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Civil Engineer Company Grade Officer Competency-Based Education Modeling

Scott R. Guerin

CIVIL ENGINEER COMPANY GRADE OFFICER COMPETENCY-BASED EDUCATIONAL MODEL

THESIS

Scott R. Guerin, Captain, USAF

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Scott R. Guerin, MS

Captain, USAF

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Scott R. Guerin, BS
Captain, USAF

Approved:

Tay Johannes, PhD, (Chairman)	Date
Adedeji Badiru, PhD, (Member)	Date
Col Donald Ohlemacher, (Member)	Date
Alfred E. Thal Jr., PhD, (Member)	Date

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Abstract

The importance of continuing education for professionals cannot be understated. This importance is doubly true for Air Force Civil Engineer Company Grade Officers who are members of not only the profession of engineering, but also the profession of arms. Air Force senior leaders understand this importance and required an update to the existing developmental education model, with a paradigm shift toward competency-based education and credentialing.

Unfortunately, the Air Force Civil Engineer career field does not currently possess the required information to create a model in compliance with the senior leader directives. This research aims at establishing the required characteristics of a competency-based education model for Civil Engineer Company Grade Officers, including: an enumerated list of competencies, a development timeline, and appropriate proficiency types for each competency. The research was guided by four research questions: 1) What are the required capabilities/competencies for Civil Engineer Company Grade Officers? 2) When should Civil Engineer Company Grade Officers achieve competence in the identified areas? 3) What are the temporal influences on the Civil Engineer Company Grade Officer's career? 4) How would a Civil Engineer Company Grade Officer educational model incorporate Civil Engineer competencies?

The methodology used to collect and analyze data was divided into four components. The first component was an Educational Working Group aimed at identifying a preliminary list of performance characteristics expected of Civil Engineer Company Grade Officers. The second component was a position analysis using position allocation data and published research to identify commonly advertised capabilities. The third component was a career field survey which operated as a stakeholder analysis. The fourth and final method was a Delphi Study, in which 18 experts were asked open ended questions to refine and validate acquired data, perform gap analysis, and ensure the model encompassed future developments for the career field. The end model was comprised of eighteen Civil Engineer Company Grade Officer competencies, development timelines, and types of proficiency for each.

This thesis is dedicated to both God and Country, for by His Will and for their cause it was undertaken

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Scott R. Guerin

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CIVIL ENGINEER COMPANY GRADE OFFICER COMPETENCY-BASED EDUCATIONAL MODELING

I. Introduction

1.1 The Importance of Continuing and Professional Education

Harvard University's 25th President, Derek Bok, described the importance of continuing education when he said, "If you think education is expensive, try ignorance" (Flynn et al. 2018). The word 'expensive' implies more than just high economic cost and incorporates the associated risks of failing to provide beneficiaries with adequate services. Along with implying that education can mitigate these risks, personnel development helps practitioners gain and maintain required performance capabilities and can provide a current perspective of professional ethical obligations (Flynn et al. 2018). One such ethical obligation is to continually enhance performance by learning current procedural improvements and incorporating technological advances (Institute of Medicine 2014). Understanding these current developments also postures practitioners to better cope with future challenges which arise from the dynamic nature of professional work (Walston and Khaliq 2010; Mitsunaga and Shores 1977). Additionally, less experienced practitioners can use continuing professional education to overcome the often overwhelming and unfamiliar challenges associated with their specific positions of employment (Mizell 2010). While many professions require a bachelor's degree in a specific field of study, university-based education rarely provides adequate insight to meet all employment obligations (Mizell 2010).

Employers understand this capability deficit and cumulatively spend an average of over $50 billion annually to educate their employees (Walston and Khaliq 2010). This

large education cost is not equally distributed across organizations, however, which disadvantages certain professionals. Organizations with less working capital or higher manpower requirements can have increased difficulty in developing education plans if production loss caused by employee absences exceeds local tolerances (Mizell 2010). Additional concerns stem from individual practitioners not seeking or supporting education opportunities. While the literature shows overwhelming organizational support for personnel development, individual practitioners may be reluctant to attend further education if they do not find it correlates with career or personal advancement (Walston and Khaliq 2010).

These educational challenges are common for most professions, including the profession of arms. The United States Department of Defense (DoD), as the world's largest employer, is tasked with educating over 3.2 million service members and civilian employees (Persyn and Poison 2012). This enormous task is further complicated by the numerous variables which must be included in personnel development planning. These variables include cost, timing, stamina, and individual unit requirements (Layne 2009). Additionally, individual military members commonly pursue continuing educational opportunities only if they perceive it to increase their potential for advancement in rank (Layne 2009).

When looking at the higher ranks, specifically the officers, the training and educational requirements to achieve performance proficiency continually increases. The officers must not only meet their current position demands but also holistically develop themselves within the profession of arms. The current officer educational programs, however, are facing "a moment of difficulty in tackling the problems created by new,

highly variable, and highly volatile operational contexts" (Caforio 2018). This highly variable context includes both the continued Global War on Terror operations and the 2014 reemergence of the Russian Federation as a near peer competitor (Jackson 2018; Slater et al. 2017). The Global War or Terror, which has been waged for over 18 years and has seen United States military personnel deployed to 76 countries, has shown no indication of an imminent termination (Engelhardt 2018). This ongoing conflict, coupled with the recent reemergence of near peer competitors, provides an increased likelihood that both conventional and asymmetrical conflicts could occur concurrently.

The uncertain future faced by the United States means military officer development remains paramount for ensuring global stability. In the words of the ancient Athenian General Thucydides, "The society that separates its scholars from its warriors will have its thinking done by cowards and its fighting done by fools" (Augier and Hughes 2019).

1.2 Background of the Study

The United States Air Force (USAF) is currently rebounding from the largest active duty personnel reduction in its history, resulting in the smallest total force population since its separation from the United States Army in 1947 (Roberson and Stafford 2017; Duffin 2019). The bulk of this reduction occurred between 1995 and 2015, when the active duty Air Force was reduced from 396,382 to 307,326 members (Duffin 2019). Unfortunately, this 22.5% force reduction was not predicated upon a decreased operational manpower need and, as such, the personnel development strategies were not adjusted to account for this change (Roberson and Stafford 2017). This resulted in the erosion of numerous Air Force occupational capabilities, including within the Civil

Engineer career field. Reduced Civil Engineer competencies were detailed in the 2019 Infrastructure Investment Strategy (I2S) as being caused by reduced manpower and a high operational tempo (Department of the Air Force 2019). To rectify this problem, the I2S provides numerous recommendations, including cultivating a diverse and capable workforce across the entire Civil Engineer enterprise (Department of the Air Force 2019).

The current education models, however, are unable to fully develop the Airman to meet their position's performance requirements. These models have failed to account for recent changes in Airman's backgrounds, including being raised alongside technological advances which provide them with constant information availability (Roberson and Stafford 2017). This has led to individuals being capable of accessing and applying a great wealth of information to solve various problems with much greater agility than previously observed (Roberson and Stafford 2017). These observations have not gone unnoticed by senior leaders, who now seek to leverage information availability and technological advances to ensure superiority over near-peer competitors.

The reemergence of near-peer competitors prompted former Secretary of Defense James Mattis, before the House Armed Services Committee, to say "the Department of Defense must be prepared to deal with technological, operational, and tactical surprise, which require changes to the way that we train and educate our leaders and our forces" (Roberson and Stafford 2017). This sentiment was echoed by former Secretary of the Air Force Dr. Heather Wilson, when in August 2017 she proclaimed a reprioritization to "restore readiness, cost-effective modernization, drive innovation, develop exceptional leaders, and strengthen alliances are all directly related to the way we develop our Airman" (Roberson and Stafford 2017). Overall, the demand to alter current military

educational development models is paramount for the success of military endeavors, is supported by literature, and is championed by senior military leaders.

1.3 Statement of the Problem

A primary discussion point of the February 2017 Corona Conference, held at Maxwell Air Force Base, Alabama, was Airman developmental education (Roberson and Stafford 2017). The Corona Conference is a triannual gathering of Air Force senior leadership in which strategic visions are developed regarding the Air Force's contribution toward meeting national strategic defense policies (Culbert 2018). During their discussions, the senior leaders identified and adopted five interlocking initiatives, including: Modularized Learning, Blended Learning, On-Command and On-Demand Learning, Competency-Based Learning, and the creation of an Airman's Learning Record (ALR) (Roberson and Stafford 2017). These five initiatives coalesce into a new Air Force educational system called the Continuum of Learning (COL). A visual display of the COL can be seen in Figure 1.

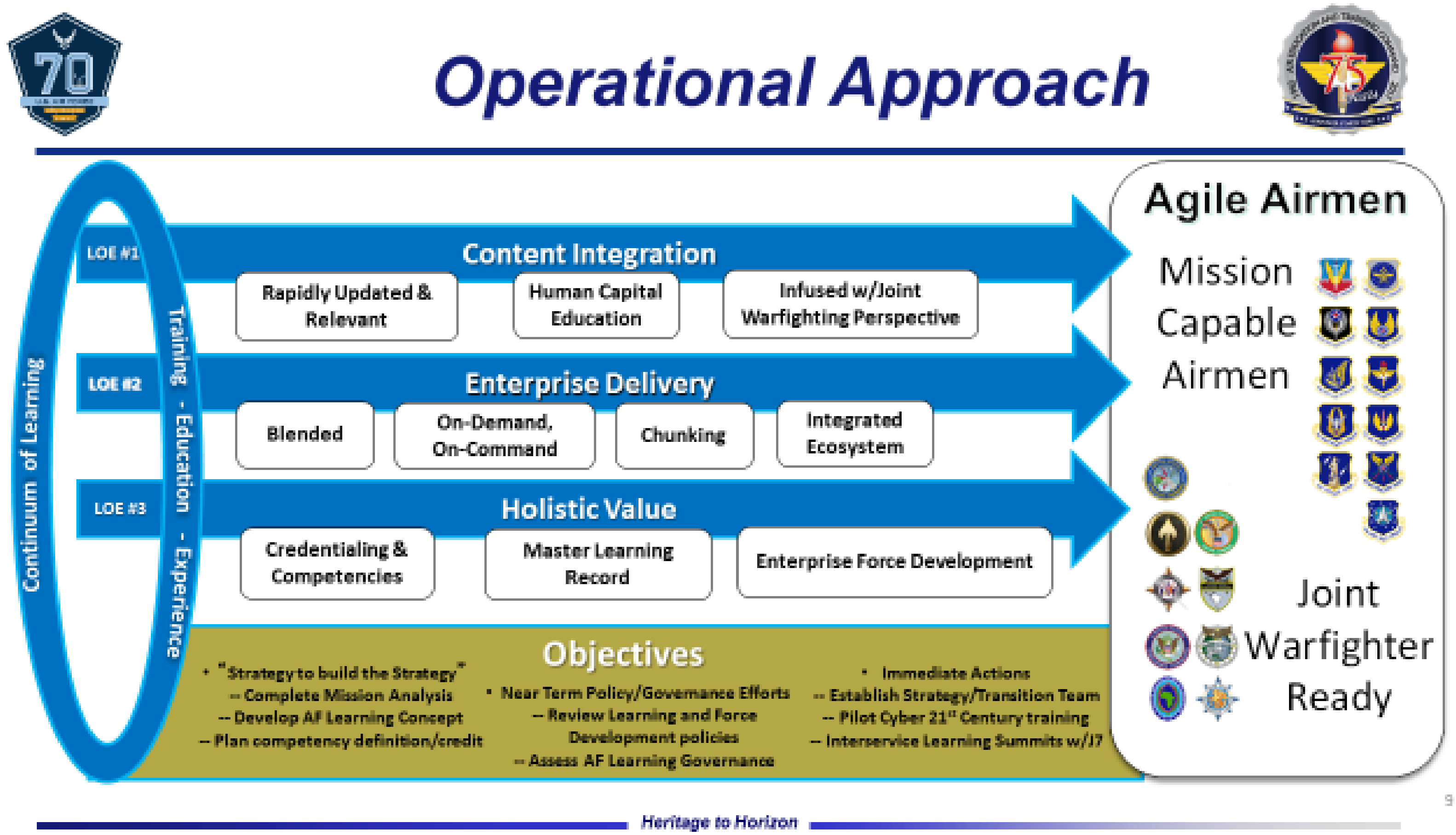

Figure 1: Operational Approach to Education (Stafford 2017)

As shown in Figure 1, three parallel pathways are utilized for Airman development. The first pathway focuses on the material taught to the Airman by integrating topics from numerous areas. The second pathway focuses on educational material conveyance by integrating multiple types of delivery avenues. These delivery methods show a wide variety of learner-centered instruction, including breaking material into small/consumable learning areas, face-to-face learning, self-paced online learning, self-study, group-projects, or integrated learning practices (Roberson and Stafford 2017; Stafford 2017). The final parallel pathway shows that members would receive competencies and credentials which would then be stored within a master learning record and would ultimately lead to an enterprise force development system (Stafford 2017).

