’ Leadership Learning Trajectories,” paper presented at the 2019 ASEE Annual Conference & Exposition, Tampa, Fla., 2019.

Organizational communication about the value of technical tracks can help. This communication might include socializing that technical track ranks and titles are equal to management ranks and titles,⁴⁰ highlighting the importance of technical workforce,⁴¹ or giving designators (badges, titles) to help other fields recognize technical authority.

Implementation Considerations

A scaled approach can help. Scaling implementation enables further experimentation and allows for new policies associated with a technical track to be implemented more with more flexibility,⁴² less administrative burden,⁴³ and more consistency.⁴⁴ Scaled implementation has also been shown to aid with cultural acceptance of change.⁴⁵ As a first step, organizations should identify technical tracks for specialty areas where technical tracks are most likely to succeed. This can reduce the risk introduced by uncertainty of a new career path system.⁴⁶

Size of career fields could matter. Previous studies with military populations⁴⁷ have suggested that technical tracks have the most utility when there is an appropriate ratio of technical to institutional track staff. A 2018 PAF analysis of a fly-only technical track for commissioned officers recommended to limit the size of the track to avoid too high a concentration of nontechnical assignments for officers in the traditional track.⁴⁸ CFMs were resistant to the idea of a fly-only track because they feared it would limit opportunities for young professionals, leading to absorption issues with older, less physically fit pilots remaining in roles better held by younger pilots.⁴⁹

Determine if promotion rates will vary between tracks. Depending on how criteria is determined for promotion, changes may be required in calculating promotion opportunity. Personnel may need to stay in grades for longer or shorter durations. For instance, the technical track might be expected to have higher retention, requiring a different advancement tempo than traditional track. If this option is

⁴⁰ Hebda et al., 2012; Pierre-Guy Hourquet and Alain Roger, “Event-Driven Careers for R&D Professionals,” *International Journal of Technology Management*, Vol. 31, Nos. 3–4, 2005.

⁴¹ Amabile et al., 1996; Ralph Katz, Michael Tushman, and Thomas J. Allen, “The Influence of Supervisory Promotion and Network Location on Subordinate Careers in a Dual Ladder RD&E Setting,” *Management Science*, Vol. 41, No. 5, 1995; Hall, 1985.

⁴² Robbert et al., 2021.

⁴³ Robbert et al., 2021.

⁴⁴ Allen and Katz, 1986.

⁴⁵ Gian Gentile, Michael Shurkin, Alexandra T. Evans, Michelle Gris , Mark Hvizda, and Rebecca Jensen, *A History of the Third Offset, 2014–2018*, RAND, RR-A454-1, 2021; Robbert et al., 2021.

⁴⁶ Robbert et al., 2021.

⁴⁷ Albert A. Robbert, Tara L. Terry, Alexander D. Rothenberg, Anthony Lawrence, and Neil Brian Carey, *Air Force Officer Management Flexibilities: Modeling Potential Policies*, RAND, RR-1921-AF, 2017; Albert A. Robbert, Michael G. Mattock, Beth J. Asch, John S. Crown, James Hosek, and Tara L. Terry, *Supplemental Career Paths for Air Force Pilots: A Warrant Officer Component or an Aviation Technical Track?* RAND, RR-2617-AF, 2018.

⁴⁸ Robbert et al., 2018.

⁴⁹ Robbert et al., 2017.

selected, it will be important to socialize slower promotions as an expected feature of technical track career paths.⁵⁰

Decide how much flexibility to allow between tracks. Literature recommends allowing flexibility to move between tracks.⁵¹ Flexibility can promote retention because personnel will not feel “trapped” in one track.⁵² Organizational arrangements that standardize coordination between technical and management track personnel can further benefit both: technical track personnel practicing leadership and management personnel becoming more familiar with operations.⁵³

Summary

Technical tracks have a long history in the private industry and military organizations. However, technical tracks are just one tool for managing technical expertise and can be designed to support a range of different objectives. Successful implementation of technical tracks depends on recognizing the unique features of managing technical talent and adjusting management approaches accordingly.