Within these pathways and initiatives, only the inclusion of competencies was a change to the education method. According to the Corona Conference, the implementation of Competency-Based Learning will change the primary educational system to be performance-and-outcome-based, which will ultimately result in a form of credentialing (Roberson and Stafford 2017). The USAF's use of competencies is not revolutionary, with the Air Education and Training Command (AETC) maintaining a list of Institutional Competencies detailing the common capabilities expected of all Airman (Roberson and Stafford 2017; Stafford 2017). These new occupational Competency-Based Education system is intended to employ competencies as a "common currency" between organizations and to help track Airman capabilities based upon their education, training, and/or experience (Roberson and Stafford 2017). Additionally, while the institutional competencies are applicable to all Airman, the occupational competencies will be specific and related to the unique requirements of the individual's career field, position, and rank.

The Airman's competencies and proficiencies would then be tracked within the ALR, which would serve as a comprehensive record of all learning the Airman has achieved (Roberson and Stafford 2017). This would be an improvement over the current system, which exists over multiple programs and currently does not track performance capabilities (Roberson and Stafford 2017). This ensures individuals who have achieved some level of mastery or proficiency in a specified task area to gain credit for their abilities without having to repeat their learning in a traditional educational environment (Roberson and Stafford 2017).

With this change to the personnel development system, a problem arises for organizations which lack enumerated occupational competencies. The Civil Engineer Company Grade Officer peerage is no exception to this problem, with the current educational system being both non-standardized and highly variable between Civil Engineer Squadrons. The first step toward solving this problem is to determine the required capabilities of Civil Engineer Company Grade Officers and establish the competencies to be tracked in the new educational model. Once the competencies have been identified, the next step is to identify a timeline for competency attainment.

1.4 Purpose of the Study

This research endeavor seeks to identify the common Civil Engineer Company Grade Officer performance requirements and determine the approximate rank at which these capabilities must be displayed. The research results will be used to establish an occupational competency-based educational model to be utilized by the Civil Engineer School in preparing Civil Engineer Company Grade Officers to execute their duties.

Once this model has been established, the Civil Engineer career field will be better aligned with the strategic vision of USAF senior leaders.

1.5 Significance of the Research

The Air Force Civil Engineer career field does not possess a standardized education model to develop Company Grade Officers. This research will aid the Civil Engineer School in identifying gaps and opportunities in Company Grade Officer education. A secondary significance is that it would inform pending decisions regarding modularized education for the Air Force Civil Engineer enterprise. Finally, the identification of actual expectations placed upon Civil Engineer Company Grade Officers would posture the career field to adjust its education to meet the demands of Combatant Commanders.

1.6 Research Questions

The following is a list of the research questions which are sought to be resolved through the execution of this research effort:

1. What are the required capabilities/competencies for Civil Engineer Company Grade Officers?
2. When should Civil Engineer Company Grade Officers achieve competence in the identified areas?
3. What are the temporal influences on the Civil Engineer Company Grade Officer’s career?
4. How would a Civil Engineer Company Grade Officer educational model incorporate Civil Engineer competencies?

1.7 Limitations

There were three research limitation areas for this study. These limitation areas include Scope Limitations, Data Limitations, and Analysis Limitations, and are detailed as follows:

1.7.1 Scope Limitations

The research scope was limited to Air Force Civil Engineer Company Grade Officers competencies and development timelines. Investigation into educational requirements for any other military-branch engineer career fields, other public organizations, any private organizations, Air Force Civil Engineer Field Grade Officers, or Air Force Civil Engineer Enlisted were not included. The Company Grade Officer ranks included Second Lieutenants (O-1), First Lieutenants (O-2), and Captains (O-3). Additionally, this study did not address how the resulting model will be used by either the Civil Engineer School, the Air Force Civil Engineer career field, or any other organization. Finally, this study did not include the creation of, or applicability to, a centralized or decentralized competency tracking system.

1.7.2 Data Limitations

The 2018 Education Working Group panel members were not previously designated as experts of the Civil Engineer career field. Although they meet the peer-nomination/superior-nomination requirement for expert designation, many did not possess the recommended 10 years of experience. This results in the data obtained from this initial investigation as being potentially inaccurate, which may have influenced the 2019 career field survey. Additionally, the 2018 Education Working Group panel members were not experts in competency writing, which may have hindered their

abilities to convey their opinions on Civil Engineer Company Grade Officer requirements. Furthermore, the Air Force Personnel Center (AFPC) does not maintain historical position data beyond a single year. The position-data received from AFPC, therefore, cannot be used to address position change trends to aid in forecasting future competency requirements. Finally, the Air Force Published Literature, as it pertains to the Civil Engineer (Civil Engineer) career field position requirements, is rarely updated and the Delphi Study panel members asserted that the provided information does not reflect accurate conditions.

1.7.3 Scope Limitations

Complete consensus of the Delphi Study Panel members could not be achieved in the three study rounds. This resulted in the final model not completely meeting the Delphi Study objective. Additionally, the first and second Delphi Study rounds only received 8 expert responses for each, which may have influenced the final model proposition of the third round.

1.8 Assumptions

The following are the research assumptions:

1. The career field survey responses represent the Civil Engineer career field and Combatant Commander requirements and opinions.
2. The survey verbiage accurately conveys the researcher's questions and are uniformly interpreted by the respondents.

3. The Air Force Personnel Command Civil Engineer position-based data is accurate, including encompassing local adaptations of position titles and requirements.
4. The Delphi Study expert panel members are objective and representative of the career field.

1.9 Organization

This thesis is comprised of five distinct chapters, which provide the business case for the study. The first chapter explains the importance of officer education, provides the research background and rationale, explains the need for altering Civil Engineer Company Grade Officer education, describes the research significance, poses the research questions to be resolved, details the study limitations, confers the acknowledged assumptions, and provides the research framework.

The second chapter provides a detailed literature review related to both competency-based education and the United States Air Force Civil Engineer career field. The chapter starts with an introduction detailing Air Force literature authored by senior leaders, which mandates the transition to competency-based education for personnel development. The second and third parts of this chapter provides the history of both Civil Engineer Officer education and competency-based learning, respectively. The fourth part details how competency-based education models are established and maintained. The fifth and sixth sections discuss the advantages and disadvantages of these educational system, while the seventh identifies the applicability of these models for Civil Engineer Company Grade Officers.

The third chapter discusses all four research methodologies, including the 2018 Education Working Group, analysis of Civil Engineer Company Grade Officer position data combined with advertised capabilities of these positions, a career field survey, and a Delphi Study. This chapter will discuss how the participants were selected, the instruments used to collect the data, and the analysis procedures used to reach the conclusion.

The fourth chapter discusses the research results and details how each method contributed toward the final competency-based education model. This includes how the 2018 Education Working Group, position analysis, and career field survey influenced the Delphi Study questions. Additionally, each Delphi Study question will be analyzed to reveal progress toward model establishment and research question resolution. The final discussion area provides the final 18 competency model, with development timeline and proficiency level requirements.

The fifth and final chapter will provide a summary of the findings, resolution of research questions, provide a final outlook of the educational model, and provide recommendations for future research. These recommendations will include the identifications of where future data may be able to strengthen the model, when the model should be updated, the applicability of this research toward Civil Engineer Field Grade Officers, and how the Civil Engineer career field should assess competencies.

II. Literature Review

This chapter reviews relevant literature for establishing a Civil Engineer Company Grade Officer competency-based education model. The second section details Civil Engineer Officer education history, from the creation of the United States Air Force in 1947, till the beginning of the modern era in 2012. The history review seeks to identify the relationship between the proposed competency-based education model and previous military officer development models. The third section provides competency-based education's historical background and shows how these models evolved over time. The fourth section details the current competency-based education model establishment processes and provides the basis for selecting research methods. This section further details required model components, including how to identify the occupational performance attributes and educational timelines. For this research's purpose, performance attributes include knowledge, skills, abilities, and/or other characteristic which must be displayed by Civil Engineer Company Grade Officers (Campion et al. 2011; McClarty and Gaertner 2015; Pijl-Zieber et al. 2014). The fifth section discusses the advantages these models can provide, while the sixth section counterposes by providing the challenges associated with competency-based education. The seventh section provides an overview of Civil Engineer Company Grade Officers and the relevance of competency-based education to these individuals. The eighth section details the current Career Field Education and Training Plan to contextualize the differences between the existing and proposed models. The ninth section discusses research method selection process and Delphi Study overview.

2.1 History of Civil Engineer Officer Education and Training

Immediately following the Second World War, the United States Air Force was established as an independent military branch from the United States Army Air Corps (Hertzer et al. 2014). The Air Force was given much of the former Air Corp's supporting infrastructure, including the Army Air Force Institute of Technology (Hertzer et al. 2014). This educational establishment was renamed the Air Force Institute of Technology (AFIT) and became the primary location for Air Installations Officer education, the precursors of modern Civil Engineers (Hertzer et al. 2014). At AFIT, these officers attended the Air Installations Engineering Special Staff Officers Course before starting employment at their installations (Hertzer et al. 2014). This course taught the career field history and basic occupational requirements for Air Installations Officers, a purpose which is mirrored by the current Air Force Civil Engineer Basic Course (Hertzer et al. 2014; The Civil Engineer School 2019). Other topics taught during the course included buildings and structures, master planning, cost accounting, property and supply, and preventative maintenance (Hertzer et al. 2014). The course's information conveyance methods included classroom lecture, laboratory experiments, and field trip experiential components (Hertzer et al. 2014). This blended learning environment displays an early acknowledgement that multiple education methods can provide greater development than purely liberal-education-based programs. Additionally, this early education model measured expected officer performance through the laboratory instruction and field trips, which ultimately reveals competency-based learning has existed within the Civil Engineer career field since 1947.

Between 1947 and the early 1950s, a bachelor's degree in engineering or architecture was not a requirement to serve as an Air Installations Officer (Hertzer et al. 2014). Senior career field leaders soon realized that position requirements and expectations could only be met if officers possessed a technical degree and mandated it as an employment prerequisite (Hertzer et al. 2014). The degree mandate specifically listed city planning, architecture, civil engineering, mechanical engineering, electrical engineering, and industrial engineering as acceptable fields (Hertzer et al. 2014). While these degrees were mandatory, the requirements were often waived if the individual had civilian engineering workforce experience (Hertzer et al. 2014). Waiving education requirements based on performance capabilities exemplifies a historical perspective for competency-based education. Additionally, the waiving of these requirements does not show the career field devalued education and merely exemplifies an understanding that university-based education does not solely prepare individuals to meet all employment requirements.

To further meet employment requirements, two additional mandatory courses were created to replace the Air Installations Engineering Special Staff Officer Course (Hertzer et al. 2014). These two courses increased instruction time to 28-weeks, with the first course being 8-weeks and the advanced course being 20-weeks (Hertzer et al. 2014). The 28-week contact time is more than triple the current 9-week course and had an audience including both new and experienced officers (Hertzer et al. 2014). Experienced officers could retake the course if they desired to refresh their skills and learn about standard operating procedure updates (Hertzer et al. 2014). One commonality between the original and current basic course was the debate regarding Civil Engineer officer

attendance timelines. There was, and has continued to be, considerable debate on the topic of gaining experience prior to attending the course or if the individual should attend as soon as they enter active duty (Hertzer et al. 2014). This debate's premise was Civil Engineer operational complexities and resulted in the 1956 course extension to 37 weeks (Hertzer et al. 2014).

As the United States Air Force continued to develop its role as an independent military branch, the Civil Engineer officer education system also continued to evolve. By the early 1960s, Civil Engineer officers were being encouraged to pursue professional licensure, certification, and registration (Hertzer et al. 2014). To help with this goal, the Professional Education Program and the Education-With-Industry (EWI) Program were created to help Civil Engineer Officers prepare for the Engineer-in-Training (EIT) and Professional Engineer (PE) exams, in 1963 (Hertzer et al. 2014). These two courses aided the career field in attaining over 45% of its Civil Engineer Officers being either professionally licensed/registered or attending the test preparation courses (Hertzer et al. 2014). Attaining these licenses, however, had the unexpected consequences of career field members pursing higher salaries outside the military. By 1964, more than 50% of mechanical and electrical degree holding engineers were transitioning to the civilian sector workforce (Hetzer et al. 2014). To combat this manpower loss, AFIT created the 9-week Applied Engineering Course (Hertzer et al. 2014). This course was divided into two portions, one which focused on coursework and the other focused on individual performance (Hertzer et al. 2014). This blended learning environment further substantiates the historical inclusion of competency-based learning within Civil Engineer career field's education plans.

By 1969, nearly nine thousand Civil Engineer officers had graduated from the Civil Engineer School Short Course Program (Hertzer et al. 2014). This program offered Civil Engineer Officers the opportunity to learn about technological advances in civil engineering, executive engineering, pavement engineering, and management (Hetzer et al. 2014). These AFIT courses were eventually found to be insufficient in meeting the career field's education and training demands. In the early 1970s, the Base Civil Engineer In-House Training Program was created to improve the performance of engineering officers at base level (Hetzer et al. 2014).Because each base had different specific requirement, the Base Civil Engineer was responsible for identifying and executing training programs which met the installation's requirements (Hetzer et al. 2014). The Squadron Commanders acting as chief performance assessor is like the recommendation of the proposed competency-based education model.

The 1970 oil and energy crisis revealed risks to Air Force contributions toward national security and led to AFIT adapting the Short Course Program to educate Civil Engineer officers about energy component infrastructure management (Hertzer et al. 2014). Course topics included energy conservation, solar power, contemporary energy applications, and facility energy systems (Hertzer et al. 2014). The target audience was Civil Engineer officers with mechanical or electrical backgrounds but was open to all career field members (Hertzer et al. 2014). The Civil Engineer officer educational and training opportunities resulted in one of the most highly educated workforces in the United States Air Force (Hetzer et al. 2014). By 1975, 40% of Air Force Civil Engineer Officers held master's degrees, including many from the USAF Graduate Facilities Management Program (Hetzer et al. 2014).

In the 1980s, the USAF began supporting doctoral education for 33 positions, specifically for advanced technology, research, and development (Hetzer et al. 2014). An additional change was the increased focus on deployment training and readiness education (Hetzer et al. 2014). This training and education included emergency repair to essential facilities and utilities damaged in war, rapid runway repair, bomb damage repair, preparing and maintaining deployed locations, and crash rescue (Hetzer et al. 2014). To provide more accurate training environments, the Prime BEEF Contingency Force performed exercises at Eglin Air Force Base (Hetzer et al. 2014). While at Eglin AFB, Civil Engineers would perform a five-day simulated base recovery exercise, which was accomplished regardless of weather conditions (Hetzer et al. 2014). Furthermore, multiple large exercises were executed to prepare Civil Engineers for expected confrontations with the Union of Soviet Socialist Republics (USSR). The first of these exercises was code named Jack Frost 79 and occurred at Alaska's Clear Creek Landing Zone (Hetzer et al. 2014). The Clear Creek Landing Zone was selected because it was like European and Asian battlefields where confrontations with the USSR were likely to occur (Hetzer et al. 2014). This full-scale expeditionary mock-deployment was considered a success and proved Prime BEEF units were ready for various environments (Hetzer et al. 2014). The second exercise was named Salty Demo and occurred at Spangdahlem Air Base, West Germany in 1985 (Hetzer et al. 2014). Salty Demo included a live air base attack demonstration followed by recovery actions. The recovery actions included both damage assessment and airfield pavement repair, which was timed to meet predetermined constraints (Hetzer et al. 2014). The exercise results were far

reaching and included establishing Explosive Ordinance Disposal within the Civil Engineer Enterprise and the AM-2 matting development (Hetzer et al. 2014).

Civil Engineer officer education dramatically changed in the early 1990s, in the aftermath of the USSR collapse and 1991 Invasion of Iraq (Hetzer et al. 2014). AFIT began offering on-site continuing education at installations by sending instructors to the bases (Hetzer et al. 2014). Additionally, the Basic Course was changed to seven weeks of AFIT coursework and an eight-day exercise at the Silver Flag Site (Hetzer et al. 2014). A second course was also created to finalize the initial skills development, named ENG 485: Combat Engineering Course (Hetzer et al. 2014). The final early 1990s educational change was the first enlisted Career Field Education and Training Plan (CFETP) being created in 1992, following the Inter-Service Training Review Organization Committee capability assessment (Hetzer et al. 2014). The CFETP framework was eventually adapted for officers in 1997, after the conclusion of debates regarding the appropriate core tasks (Hetzer et al. 2014).

In 1993, a new Silver Flag site was created at Tyndall AFB, Florida, which would begin hosting Readiness Challenges. The training offered at this new site included beddown procedures, general troop support, food services, and mortuary operations (Hetzer et al. 2014). The training was inspired from lessons learned in Desert Storm/Desert Shield, which showed additional training should be created for bare base assets (Hetzer et al. 2014). Furthermore, there were changes to the way that civil engineers attended exercises, with the dynamic changes in the world’s military posturing following the collapse of the USSR. These included the Foal Eagle Exercises with the Republic of Korea, the Green Flag Exercise, and the Engineer Capstone Exercise. The

Foal Eagle Exercises were joint operations between the United States and the Republic of Korea which focused on the rapid repair of damaged assets (Hetzer et al. 2014). The Green Flag Exercise occurred in 1995 at Nellis Range, Nevada, with Civil Engineers displaying competence in camouflage, concealment, and deception operations (Hetzer et al. 2014). The 1996 Engineer Capstone Exercise occurred at various locations within the Kingdom of Cambodia. This constituted the largest U.S. troop deployment since the Vietnam war and was intended as both humanitarian support and deployment training (Hetzer et al. 2014).

The early 2000s saw education and training initiatives bring constrained by the Global War on Terror (GWOT) requirements (Hetzer et al. 2014). Overseas rotational manpower requirements reduced Airman time availability and budget requirements decreased available funding to support classes (Hetzer et al. 2014). Also, utility privatization reduced organic training opportunities on certain assets (Hetzer et al. 2014). The remaining education and training plan drove initiatives toward join operations, with Civil Engineer officers readily deploying alongside sister service members (Hetzer et al. 2014). Air Force Civil Engineers often build and maintain installations when deployed in these roles, and AFIT created the Engineering 480: Simplified Facilities Design Course in 2005 to help prepare for these assignments (Hetzer et al. 2014). Also in 2005, the Joint Engineer Operations Course was established to align engineers of all services into the requirements of their roles (Hetzer et al. 2014). The joint nature of the modern training and educational methods saw more engineer personnel attending the Silver Flag Trainings, rather than just key personnel (Hetzer et al. 2014).

2.2 Historical Background of Competency-Based Education

Competency-based education history began with the application of the scientific method to labor roles (Ford 2014; Brown 1994). In these early models, individuals would apprentice under a master artisan and would only progress into independent practice by proving competence with a 'masterpiece' (Brown 1994). The inclusion of the word 'competence/competency' within these education programs, however, did not occur until the early 1960s teacher education reforms (Ford 2014; Brown 1994; Tuxworth 1989). These reforms, and the refinement which immediately followed, provided the baseline for modern competency-based education models and included the competency-based education being included in higher education (Ford 2014; Brown 1994; Tuxworth 1989).

Since the 1960s, competency-based education framework capabilities have expanded applicability to the program, institutional, and even national levels (Ford 2014). Increased model applicability and popularity is partially due to the 1970 United States Department of Education initiatives. At that time, the Department of Education established the 'Fund for the Improvement of Postsecondary Education', which provided monetary support to develop competency-based education at locations where adult-learning was already occurring (McClarty and Gaertner 2015). These programs were largely successful and other nations began developing competency-based education models. In the 1980s and 1990s, the United Kingdom and its constituent commonwealth nations began national education reforms, which encouraged competency-based models (Ford 2014; Hodge and Harris 2012). Australia, specifically, mandated all accredited vocational educational programs transition to performance-based assessments (Ford 2014; Hodge and Harris 2012). Also at this time, the United States Department of Labor began championing

competency-based learning to reduce the industrial sector's large demand for skilled laborers (Ford 2014; Ganzglass et al. 2011). The Department of Labor also identified the value of stackable credentials which could ensure that hired labor can meet the current demands or could be altered to meet the future demands of the manufacturing sector (Ford 2014; Ganzglass et al. 2011).

The late 1990s and early 2000s saw the attempted adaption of competency-based education models into non-vocational applications. A common non-vocational model application was medical education and training (Carraccio et al. 2002). While current medical applications have been largely successful, early model adaptations failed at the conceptual level. These failures occurred because existing systems were unable to link performance measures to medical curriculum and assessment tools had not been properly developed (Ford 2014; Carraccio et al. 2002).

These initial problems have since been overcome and competency-based education models can now be found at even the most elite, Ivy League, schools. Brown University incorporates competency-based education in its MD2000 program, at its Alpert Medical School (Carraccio et al. 2002). With this program, the Alpert Medical School developed a series of competencies, proficiency levels, and unambiguous performance criteria to assess a student's skill level (Carraccio et al. 2002). Prior to graduation, each student must demonstrate competence through application of performance tasks (Carraccio et al. 2002). Overall, this educational model allowed the Alpert Medical School to maintain a ranking between #20 and #26 of 179 total medical schools in the United States (Stanger and Martin 2015; US News and World Report 2019).

Baylor College of Dentistry is another notable program which utilizes competency-based education (Carraccio et al. 2002). Although this program is substantially smaller than the MD2000, it has displayed multiple great improvements in graduate capabilities. These observed improvements include reduced clinical skill failure and complication rates in invasive procedures (Carraccio et al. 2002). Student skill improvements have been validated through three measurement criteria, including pre-testing, group instruction, and hands-on teaching (Carraccio et al. 2002).

Modern competency-based programs extent to more than just medical education, with many education accreditation organizations employ performance-based programs. A non-exclusive list of these accreditation organizations includes: the American Accreditation Board of Engineering and Technology Engineering Criteria 2000, the United Kingdom's OSC Engineering Occupational Standards, Australia's Engineering Attributes, Japan's Employable Personal Qualities, and the European Union's Generic Employability Standards (Zaharim et al. 2010).

In 2013, the National Institute for Learning Outcome Assessments (NILOA) polled 1,202 accredited universities, including public and private institutions, about their application of outcome/competency-based criteria for graduation (Kuh et al. 2014). The polling results showed 43% of responding universities had used competency-based learning, which was a 10% increase since 2009 (Kuh et al. 2014). Other noteworthy examples of higher education institutes or organizations employing competency-based learning the American Association of Colleges and University's (AAC&U) Liberal Education and America's Promise (LEAP) Program (Klein-Collins 2013), the State

University of New York's OPEN SUNY Program (Travers and McGuigge 2013), and Southern New Hampshire's College of America Program (Klein-Collins 2013).

Current non-educational competency-based education applications extend into the organic capabilities of multiple large corporations, including both the Ford Motor Company and the Boeing Company. The Ford Motor Company maintains a special human resources team at their World Company Headquarters which oversees its competency-based training and hiring processes (Jones and Voorhees 2002). This team uses the Ford Company's model to determine an individual's suitability for salaried positions and identify competent individuals for promotion (Jones and Voorhees 2002). The Ford model components were based on educational programs employed by Phillip Morris, Texas Instruments, and British Airways (Jones and Voorhees 2002). In the initial interview, the potential employee is given an opportunity to display competence through a written examination (Jones and Voorhees 2002). If the potential employee displays an adequate level of competency, a second interview is offered. The second interview places the individual in a simulated job environment to prove their capabilities and performance potential (Jones and Voorhees 2002). Successfully passing both interviews will result in hiring (Jones and Voorhees 2002).

The Boeing Company employs a similar initial competency model, but also uses a well-defined iterative process to keep their model current and competitive. The first step of the Boeing model is to align their model with organizational long-term goals and receive approval from top-level leadership (Campion et al. 2011). This solicitation of top-level leadership is important to competency-based education models because these individuals can provide insight into the future organizational direction. The second step of

the model is to establish a cross-functional team which integrates the competencies with the human resource policies (Campion et al. 2011). During this stage, a set of common definitions are established to standardize the usage across the organization (Campion et al. 2011). The third step is to identify the data gathering and analysis methods to ensure that the data collected is accurate and that data integrity holds as competencies are added or removed (Campion et al. 2011). The final element is to maintain the process and to revisit/update the model on a five-year periodic basis (Campion et al. 2011).

2.3 Modeling Competency-Based Education

Establishing competency-based education models starts with understanding how employee performance contributes toward organizational goal accomplishment (Campion et al. 2011). Aligning performance attributes and corporate strategy includes identifying all factors which influence the employee's behaviors and determining common needed improvement areas (Campion et al. 2011; Jones and Voorhees 2002; Rouvrais et al. 2006; Frank et al. 2010). This analysis allows senior organizational leaders to correlate employee action with positional outcomes and determine if current operations are adequately meeting requirements. Senior leader involvement is critical for establishing these models because higher level management can provide greater insight to potential future organizational operations changes (Campion et al. 2011). These upper managers may not know specific position competency requirements, however, which requires lower level managers to perform additional analysis (Campion et al. 2011).