⁵⁰ Robbert et al., 2021.

⁵¹ Giorgio Petroni, Karen Venturini, and Chiara Verbano, “Open Innovation and New Issues in R&D Organization and Personnel Management,” *International Journal of Human Resource Management*, Vol. 23, No. 1, 2012; Kim et al., 2014.

⁵² Michal Biron and Ravit Eshed, “Gaps Between Actual and Preferred Career Paths Among Professional Employees: Implications for Performance and Burnout,” *Journal of Career Development*, Vol. 44, No. 3, 2017.

⁵³ Cabanes et al., 2016.

Workshop Methods

In this appendix, we provide more details on methods for the advanced technical track workshop described in Chapter 5.

Participant Solicitation

In Spring 2023, we coordinated with AF/A1 to solicit participation for the workshop. Our A1 point of contact reached out to the three CFMs for Avionics (2AX), Cyber Defense Operations (1D7), and Cyber Warfare Operations (1B4) to nominate approximately five representatives from each of their communities who are familiar with policies and processes for manning, training, and assignments. The CFMs provided their nominations to our team, and we reached out directly to those individuals to recruit them for the workshop. AF/A1 also nominated representatives to attend the workshop as policy advisers. (The A1 representatives participated in large-group discussions, not AFS-specific [small group] discussions.)

A total of 32 USAF enlisted personnel participated in the workshop (see Table D.1). A majority (88 percent, or 28 out of 32) were senior NCOs (E-7 through E-9).

Table D.1. Description of Workshop Participants

Specialty/Organization	Number of Participants
Avionics (2AX) ^a	8
Cyber Defense Operations (1D7)	8
Cyber Warfare Operations (1B4)	6
Headquarters A1	10
Total	32

NOTE: A few participants did not participate for the entire workshop.

^a Two avionics participants attended virtually.

Agenda and Activities

We hosted a 2.5-day workshop on June 21–23, 2023. Figure D.1 shows the workshop agenda sent to participants. Each day had a theme. To encourage sharing of ideas across the three functional communities, each AFS group met separately and then convened as a large group to discuss cross-cutting themes and issues. We used a combination of facilitated discussions and structured activities throughout the workshop. We briefly describe these in the following sections, organized by workshop day.

Figure D.1. Workshop Agenda



AGENDA

USAF Enlisted Advanced Technical Track Workshop

WEDNESDAY, JUNE 21

Defining the Demand for an Advanced Technical Track

08:30 – 09:00 Check -in
09:00 – 09:15 Welcome and Introduction (RAND)
09:15 – 10:00 Introduction Briefing and Discussion (Air Force)
10:00 – 10:45 Benefits of an Advanced Technical Track (RAND)
10:45 – 11:00 Break
11:00 – 14:00 Identifying Key Technical Roles (Small Groups)
(Small groups = functional communities [1B4, 1D7, 2A])
12:00 – 13:00 Working Lunch
14:00 – 14:30 Summary and Lessons on Key Technical Roles (Large Group)
14:30 – 16:30 Workforce Planning and Staffing Mix (Small Groups)
15:00 – 15:15 Break
16:30 – 17:00 Summary of Day 1 Topics (Large Group)

THURSDAY, JUNE 22

Career Paths and Selection Policies for an Advanced Technical Track

08:30 – 09:00 Check -in
09:00 – 10:30 Review of Day 1 and Briefing for Day 2 (RAND)
10:30 – 10:45 Break
10:45 – 14:00 Career Paths and Incentives (Small Groups)
12:00 – 13:00 Working Lunch
14:00 – 14:30 Summary and Lessons on Career Paths and Incentives (Large Group)
14:30 – 14:45 Break
14:45 – 17:00 Selecting Airmen for an Advanced Technical Track (Large Group)
The Chief Master Sergeant of the Air Force plans to give remarks but time is TBD