A recommended method to identify competency requirements is rigorous job analysis (Campion et al. 2011). Rigorous job analysis takes a holistic approach in acquiring position information, and generally utilized multiple data collection techniques.

Common position data collection techniques include current position observations, Subject Matter Expert interviews, structured brainstorming sessions, and stakeholder analysis (Campion et al. 2011). Current position observations can occur either formally or organically, and can include watching employees perform their duties, providing an employee survey, or controlled simulations (Campion et al. 2011). Additionally, position observations can occur through analyzing advertised capabilities listed within organizational literature. The second method, Subject Matter Interviews, includes soliciting experts' opinions about positional requirements. These experts do not need to be organizational employees but should meet the literature recommended requirements for expert designation. The third method, structured brainstorming sessions, has individual's hypothesis and discuss the desired outcomes from various positions. This method looks at what should be accomplished rather than current operations. The final method, stakeholder analysis, has individuals affected by positional or organizational outcomes express their opinions, wants, and needs.

After position data acquisition, model establishment has four steps, including: describing performance requirements, determining competency assessment methods, creating a testing scheme, and identifying the proficiency types and levels (Jones and Voorhees 2002). Competencies should be written as specific as possible, yet general enough to apply to multiple situations. Specific competency wording is important because: 1) competencies guide coursework direction, 2) competencies provide a common performance requirement understanding to stakeholders, and 3) competencies inform how the coursework assessment (Jones and Voorhees 2002).

The emphasis placed on performance measures is a dramatic change from common traditional education systems in most fields of study (Frank et al. 2010). According to the National Library of Medicine, most education models do not focus curricula toward defined graduated student performance capabilities, nor do they provide a final knowledge assessment (Frank et al. 2010). However, the second step competency-based model development does borrow concepts from these traditional programs. The examinations which commonly occur in liberal-education models are also used in competency-based education as milestones towards proficiency goals (Frank et al. 2010). These small milestones are used as learning objectives within the individual's education and become overall competency requirements.

After defining competencies and learning objectives, the third step is to determine student assessment methods. The assessment criteria should include multiple disparate and diverse techniques which provide a multifaceted approach toward measuring student proficiency, including both formative and summative assessments (Stafford 2017). Formative assessments provide educators with feedback regarding the student's understanding and occurs during instruction periods (Stafford 2017). Assessment examples include tests, quizzes, and homework assignments, but differ from the traditional examples by focusing on performance-based problems. The second proficiency measuring type, summative assessments, determines the student's overall mastery prior to graduation but after instruction completion (Stafford 2017). This final assessment, being similar to an exit exam, is generally provided in multiple varied formats to ensure the students capabilities are not situational and can be applied to concepts beyond the testing

situations (Stafford 2017). At the formal instruction period completion, the instructor should not doubt the student's capabilities and certify a competency level.

Competency levels, commonly called proficiency levels, are broken down into two separate categories: scaled or binary. A scaled proficiency type generally has five distinct levels, with education-exclusive components only able to certify the first four levels (Stafford 2017; Carraccio et al. 2002). Individuals at the first proficiency level are designated as 'Novice/Basic Practitioners'. These individuals can perform tasks directly related to isolated concepts they were specifically taught (Stafford 2017; Carraccio et al. 2002). This level focuses exclusively on cognitive abilities, not necessarily applying instructed material (Stafford 2017; Carraccio et al. 2002). Written tests are used as the general testing method for 'Novices/Basic Practitioners' (Stafford 2017; Carraccio et al. 2002).

Individuals who progress to the second competence level are designated 'Beginners/Intermediate Practitioners'. These individuals can often synthesize and integrate relevant information to determine appropriate courses of action (Stafford 2017; Carraccio et al. 2002). Simulated problems and situations are used to assess 'Beginners/Intermediate Practitioners' (Stafford 2017; Carraccio et al. 2002). These simulations include replicating controlled experiences that graduated students may encounter during the employment.

Individuals at the third level of proficiency are designated 'Competent/Proficient Practitioners'. 'Competent/Proficient Practitioners' can display competency in a work setting but require direct supervision (Stafford 2017; Carraccio et al. 2002). These individuals are assessed for subjective reasoning abilities and common testing apparatus'

include supervisor evaluation, test case/case study reproduction, or creating work products (Stafford 2017; Carraccio et al. 2002).

Individuals at the fourth proficiency level are designated ‘Proficient/Skilled Practitioners’. These individuals can practice their competencies with minimal supervision and are assessed by the same work-related indicators as the third proficiency level (Stafford 2017; Carraccio et al. 2002). The third and fourth proficiency level’s nomenclature exemplifies the failure to standardize a common competency-based education lexicon across organizations.

The final proficiency level includes those individuals designated as ‘Experts/Advanced Practitioners’. This level cannot be designed from education-exclusive development and requires individuals gain experience prior to attainment (Stafford 2017; Carraccio et al. 2002). ‘Experts/Advanced Practitioners’ can both practice their craft unsupervised and supervise lower proficiency members (Stafford 2017; Carraccio et al. 2002). The only assessment criteria for ‘Experts/Advanced Practitioners’ are self-administered tests based on internalized standards of mastery (Stafford 2017; Carraccio et al. 2002).

There are situations, however, where organizations do not develop its members through multiple levels of competence, and merely require members to exceed a minimum standard. The proficiency levels then become binary, with members either passing or failing to meet the standard. In many cases, the binary proficiency measures are combined with other smaller tasks to generate an overall categorical competence classification score (Green and Wigdor 1991).

Upon model establishment, the first common competency-based education usage is during the hiring process. Organizations who employ these models generally assess potential applicants for position suitability, based on already attained proficiency levels (Campion et al. 2011). After hiring, the competency-based assessments allow the employer to create educational courses to build upon the specific members competency (Campion et al. 2011). Additionally, competency-based education is commonly used to guide an employee's career based on their own desires to attain certain positions (Campion et al. 2011). By identifying the competency requirements for various positions, employees can pursue development opportunities to better posture themselves for advancement. Finally, competency-based education can manage critical skill retention during reduction-in-force activities through identification and measurement of competencies tied to current and future organizational objectives (Campion et al. 2011). Ultimately, though, this entire process hinges upon being able to identify and evaluate the level of competence in the practitioner.

2.4 Advantages of Competency-Based Learning

The first competency-based education advantage is the program's flexibility to adjust to dynamic changes in educational requirements, forecasted practitioner demands, and individual students learning requirements. The flexibility to meet student learning requirements comes from the individual's ability to prove proficiency in content areas prior to attending formal education (Stafford 2017). To exemplify, if an individual has multiple years of project management practice, they will receive certification in competent areas and would receive instruction only in content they had not mastered.

The second competency-based education advantage is the potential for greater resource efficiency (Stafford 2017). Organizations can certify an individual's proficiency without expending funds on unneeded formal education (Frank et al. 2010). This benefit comes from both direct education time cost savings and reduced indirect overhead personnel costs (Frank et al. 2010). Secondly, individuals who attain mastery before course completion would graduate early and rejoin their organization's workforce (Frank et al. 2010). Furthermore, traditional education methods emphasize contact time between student and, while this method would allow students to test-out of topics (Frank et al. 2010).

The de-coupling of education and time reveals the third advantage, the tailoring of education to meet student needs (Stafford 2017). By removing the rigid time structure of traditional models, students can progress at their own pace, regardless of the pace of their peers (McClarty and Gaertner 2015). If a student is struggling to understand a concept, then they take greater time at it and students who master subjects quickly can progress forward without being slowed down by classmates. Additionally, this model allows students to take more responsibility toward their development by establishing milestones along a transparent pathway toward competence (Frank et al. 2010). Also tailored to users is the multiple modes of conveying learning (Klein-Collins 2013).

The fourth advantage is a better understanding of graduate student capabilities. By directly assessing graduate student capabilities, employers can better leverage attained capabilities into more suitable roles (Frank et al. 2010). Additionally, understanding individual capabilities allows organizations to develop their employees in areas of weakness. Furthermore, advertising graduate capabilities makes the certifications portable

(Frank et al. 2010) and can help to identify/distinguish top performers (Campion et al. 2011).

The final primary advantage is the promotion of continuous learning (Frank et al. 2010). Competency-Based models are built with an inherent understanding that both the individual's abilities and performance requirements are dynamic. Students must remain up-to-date on recent discoveries or best-practices to maintain competence beyond initial skills development (Frank et al. 2010). This is similar to the continuing education requirements for multiple types of professional licensure, such as the Professional Engineer (PE).

2.5 Disadvantages & Challenges of Competency-Based Learning

Competency-based education disadvantages include disagreements on model applicability, benefits, and disadvantages. Even within occupational fields which commonly use these programs, such as medical education, there is minimal consensus on model attributes (Edwards et al. 2009; Frank et al. 2010). Contended model attributes include competency verbiage, development, uses, assessments, and credentialing. This failure to achieve consensus has made competencies attained through these models non-transferable and defeats a major purpose of competency-based education championed by the United States Department of Labor. A partial reason for credential non-transferability comes from disagreements regarding proficiency level designations and assessment tools (Ford 2014; Frank et al. 2010). This problem is exacerbated when different organizations utilize different proficiency models, i.e. binary versus scaled. Furthermore, individual organizations often generate unique testing procedures, which may not be accepted by other organizations. This disagreement can be focused on the fact that performance-based

testing can enable students to hide a lack of knowledge through other personal characteristics (Pijl-Zieber et al. 2014; Edwards et al. 2009). These personal characteristics include comfort-level, confidence, and self-efficacy, and being high in these and low in knowledge may appear to be competent when they are not (Pijl-Zieber et al. 2014). Ultimately, this means that competencies are often non-transferable.

Additionally, these models can be difficult to implement. The most common challenge with model implementation is acquiring adequate senior leadership support (Hollenbeck and McCall 2003; Kuh et al. 2014). This challenge can be amplified during leadership turnover, in which successive leaders may repeal previously provided support for developing competency-based models (Hollenbeck and McCall 2003; Kuh et al. 2014).

If leadership support can be achieved, the next disadvantage is the difficulty involved with developing the model. It is challenging to devise framework which can provide recognized academic credit, even with external assistance (Ganzglass et al. 2011). Additionally, it is difficult to establish the measurement/assessment tools which are both accurate and reliable (Pijl-Zieber et al. 2014). These concerns stem from measuring tools either being too sensitive or specific, resulting in difficulties in determining where the line of competence level resides (Pijl-Zieber et al. 2014). Also, if a model can be established, neither the competencies nor organizational objectives tend to remain constant (Ford 2014). These changes come from evolutionary nature of industry, as well as evidence of student performance. This means that competencies need constant support and adjustment, and some argue that this extra effort is not worth the potential benefits (Ford 2014). Furthermore, competency-based education is useless unless talent-management construct is created to properly track and manage the levels of competency of graduates and students

(Stafford 2017). Finally, and only under certain conditions, the assessments of competence can be more expensive than traditional liberal education (Pijl-Zieber et al. 2014). An example of this is Nursing Education Clinicals, which can cost a university a great deal of money if a mutual partnership is not established (Pijl-Zieber et al. 2014).

The final disadvantage is a lack of universal organizational support for these education models. The use of these models has not been sufficiently widespread to receive the refinement required to be universally implemented. Currently, the Department of Education has explained that these educational models are not developed enough to be transported between educational institutions nor economic sectors (McClarty and Gaertner 2015). This limited portability of the credits earned has resulted in push-back from students and instructors alike (Frank et al. 2010). Opponents of these models also argue that these models are too utilitarian and grant only specific knowledge, which can be seen as a reduction in critical-thinking learning (Stafford 2017; Frank et al. 2010). Following this argument is that the competencies are matched exclusively to an outcome list but does not take into account how these outcomes integrate into an overall operation (Ford 2014; Kleins-Collins 2013; Schneider 2013). This can lead organizations to make broader competencies which encompass greater applications of the knowledge but become difficult to test (Ford 2014; Kleins-Collins 2013; Schneider 2013). There are also disadvantages from the other spectrum, where organizations fall into a process of reductionism (Frank et al. 2010). This reductionism is a continual breakdown of competencies into smaller and smaller units, leading to an unlimited nesting of abilities which become impossible to test (Frank et al. 2010).