FRIDAY, JUNE 23

Implementation Considerations for an Advanced Technical Track

08:30 – 09:00 Check -in
09:00 – 10:30 Review of Day 2 and Briefing for Day 3 (RAND)
10:30 – 10:45 Break
10:45 – 12:00 Implementation Roadmap and Timeline (Large Group)
12:00 – 12:15 Closing Remarks

First Day of Workshop

The objective of the first day of the workshop was twofold: (1) orient the participants to the purpose of the workshop (morning presentations) and (2) identify criteria for determining which positions should be considered as part of a technical track in their career fields. We held two small-group sessions for participants to discuss position types and criteria to select positions for a technical track. In the first session, we guided a discussion about the types of job roles (e.g., superintendent) and specialty areas (e.g., network engineering) that would belong in a technical track. We then asked participants to fill out forms for what we called *mini position descriptions*, which were designed to be

similar to what federal government civilian positions require. The position descriptions included the following fields:

- role title
- specialty area
- alternative role titles
- ideal rank (four options provided: E-6, E-7, E-8, and E-9)
- proficiency level (four options provided: basic, intermediate, advanced, expert)
- role summary (i.e., open text field to briefly describe the role)
- duties/responsibilities
- required knowledge/skills
- required experience (prior assignments)
- required certificates
- required SEIs.

Each participant was asked to complete one mini position description and encouraged to fill out as many fields as possible.

For the second small-group session, we presented participants with actual position (billet) data from UMDs for their AFS. We created an interactive tool to present UMDs with different filters using data fields in UMDs, such as duty title, pay grade, MAJCOM, functional account codes, program element (payment source) codes, among others. We asked participants to identify which UMD fields that they wanted to use to identify and describe positions suited for a technical track. However, the two cyber groups (1B4 and 1D7) did not feel that reviewing the UMD positions would be valuable to determine which positions should become technical track positions. For these two AFS groups, the facilitators instead led a discussion about what factors would be relevant for determining which positions would become technical track positions.

Second Day of Workshop

On the second day of the workshop, we focused on two features of technical tracks: (1) defining the career paths and incentives for a technical track and (2) criteria and mechanisms for selecting airmen for a technical track. We held small-group sessions to discuss career paths and incentives. For career paths, we guided discussion and used whiteboarding to outline key career milestones, professional development needs, opportunities for airmen to move between tracks, and other factors that would define the career path for a technical track. For discussions about incentives, we facilitated an activity to determine incentive priorities. We used a “card sorting” activity whereby each participant received a stack of index cards, where each card had a type of incentive on it.¹ Participants were asked to independently sort the incentives from most to least important for attracting and retaining airmen

¹ The 15 incentives were derived from conversations with AF/A1 working group leadership and our team’s professional expertise. We also provided the opportunity for participants to add other incentives. They discussed these before the sorting exercise and wrote them on blank index cards.

in their AFS in a technical track. Each participant was then asked to discuss their rankings and rationales with the others in the AFS group. Below are the 15 incentives listed on the cards:

- Pay for education and training.
- Provide special and incentive pays.
- Provide monetary awards.
- Provide support programs for health and wellness.
- Take assignment preferences into account.
- Provide opportunities to work on special projects.
- Allow for flexible work schedules.
- Permit extra leave.
- Provide cutting-edge tools and resources.
- Allow for more autonomy (e.g., choice in tasks and projects, and equipment procurement).
- Allow for more relaxed dress codes.
- Provide mentoring programs and industry partnerships.
- Give recognition through awards, badges, and patches.
- Provide geographic stability.
- Waive physical fitness requirements.

After the card-sort activity, the small groups reconvened as a large group to discuss airmen selection into technical tracks.² We guided a discussion about the types of criteria for entry and the mechanisms (e.g., selection board) they thought would be useful. We captured their insights in our notes and summarized cross-cutting themes, as well as AFS-specific considerations.