2.6 Civil Engineer Company Grade Officer Context, Overview, and Guidance

According to the Air Force Personnel Center's Civil Engineer Company Grade Officer Assignment's Officer, during the 20 March 2019 assignments discussion with Air Force Institute of Technology's Engineering Management Students, the general goal for Civil Engineer Company Grade Officer development is to "grow, nurture, and cultivate CE Officers to become Squadron Commanders". The assignment's officer quickly followed this quote by saying "all roads lead to squadron command" and "the general goal is to make Squadron Commanders". This overall goal is, therefore, an organizational objective of Civil Engineer officer education and provides an approximate deadline for proficiency development. Generally, Civil Engineer officers command squadrons at the rank of Major selected for promotion to Lieutenant Colonel or Lieutenant Colonel. According to Department of Defense Instruction 1320.12, officers are generally selected for promotion to Major between years 9 and 11 of total active service, with selection for promotion to Lieutenant Colonel occuring between years 15 and 17 of service (Department of Defense 2009). This implies an overall educational timeline of approximately 15 years.

Because Squadron Commanders generally reside at base level, and with knowing Chief of Staff General Goldfein's initiative to revitalize the squadrons, the assessments of competence should occur at either the base-level Civil Engineer Squadrons or Staff Directorates (Roberson and Stafford 2017). Commanders and Staff Directors would be responsible overseeing Company Grade Officer development and ensuring competence in required areas. Furthermore, these senior officers would be responsible for updating and

maintaining the Master Learning Record, which would capture the Airman's education, training, and experience record throughout their career (Stafford 2017).

Competency-based learning assessments at the squadron level would not be a drastic change from the current situation, in which individuals are already assessed in areas of readiness. Such education is comprised of two main categories which have multiple assessment formats. The first category is Developmental Special Experiences (DSE), which are immersive situations in which an Airman can gain real-world experience in a controlled environment (Roberson and Stafford 2017). These DSEs are commonly used in other career fields, such as Air Operations Centers (AOC), where airman are sent to a function AOC to observe operations (Roberson and Stafford 2017). The second category is Live, Virtual, Constructive Learning Opportunities (LVC), which would be virtual simulations of real-world problems involving real applications of personnel and equipment (Roberson and Stafford 2017).

The use of Competency-Based Learning for Civil Engineer Company Grade Officers is directed to remain limited to force development. Lt. Gen. Darryl Roberson, Commander of Air Education and Training Command and Air Force Force-Development Commander, has expressly stated that that this educational system is not going to replace the existing talent marketplace apparatus (Stafford 2017). This directive means that the Human Resource applications generally utilized in other Competency-Based models will not be implemented for Civil Engineer Company Grade Officers.

2.7 Career Field Education and Training Plan and Advertised Capabilities

The current Career Field Education and Training Plan provides descriptions of desired Civil Engineer officer training, education, professional development, and experience (Department of the Air Force 2015). This plan can be used by officers and supervisors to develop educational plans but does not provide or enforce standardized career field development (Department of the Air Force 2015). This plan also details the expected career field capabilities as both doctrine and the specialty of training, but further explains that there are no definitive steps toward promotion (Department of the Air Force 2015). The expected career paths of Civil Engineer Officers are shown in Figure 2.

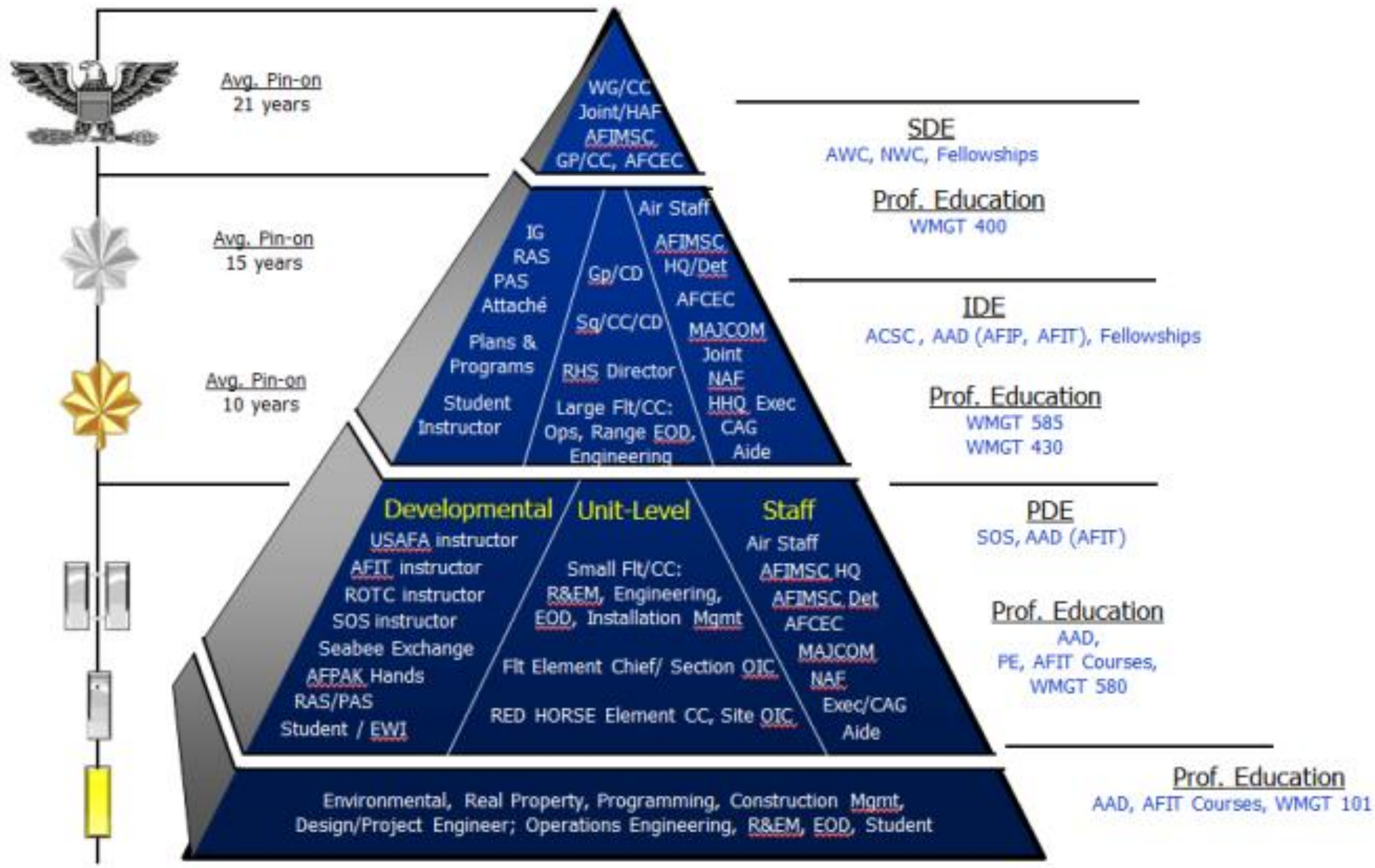

Figure 2: CE Career Development Pyramid (Department of the Air Force 2015)

As shown in Figure 2, most applicable Civil Engineer Company Grade Officer positions are located at the Squadron level, which includes experiences in tactical-level planning, execution and management of base infrastructure and real property, and the provision of emergency services (Department of the Air Force 2015). The Civil Engineer Squadron standard common template consists of six flights, with Company Grade Officers able to gain experience in five of those flights (Department of the Air Force 2015). The sixth flight, Fire Emergency Services (CEF) employs enlisted career field members exclusively (Department of the Air Force 2015).

The first flight to which Civil Engineer Company Grade Officers can be assigned is Engineering Flight (CEN). Company Grade Officers assigned to CEN can serve as Flight Commander or within the two comprising elements: Portfolio Optimization and Project Management (Department of the Air Force 2015). Lieutenants and Junior Captains normally serve as project programmers, project managers, program managers, or officers-in-charge (OIC) of project execution (Department of the Air Force 2015). Senior Captains or Majors can hold the position of flight commander, deputy, project management element chief, portfolio optimization element chief, or others based on local circumstances (Department of the Air Force 2015). The specified skill requirements include comprehensive base planning, project programming, environmental planning, technical design, and construction surveillance to maintain, restore, and upgrade facilities and infrastructure (Department of the Air Force 2015).

The second flight mentioned in the CFETP is Installation Management Flight (CEI) (Department of the Air Force 2015). Generally, this flight only has program manager roles with potential supervisory responsibilities for Lieutenants or Junior

Captains (Department of the Air Force 2015). These responsibilities include overseeing real property, resources and force management, squadron finance, housing, environmental compliance, and environmental assessment (Department of the Air Force 2015).

The third flight mentioned in the CFETP is Readiness and Emergency Management (CEX) (Department of the Air Force 2015). Civil Engineer Officers in this flight provide planning, program management, and training for integrated wing readiness plans, wing emergency management plans, CE readiness, and AF incident management systems (Department of the Air Force 2015). This flight is normally lead by a Company Grade Officer, who oversees the Prime Beef Program, Deployment Manager, and EM functions (Department of the Air Force 2015). Additionally, this role briefs unit status from the Status of Resources and Training System (SORTS), facilitating the Emergency Management Working Group (EMWG), overseeing CBRN defense training, and interfacing with local EM Structures, and ensuring operational capabilities of the UCC and EOC (Department of the Air Force 2015). When fully qualified, the Flight commander is qualified as the EOC manager (Department of the Air Force 2015).

The fourth flight mentioned in the CFETP is Operations Flight (CEO) (Department of the Air Force 2015). A Senior Captain can sometimes serve in the position of Operations Flight Chief, but more commonly Company Grade Officers fill Operations Engineering Element Chief or Officer-in-Charge of the Requirements and Optimization Section (Department of the Air Force 2015). This involves the overseeing service contracts, customer service, and operates material control (Department of the Air Force 2015).

The fifth flight mentioned in the CFETP is Explosive Ordinance Disposal (EOD)(CED) (Department of the Air Force 2015). Civil Engineer Company Grade Officers can serve as the flight commander, range flight commander, operations chief, and Chief of EOD Support element. The participation in this flight requires Civil Engineer Officers to apply through a voluntary and competitive selection process before attending specialized training.

The sixth flight mentioned in the CFETP is the Fire Department, which is unassignable for a Civil Engineer Company Grade Officer. Understanding the Fire Department capabilities becomes important during squadron command, toward year 15 of active Civil Engineer service.

2.8 Support for Research Method

2.8.1 Research Method Overview

Research method selection started with reviewing competency-based education literature to identify data needs. The required information was recommended to come from multiple sources, including: job analysis of current positions, stakeholder analysis, and Subject Matter Expert interviews (Campion et al. 2011).

Current position job analysis was accomplished by acquiring Air Force Personnel Center position data and analyzing it with Air Force Publications advertised capabilities. The stakeholder analysis was accomplished through a career field survey, with selected participant groups including: Field Grade Officers, Company Grade Officers, selected Air Force Civilians, and Senior Enlisted Civil Engineer personnel. Field Grade Officers provided two forms of insight: firstly, they previously served as Civil Engineer Company

Grade Officers and secondly, they serve as the employers and assessors of current Company Grade Officers. Company Grade Officers provide insight on current position requirements, work alongside other Lieutenants and Captains, or supervise junior Civil Engineer Officers. Selected Air Force Civilians provide insight as employers/assessors, coworkers, and subordinates of Civil Engineer Company Grade Officers. Selected Senior Enlisted Civil Engineers provide insight as subordinates to Company Grade Officer and as advisors to Field Grade Officers. Before the survey could be dispersed, however, baseline information was needed. In June 2018, an Education Working Group was convened to identify the tasks, knowledge, skills, deliverables, or other performance characteristics required of Civil Engineer Company Grade Officers.

The Subject Matter Expert interviews were accomplished through a Delphi Study. The panel of members were selected based on a rigorous set of criteria established through a literature review. The Delphi Method was selected over two other methods for the finalization of the Competency-Based Education Model.

2.8.2 Non-Selected Research Methods

Two research methods were investigated prior to the Delphi Study's selection as the model establishment technique. These two methods included Textual Analysis and Observational Trials. Textual Analysis relies upon published literature and other texts to draw information for use in research (Von Dormolen 1986). Therefore, textual analysis success requires the published information be accurate at the time of research and that there be substantial philosophical publications. For this research, there was neither an adequate philosophical literature supply pertaining to Civil Engineer officer capabilities nor guaranteed accuracy of existing publications. Textual Analysis was used for a portion

of research, but had to be validated by the Delphi Study panel members. Additionally, archival communications research can be used as Textual Analysis, but the dynamic nature of the Civil Engineer career field potentially invalidates the applicability of this method (Frey et al. 1999). The Civil Engineer career field had a dynamic shift in its hierarchical structure in 2012 with the squadron realignment and the advent of the Air Force Installations and Missions Support Center. This means that historical publications prior to this change, and during the transitional period, may be inaccurate. Without having full faith in pursuing the research under this method, investigation for other techniques commenced.

The other research method investigated for this research was Observational Trials. Observational Trials can take on multiple forms, including Cohort Studies and Case Control Studies (Institute of Work and Health 2016). Neither of these Study-types could even marginally guarantee a successful model due to the nature of their investigation. In the case of a Cohort Study, the Civil Engineer Company Grade Officers would act as the Cohort, but the discrepancies between position types would make the Cohort heterogeneous. The lack of homogeneity would also make a Case Control Study inaccurate, as there is no guarantee that the individual/individuals selected would be representative of the population.

2.8.3 Delphi Study Overview

The RAND corporation developed the Delphi Study technique in the 1950s and 1960s to solicit and achieve expert consensus to solve various research problems (Kobus and Westner 2016; Okoli and Pawlowski 2004; Cohn et al. 2015). Originally, this technique was used for long-term policy creation, but its growing popularity has seen its

framework expand into the education sector, health field, urban growth design, physical sciences, engineering career fields, administration, business, and even economics (Dalkey 1969; Pare et al. 2004). There are three common characteristics of the Delphi Study, including: anonymity of experts in their responses, iteration and control of feedback, and statistical group response (Dalkey 1969). Each characteristic is designed to minimize the negative effects associated with dominant individuals controlling conversations, irrelevant side conversation, redacting of efforts from previous responses, and the removal of conformity pressures (Dalkey 1969; Cohn et al. 2015). The validity of these features in accomplishing their objectives was determined in the RAND Corporations subsequent experiments in 1968 (Dalkey 1969). The 1968 experiment showed that Delphi Studies were more accurate than the face-to-face discussions of the control group (Dalkey 1969).

One of the Delphi Study's most acknowledged strengths is the response diversity from the expert panel members, even if they possess the same credentials (Dalkey 1969). The diversity of opinions on the presented topics can allow the synthesized response to be closer to the true answer than any individual feedback (Dalkey 1969). In fact, the synthesized response should be proximate to the median of the independent responses, which means it is likely to be closer to the true answers than half of the expert responses (Dalkey 1969).

The Delphi Technique is particularly beneficial when the research endeavor has limited information or involves future organizational goal projections (Helmer-Hirschberg 1967; Iqbal and Pipon-Young 2009; Kobus and Westner 2016). Essentially, the Delphi Technique is superior when dealing with situations which require judgements

rather than statistical analysis (Okoli and Pawlowski 2004). The experts are the individuals who may provide the greatest insight into both the current state and future changes for their organization. These experts, especially in larger organizations, can be geographically dispersed. The methods of communication utilized by the Delphi Method is ideal for these separated experts (Paré et al. 2013). Since these experts are "filling in" the missing information and providing forecasted requirements, they must be carefully selected (Helmer-Hirschberg 1967; Kobus and Westner 2016; Cohn et al. 2015). This makes the Delphi Technique an inductive and exploratory research method, which is useful when there is limited or no empirical evidence (Paré et al. 2013).

Once the experts are selected, they are provided questions in multiple iterations, called rounds (Iqbal and Pipon-Young 2009). Typically, there are three rounds, with synthesized and statistical feedback offered between successive sets of questions (Iqbal and Pipon-Young 2009; Kobus and Westner 2016; Cohn et al. 2015). Because the feedback is a synthesis of responses, there is no direct confrontation with the experts (Kobus and Westner 2016). The final synthesized result replaces the opinions of the individual experts and establishes consensus (Paré et al. 2013).

2.8.4 Delphi Technique Problems and Critiques

The first Delphi Study critique is a lack of consensus on the expert panel member size (Paré et al. 2013). This can bring the study reliability into question, especially because expert selection is the research quality's most critical aspect (Paré et al. 2013). Additional concerns stem from determining which expert to include on the panel (Helmer-Hirschberg 1967). In the absence of acknowledged experts, expertise criteria establishment may not adequately correlate to obtaining the required information

(Helmer-Hirschberg 1967). Furthermore, expert establishment criteria and selecting the appropriate expert is often neglected (Kobus and Westner 2016; Okoli and Pawlowski 2004). The neglect of choosing the appropriate expert commonly stems from utilizing whatever resources are available and accessible at the time of the research (Okoli and Pawlowski 2004).

A second critique is that establishing criteria for expert designation does not mean that adequate data will be available to determine degree-of-expertise (Helmer-Hirschberg 1967). Additionally, synthesizing multiple responses into a single opinion may pose validity concerns (Helmer-Hirschberg 1967). If the responses from the experts follow a bimodal or multimodal distribution, then synthesis of the responses may yield a less accurate response.

A third critique is that study benefits may be partially self-limiting. Response anonymity can produce answers which lack ownership of ideas (Dalkey 1969). Additionally, anonymity and lack of intercommunication between experts can reduce response depth and prevent the stimulation of novel ideas (Dalkey 1969). Furthermore, communication between the researcher and the experts is generally solely electronic. This compounds the issues with ambiguity in any questions within the rounds (Paré et al. 2013).

The fourth critique is outlier responses are notoriously difficult to explain in Delphi Studies (Cohn et al. 2015). Due to the lack of confrontation or discussion with the experts during the rounds, the rationale for their responses remains difficult to ascertain if not provided with the answers (Cohn et al. 2015). Potential explanations include experts being anchored to recent study results or precedence being given to personal experiences,

rather than literature (Cohn et al. 2015). These potential explanations may provide context to different answers to the same question but do not precisely explain any individual answer (Cohn et al. 2015).

The fifth and final critique is that some researchers dispute the validity of this method because the conclusions lack statistical support and the methods for developing conclusions lacks definitive methods (Paré et al. 2013; Okoli and Pawlowski 2004). The lack of statistical support stems from the study sample not being representative of the population, instead using experts who may have a better understanding of the situation than the population (Okoli and Pawlowski 2004). The lack of agreed upon research methods instills doubt with regards to interpretation and analysis of results, and therefore the accuracy of the conclusions (Iqbal and Pipon-Young 2009). The generalizations made from these conclusions are also in question, as subsequent panels may reach different conclusions to the same situations (Iqbal and Pipon-Young 2009). These different answers show a low reliability in the answers provided by any individual panel, with high dependency being placed upon the personal experiences of the experts selected (Paré et al. 2013).

2.8.5 Assessment of Expertise

The Civil Engineer career field does not have a requirements list for assessing Company Grade Officer competency expertise. Therefore, Subject Matter Experts included in this study will meet the requirements for expert designation found in published literature. The Office of Personnel Management (OPM) defines a Subject Matter Expert as “A person with bona fide expert knowledge about what it takes to do a particular job. First-level supervisors are normally good SMEs. Superior incumbents in the same or very

similar positions and other individuals can also be used as SMEs if they have current and thorough knowledge of the job's requirements" (The Office of Personnel Management 2019). OPM then recommends using numerous Subject Matter Experts, in research, to ensure that all key job requirements are captured and that multiple viewpoints are included (The Office of Personnel Management 2019). This definition explains that experts have in-depth requirements knowledge and that polling numerous individuals is best. Additionally, OPM designates supervisors and leaders as being good subject matter experts. The concept of leadership operating as experts makes sense due to a higher likelihood of insight about future organizational needs (Campion et al. 2011).

The OPM definition is based upon assumptions, however, which must be validated prior to designating experts. One assumption is that Subject Matter Experts have enough experience within the field of practice to provide optimal answers. To parallel OPM's definition, the National Library of Medicine places a higher emphasis on an expert's abilities in the job, rather than solely upon the knowledge the person has attained. The exact definition by the National Library of Medicine is "Elite, peak, or exceptionally high performance on a particular task or within a given domain. A description of expertise requires an inventory of what the expert knows, knows how to do, and what he or she has achieved" (Bourne et al. 2014).

Experience time to achieve expert level performance varies widely between domains (Ericsson et al. 2007). For example, the Harvard Business Review's research on expertise shows that gifted performers require 10,000 hours/10 years of practice before they can win internationally, and musicians can take 15-25 years (Ericsson Et al 2007; Ericsson et al. 2006). The importance of experience, rather than inherent skills, has been

empirically validated by psychologists in their minimizing talents developed prior to experience toward development of expertise (Ericsson et al. 2006). Laboratory findings prove that extended practice can increased performance by an order of magnitude higher than those with inherent skills (Ericsson et al. 2006). Additional empirical results have validated that simple experience is not adequate to obtain expertise (Ericsson et al. 2006). An individual can become proficient in a task within 50 hours of practice, but to ascend beyond this minimal performance requires focus on refinement (Ericsson et al. 2006). This paragraph's main point is to show that knowledge attained prior to experience is irrelevant to expertise and that the individual must have shown an actual drive for skill improvement.

One common method researchers used to identify experts is peer-nominations from professionals within the same practice domain (Ericsson et al. 2006). This selection method can have complications in larger domains, where members may be biased towards practitioners they have personally observed and would therefore not necessarily choose the most superior performers (Ericsson et al. 2006). This method of identifying an expert comes from a common definition of an "Expert is one who is very skillful and well-informed in some special field or someone who is widely recognized as a reliable source of knowledge, technique, or skill whose judgement is accorded authority and status by the public or his or her peers" (Ericsson et al. 2006). The main point of this paragraph is that an expert earns the title through the acknowledgement of the public, their peers, and/or their superiors.

The acknowledgement of expertise can be summed up with a measurement of superior performance in a given field or at a given task (Ericsson et al. 2006). Common

accepted expertise proficiency measurements come from academic qualification, seniority in task performance experience, and acceptance of such performance by peers (Ericsson et al. 2006). In some cases, domain specific knowledge tests can be administered to determine expertise, but such tests are not common occurrences (Ericsson et al. 2006). The evidence for this appraisal comes from extensive research into medical professions, where practitioner performance is evaluated by clinical reasoning (Ericsson et al. 2006). The results of these studies showed that physician's display a wide variation of competency profiles depending on experience and the specific situation (Ericsson et al. 2006). This variation in competence took a large number of clinical assessments to achieve a reliable result, with 14-18 cases being required on average (Ericsson et al. 2006). The fact that an individual's expertise is limited to a very specific knowledge-domain and then further to a content-matter (Ericsson et al. 2006). The main point of this paragraph is to show that expertise is highly limited to a specific content matter and that it takes multiple displays of superior performance to allocate this title.

Research has also shown that an expert has multiple other vital characteristics outside of superior performance and adequate experience. The first of these characteristics is an advanced decision-making ability when compared to non-experts in the same domain (Ericsson et al. 2006). This does not mean than an expert can avoid making mistakes by knowing what mistakes have been made in the past and avoiding them, but by understanding what would constitute a mistake (Ericsson et al. 2006). Therefore, the decision-making process for experts possess a much wider breadth and depth on readily accessible information that a non-expert would not have the experience to replicate (Ericsson et al. 2006). To clarify this point, a non-expert would be able to perform

research on what no to do in certain situations, but this research would be limited by the abilities of an author to convey their experiences. An expert would be able to draw upon their own understanding to avoid mistakes from being made that may or may not have occurred for others. This decision-making ability can be broken down into multiple categories of thought.

The first category of thought on an expert's decision-making abilities comes from their ability to utilize and integrate larger cognitive units (Ericsson et al. 2006). These units can be thought of as a large vocabulary of smaller elemental experienced-based memories into a larger functional and perceptual unit (Ericsson et al. 2006). This essentially means that they can accurately remember large amounts of specific information over a long-term time period, and after their practice had been disrupted by interfering activity (Ericsson et al. 2006). This area of thought makes it appear that an expert has the same strength of long-term memory as a basic practitioner would have from short-term memory.

The second category of thought on an expert's decision-making abilities comes from their ability to utilize functional and abstract representations of presented information (Ericsson et al. 2006). This ability is such the expert can see a problem from within their domain on a much deeper level than a basic practitioner. Essentially this means that the expert has restructured the way they store information such that they may synthesis previous and complex interactions of variables and summon this knowledge to be applied to current situations (Ericsson et al. 2006). Consider this depth of knowledge to also represent a breadth of capabilities as well, as it encompasses a multitude of encounters with tasks or problems.

The third category of thought on an expert's decision-making abilities comes from the involvement of automated basic strokes (Ericsson et al. 2006). This can be simplified to mean that an expert can perform tasks within their domain without much effort and can appear to be automated (Ericsson et al. 2006). One of the key pieces of evidence of automaticity is the ability to produce a superior outcome quickly (Ericsson et al. 2006).