Third Day of Workshop

Our final workshop day was a half-day and focused on discussing implementation of a technical track. Based on feedback from participants during large-group sessions on the second day of the workshop, we began the third day's session by describing the desired objectives to manage enlisted technical talent and COAs for changes to enlisted force management that could address those objectives. Discussions led to the six objectives and three COAs listed below.

- Six objectives:
 - Retain technical expertise.
 - Increase first-term reenlistment.
 - Increase job satisfaction.
 - Build better generalists (“raise the floor”).
 - Develop deeper expertise.
 - Increase innovation/solve “wicked problems.”

² Because the selection of airmen into technical tracks will require use of USAF enlisted force structures and policies, we thought it would be best that it be discussed as a large, cross-AFS group.

- Three COAs:
 - **Status Quo:** Do not make any significant structural changes to enlisted force management and use existing skills management tools to the greatest extent possible (e.g., expand use of SEIs to tag billets and airmen).
 - **Technical Track:** Establish an advanced technical track in the enlisted force along the lines of what the workshop discussed.
 - **Warrant Office Plus:** Establish a WO corps, LDO system, or another enlisted-to-officer structure that would move enlisted personnel into a technical officer workforce structure.

Once the objectives and COAs were agreed upon by the group, we led an activity where participants were asked to rate each objective on how important it is for managing technical talent. We then asked participants to rate how well each COA would address each objective. Participants completed this activity independently, providing their ratings on a provided form that we collected at the end of the activity. The data generated by these ratings formed the basis of our analysis of COAs and objective ratings in Chapter 5.

To end the workshop, we asked participants to summarize key features of the technical track concept for their AFS. We broke out into the small AFS groups and worked with participants to complete a PowerPoint template provided by AF/A1.³ We then reconvened as a large group and each small group had a representative present their slides to the larger group.

³ AF/A1 workshop representatives informed us that AF/A1 was moving forward with a similar pilot program for officers referred to as “Highly Specialized Officers.” We used the officer slide template from AF/A1 as the basis for summarizing the key features of technical tracks for enlisted personnel.

Abbreviations

AAP	AFPC assignment personnel
ACE	Agile Combat Employment
AETC	Air Education and Training Command
AF/A1	Air Force Manpower, Personnel and Services
AF/A1P	Air Force Directorate of Force Management Policy
AFH	Air Force Handbook
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFPC	Air Force Personnel Center
AFS	Air Force Specialty
AFSC	Air Force Specialty Code
AI	artificial intelligence
CDC	Career Development Course
CFETP	Career Field Education and Training Plan
CFM	career field manager
COA	course of action
CWO	chief warrant officer
DAF	Department of the Air Force
DAFI	Department of the Air Force Instruction
DAFMAN	Department of the Air Force Manual
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	DoD Instructions
IT	information technology
KSAO	knowledge, skills, abilities, and other characteristics
LDO	limited duty officer
MAJCOM	major command
MCA	multi-capable airmen
MFM	MAJCOM functional manager
MilPDS	Military Personnel Data System
MRA	mission ready airmen
NCO	noncommissioned officer
NLP	natural language processing
OAR	Occupational Analysis Report

OCM	occupational competency model
O*NET	Occupational Information
PAF	RAND Project AIR FORCE
PCA	permanent change of assignment
PRAP	Personnel Reliability Assessment Program
SEI	special experience identifier
SEL	senior enlisted leaders
STM	sentence transformer model
TDY	Temporary duty
TF-IDF	term frequency-inverse document frequency
TMAP	talent management assignment process
UMD	unit manning document
USAF	U.S. Air Force
USC	U.S. Code
WAPS	Weighted Airmen Promotion System
WO	warrant officer

References

AFH—See Air Force Handbook.

AFI—See Air Force Instruction.

AFMAN—See Air Force Manual.

AFPC—See Air Force Personnel Center.

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