2.9 Summary

This literature review has provided the rationale for undertaking this research study in support of establishing a competency-based educational program for Civil Engineer Company Grade Officers, through detailing the importance of continuing education for professionals, providing the history of both Civil Engineer Officers and Competency-Based Education, discussed how these models are established and assessed, and discussed both the advantages and disadvantages of competency-based learning. As recommended in the literature, the research methodology will encompass three main areas of study: position-based analysis, stakeholder analysis, and subject matter expert interviews. The position-based analysis came from a combination of Air Force Personnel Center Position Data and Air Force Published Literature related to position capabilities. The Stakeholder Analysis was accomplished through a 2018 Education Working Group and career field survey and career field survey. The Subject Matter Expert interviews will be accomplished through a Delphi Study. The details of each methodology component will be further discussed in Chapter 3.

III. Methodology

Four methodologies were used in this research: the 2018 Education Working Group, Position Analysis using Air Force Personnel Center data and Air Force literature advertised position capabilities, a career field survey, and a Delphi Study. This chapter is organized into five sections: 2018 Education Working Group, Air Force Personnel Command Position Data, Career Field Survey, Delphi Technique (Expert Elicitation), and Summary. Table 1 matches the data requirement to the corresponding data acquisition method.

Table 1: Data Requirement Trace Matrix

Data Requirement Trace Matrix		
Data Requirement	**Rationale**	**Acquisition Method**
Preliminary Competency List	The Civil Engineer (32E) Career Field does not maintain a list of occupational competencies	Preliminary Pilot Study
Preliminary Competency Attainment Timeline	The Civil Engineer (32E) Career Field does not maintain a standard timeline for personnel development	Preliminary Pilot Study
Civil Engineer Company Grade Officer Position Allocations	The breakout of Civil Engineer Company Grade Officer Positions throughout the Air Force can be used, in conjunction with publihsed literature, to find the advertised common skill requirements.	AFPC Position Data/AF Published Literature
Civil Engineer Company Grade Officer Advertised Capabilities		
Stakeholder Analysis of Preliminary Competency Importance	Polling the entire 32E career field can help determine the validity of the Pilot Study outcomes and can ensure a better representation of stakeholder opinions on competency requirements, timelines for development, and proficiency levels.	Career Field Survey
Stakeholder Analysis of Preliminary Competency Attainment Timeline		
Stakeholder Analysis of Preliminary Competency Proficiency Levels		
Expert Gap Analysis of Preliminary Competency Results	The small group of peer-nominated experts can analyse the overall outcomes of the previous steps, within the context of their postions and experience, to identify gaps and/or refine the data.	Delphi Technique (Expert Elicitation)
Expert Gap Analysis of Preliminary Competency Attainment Timeline		
Expert Gap Analysis of Preliminary Competency Proficieny Levels		

3.2 2018 Education Working Group

3.2.1 2018 Education Working Group Purpose

The 2018 Education Working Group was convened between 26-28 June 2018 to identify Civil Engineer Company Grade Officer performance characteristics and the timeframe in which those characteristics should be displayed. Performance characteristics included the knowledge, skills, capabilities, or other attributes which Civil Engineers should exhibit while performing their duties. Existing Air Force publications provide neither a performance characteristics list nor a career progression timeline, which led to the question: "What capabilities do Civil Engineer Company Grade Officers need to possess and at which point in their career should they exhibit these traits?"

3.1.2 Participant Selection

Participants were selected through a Major Command level nomination process. Members submitted a nomination package through their chain of command, which was reviewed and prioritized by senior officers. The highest prioritized member received both an invitation and funding to attend the working group, which was held at the Civil Engineer School at Wright-Patterson AFB. This initial selection by self-nomination introduces a threat to external validity, as the members were not selected at random nor was it unbiasedly performance-based. Essentially, there was no guarantee that the best possible choice for study inclusion would submit a self-nomination package.

3.1.3 Participant Demographics

There were four participant categories at the 2018 Education Working Group: workshop members, senior leader mentors, faculty support, and additional support. The 22 workshop members were the individuals chosen through the aforementioned selection

process and were the primary participants of this study. The other three categories aided workshop members in a support role by either ensuring conversations stayed on target or providing contextual information to discussions. The senior leader mentors were universally Civil Engineer Colonels (O-6) and helped guide discussions using knowledge obtained throughout their careers. The faculty support were universally Civil Engineer School Staff members and performed administrative roles, as process owner representatives. The additional support personnel aided the faculty in administrative roles and captured additional information through discussion observation. Ultimately, the workshop members were providing the information for the study and representing their Major Commands and career field. The Major Command representation can be seen in Figure 3 and the ranks of each participant can be seen in Figure 4.

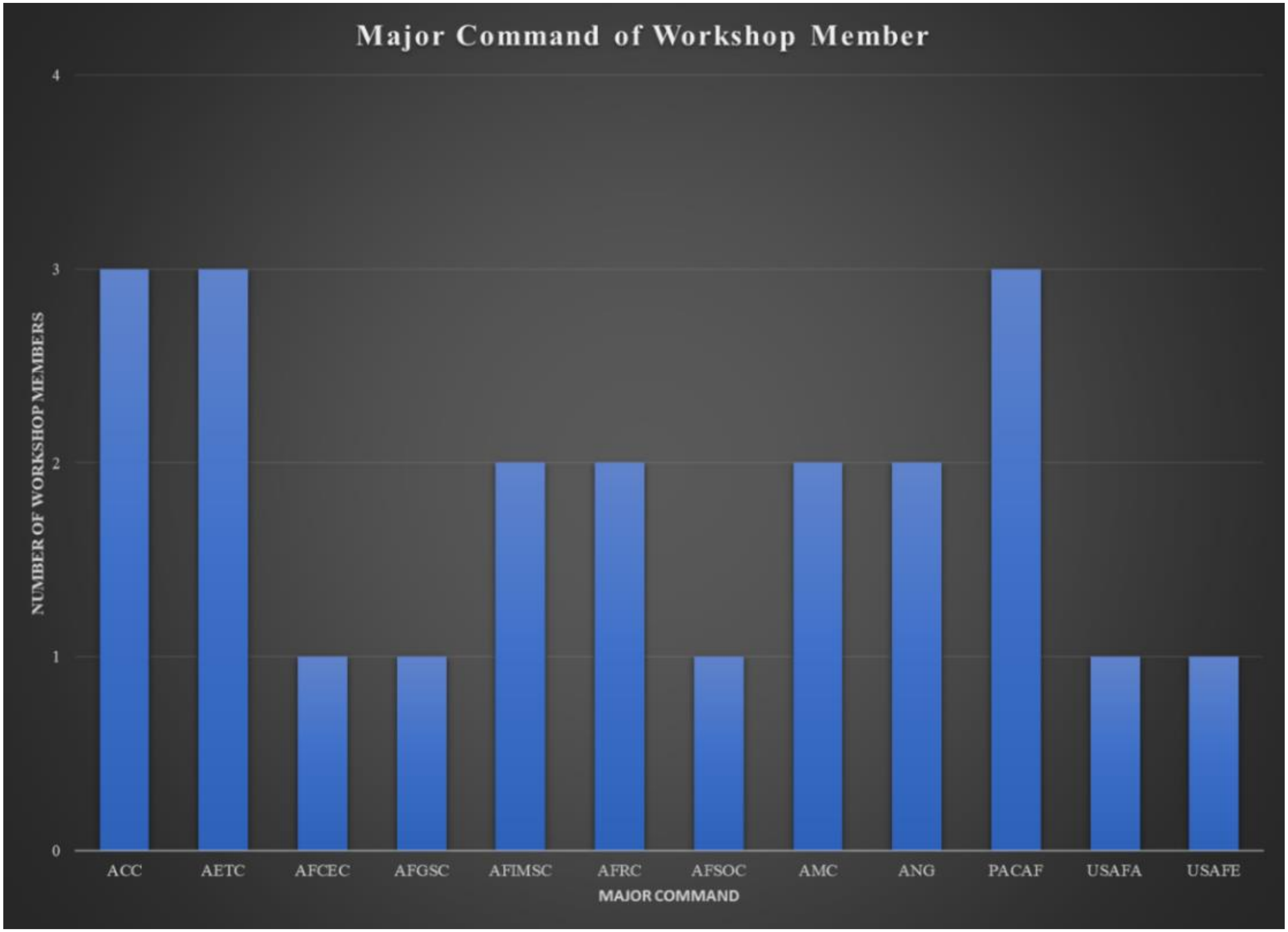

Figure 3: Major Commands/Direct Reporting Units of Workshop Participants

As shown in Figure 3, workshop participants represented 11 Major Commands or Direct Reporting Units. While each Major Command/Direct Reporting Unit was not represented equally nor proportionally based on population, these percentages were not significantly difference. Table 2 shows the representation percentages for the Major Commands and Direct Reporting Units present during this working group.

Table 2: 2018 Education Working Group Major Command/Reporting Unit Percentages

Preliminary Pilot Study MAJCOM/DRU Representation				
Major Command/Direct Reporting Unit	Total Population (Air Force Association 2019)	Approximate Percentage of Total Air Force	Participant Representation	Representation
ACC	80,349	16%	14%	Under Represented
AETC	70,839	14%	14%	Exact Representation
AFGSC	32,247	6%	5%	Under Represented
AFMC	82,173	16%	14%	Under Represented
AFSC	16,696	3%	0%	Under Represented
AFSOC	16,720	3%	5%	Over Represented
AMC	28,468	6%	9%	Over Represented
PACAF	22,571	4%	14%	Over Represented
USAFE	48,718	10%	5%	Under Represented
USAFA	1,700	0%	5%	Under Represented
ANG	106,000	21%	9%	Under Represented

As shown in Table 2, only one Major Command or Direct Reporting Unit had perfect representation based on percentage of population to total force. Seven Major Commands or Direct Reporting Units were underrepresented while three were overrepresented at this workshop. Of the underrepresented Major Commands, Air Force Space Command did not have any participants in this study. This lack of representation may lead to unit-specific information being overlooked by the study participants,

particularly if none of the participants had never served within the Space Command. The previous units to which these members were assigned was not collected for analysis under this research endeavor.

Figure 4: Ranks of Workshop Participants

As shown in the Figure 4, 4 civilians and 18 military members participated in the workshop. The civilians are shown with the designators of GS-12, GS-13, and GS-14 and made up 22.2% of the panel. For the 77.8% of the panel comprised of military personnel, 11.1% were Senior Enlisted, 33.3% were Company Grade Officers, and 55.6% were Field Grade Officers. From these breakouts, there were 2 female civilians, 1 female Field Grade Officer, and 1 female Company Grade Officer, equating to 18.18% of the panel. Female representation on the panel may appear low but is nearly equivalent to the 21.1% Air Force population which identifies as female (Air Force Association 2019). Field Grade Officer, Company Grade Officer, and Civilian representation was not proportional to their total force population percentages. This lack of proportional population representation provides a threat to external validity but is partially mitigated by the members semi-expert status. An additional workshop participant demographic can be seen in Figure 5, which shows the type of unit the participants report to within their Major Command or Direct Reporting Unit.

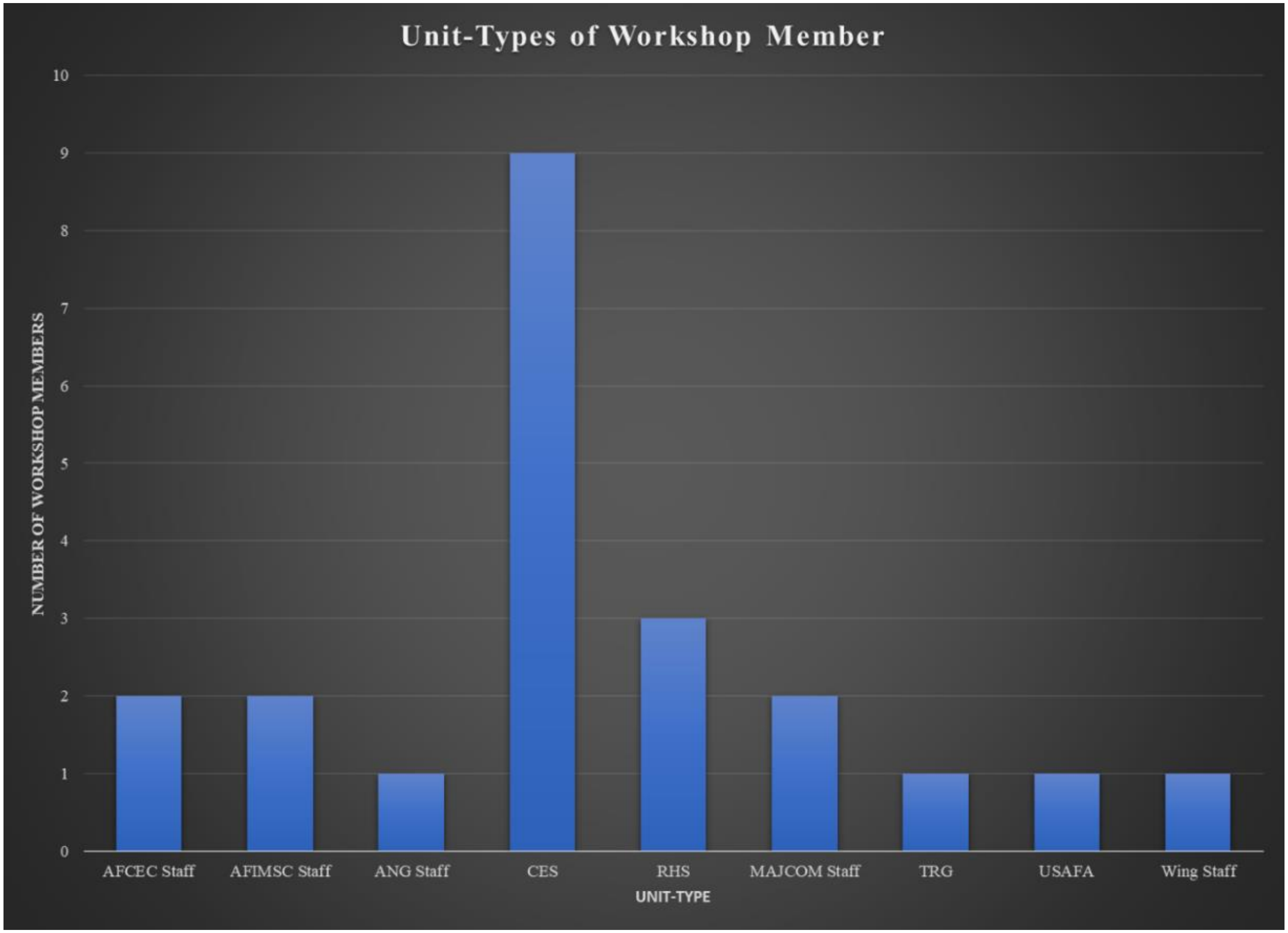

Figure 5: Unit-Types of Workshop Participants

As shown in Figure 5, the largest unit-type represented by the workshop participants was Civil Engineer Squadrons (CES), at 40.91%. The second largest unit-type was the staff types composite, including AFCEC Staff, AFIMSC Staff, ANG Staff, MAJCOM Staff, and Wing Staff, which equated to 36.36%. According to the Air Force Personnel Center position data, Civil Engineer Squadrons are drastically under-represented while all other unit-types are overrepresented. This may not pose a concern, however, as members currently assigned to other organizations may have served within Civil Engineer Squadrons at previous points in their career. The previous units to which the participants reported was not collected during this study.

The senior leader mentors were all Civil Engineer Colonels (O-6), do not currently serve at base level, and were all male. One mentor was the Civil Engineer School Dean, one was on AFCEC Staff, one was on AFIMSC Staff, and one was on Headquarters Air Force Staff. Senior leader mentor involvement in the study was not consistent for all topics, with these senior leaders occasionally leaving for other obligations. Additional demographic information about these senior officers was not collected during this study.

The Faculty support were all Civil Engineer School staff members. These staff members included 7 Captains, 1 Lieutenant Colonel, and 2 Civilians. Of the military members, 7 members were male and 1 was female. Both civilians were female. Additional demographic information about the faculty support was not collected during this study.

The additional support were all males, with one Captain, one Contractor, and one GS-13. The Captain was from base level and on orders to attend AFIT in the following

year, the Contractor was from Headquarters Air Force, and the GS-13 was from the AETC MAJCOM Staff. Additional demographic information about the additional suport was not collected during this study.

3.1.4 Instrumentation

The study participants were invited on temporary duty orders to the Civil Engineer School at Wright-Patterson Air Force Base for a one-week panel discussion. The 2018 Education Working Group began with an initial briefing on the studies purpose, expectations, research methods, and the expected schedule. Participants were then divided into six independent teams, comprised of approximately equal numbers, and provided with discussion topics. Each team openly brainstormed and collaborated ideas related to the topics and documented summaries of their conversations on paper and electronically, using Microsoft Word. Those summaries written in Microsoft Word were transferred into electronic files prior to the beginning of subsequent topics. The senior leader mentors observed and joined conversations to provide their own inputs and introduce new concepts. The faculty support and other support observed conversations and took notes regarding contextual information.

Workshop members were given a topics schedule, which can be seen in Appendix 1, to encourage independent brainstorm before collaboration, during either the break periods or in the evenings when they were off duty. Two additional handouts were provided to aid group discussions. The first handout discussed competency terminology and is shown in Appendix 2. The second handout provided a participant documentation matrix template and is shown in Appendix 3. These handouts aided participant understanding opinions should be recorded and to orient them toward the final goal of

identifying competencies and development timelines. The final competency list and development timeline were debated and agreed upon by the entire participant population. This was accomplished as a single group in open discussion with results documented in Microsoft Word.

3.1.5 Data Collection

Participants were asked to complete a handout which displayed four columns showing Company Grade Officer ranks and 96 rows representing tasks. These 96 tasks were developed in the discussions during the working group. The participants were told to input a value of 1, 2, 3, or 4 in each of the rank columns to signify how important the competency was for that rank. A value of 1 indicated the participant believed the competency was optional for that rank and a value of 4 indicated the competency was a prerequisite. The handout can be seen in Appendix 4.

3.2 Air Force Personnel Center Position Data and AF Literature Analysis

3.2.1 Position Data and AF Literature Analysis Purpose

The first purpose of the Position Data and AF Literature analysis was to identify common capabilities advertised across multiple positions and establish the likelihood of Civil Engineer Officers being required to exhibit these traits based on the positions they held. The second purpose was to orient the Delphi Study questions by providing experts with perspectives regarding current Civil Engineer Company Grade Officer positions composition. The Air Force Personnel Center data included position title, unit assignment, authorized position rank, and current incumbent officer rank. No personal information regarding the incumbent officers was requested nor received.

From this information, it will be possible to match the positions with the expected requirements detailed within Air Force publications. This would provide an overall expectation on the requirements of the career field, statistically, as in the current state. However, there is a major limitation within this data in that there is only data available for this current year. Furthermore, there is no guarantee that the position requirements found within publications are accurate for current Civil Engineer operations, with all documents being between 5-10 years old.

3.2.2 Data Collection from Air Force Personnel Center

Position-based data was acquired from the Air Force Personnel Center on 28 December 2018. This data included 1,031 data points and represented all active duty non-deployed positions for Civil Engineer Officers. The data set included the authorized rank for each position, the authorized Air Force Specialty Code, the position's duty title, the reporting chain for the position, the position's office symbol, and the rank of the incumbent officer. The position's reporting chain, in descending order, included Major Command, Sub-Command, Base, and Assigned Unit. Analysis consideration was only given to duty title, authorized rank, incumbent rank, and reporting chain. The Air Force Specialty code was not relevant because it is primarily identical for all Civil Engineer Officers. The position's office symbol was not independently useful for analysis because it reflects the duty title of the position. Finally, the specific base was not important because this research is to find the common core competencies and the base would therefore be a specificity beyond this research.

From the overall data set, 575 data points corresponded to Company Grade Officers position. The sample size was validated as representative of the population with

the Yamane Method, which can determine sample size requirements for a known population (Israel 2003). The Yamane Method is shown in Equation 1.

$$n = \frac{N}{(1+N(e)^2)} \qquad \text{(Equation 1)}$$

In Equation 1, the sampling size (n) is determined based on the known population (N) and the acceptable margin of error (e). The margin of error for this analysis was 5%, based on a 95% confidence interval. The 95% confidence interval was chosen due to being the most commonly selected confidence interval used for statistical analysis (Zar 1998). The total Civil Engineer Company Grade Officer population is 680 individuals, including those members who are holding positions outside the career field. External positions correspond to officers not performing civil engineer functions and often result in a temporary change of Air Force Specialty Code. An example of this type of position is Air Force Institute of Technology student. The total population and explanation regarding its details was obtained through personal conversation with the Civil Engineer Company Grade Officer Assignment's Officer on 20 March 2019.

With the exact Civil Engineer Company Grade Officer population known and a specified margin of error of 5%, the required sample size to receive a proportional population mean was 252 individuals. Based on the 575 data points received from the Air Force Personnel Center, the margin of error for the sample size has been reduced to 1.64%

Multiple data points were missing crucial variable components and were removed from the analysis. This missing data included 98 data points missing duty titles, 10 data points missing flight assignments, and 3 data points which were completely masked due to being classified. These data points were only used within analysis components in which every required parameter was found within the data point. In some of the cases, the entire

data point had to be removed from the analysis, which reduced the overall sample size to 467. By reusing Equation 1, it was found that the overall margin of error increased from 1.64% to 2.59%, which was still well within the margin of error of 5%

3.2.3 Data Collection Literature

The Air Force Civil Engineer Center Reachback Center was contacted on 19 March 2019, with a request for information regarding publications which describe requirements for Civil Engineer Positions. A copy of the email can be seen in Appendix 5. This department was selected for assistance due to its serving as a focal point for Air Force Civil Engineer requirements and operations. Most Air Force Civil Engineer subject matter experts report to AFCEC and can be reached through this department. The AFCEC Reachback Center directed further investigation toward the career field manager, who responded to inquiries on 25 March 2019, and in-turn directed research toward the Civil Engineer Officer Assignments Team. The email correspondence from AFCEC, with the Career Field Manager, and the Company Grade Officer Assignments Officer can be seen in Appendix 6, Appendix 7, Appendix 8, and Appendix 9 respectively**.** The Civil Engineer Career Field Company Grade Officer Assignments Officer revealed that the position requirements would come from four sources: the Civil Engineer Career Field Education and Training Plan, the Air Force Officer Classification Document, Programming Plan for Implementation of Enterprise-Wide Civil Engineer Transformations (PAD), and local needs at each installation. For the purpose of this thesis, the local adaptations will be discarded as they would not be considered core to the overall career field.

3.2.4 Position Data and AF Literature Analysis

The analysis started by identifying position and rank frequency and commonly assigned unit types. The second step was identifying rank or position misalignments, which could potentially cause some concerns with the development of the model. These misalignments are not a concern for most units and are considered an acceptable practice by policy. The third step was to assign each position with the capabilities advertised in the Air Force published literature. The final step was to identify the most common occurrences of capabilities by number of positions total which had the capability as a component.

3.3 Civil Engineer Career Field Survey

The career field survey's purpose was to gather information from current Company Grade Officers, supervisors of Company Grade Officers, supervisees of Company Grade Officers, and coworkers of Company Grade Officers. These individuals collectively are stakeholders of Company Grade Officer educational programs, and their input can refine, invalidate, or validate the information from the 2018 Education Working Group. This survey was motivated by the stakeholder analysis commonly used at Universities, in which a survey or poll is distributed to employers, graduated students, and academic advisors (Edwards et al. 2009). In this case, the employers are the Field Grade Officers and Government Service Civilians who supervise Company Grade Officers, Senior Enlisted who are supervised by or aid Company Grade Officers, and Company Grade Officers and Civilians who interact with other Company Grade Officers.

3.3.1 Data Collection from the Career Field Survey

The survey questions were motivated by the refined 2018 Education Working Group outcomes and was approved by the Headquarters Air Education and Training Command Occupational Analysis Survey Manager. The original Working Group competency list was refined into 73 combined competencies by the Civil Engineer School staff, by combining similar tasks into umbrella terms and removing redundancy. Upon receipt of Survey Manager approval, a drafted email was sent from the Civil Engineer School to the Director of Civil Engineers, who in turn sent an enterprise-wide email requesting participation in the study. The participants logged into the survey via a ".mil" computer with a Common Access Card (CAC) reader, utilizing Internet Explorer, as described in the forwarded email. Appendix 10 shows the exact verbiage used to request participation from Civil Engineer career field members.

3.3.2 Participant Demographics

The Civil Engineer Occupational Competencies Survey was dispersed to 4,305 career field members. The participant group included Active Duty Air Force Members, Air National Guard Members, Air Force Reserve Component Members, and Air Force Civilians. Table 3 displays the response rate by survey participant groups and Table 4 displays the percent of responses by military components exclusively.

Table 3: Overall Survey Response Demographics

Overall Survey Response Demographics			
Survey Groups	**Surveys Sent**	**Number Remaining After Partial-Completion**	**Response Rate**
Active Duty	1358	516	38.0%
Civilian	1796	194	10.8%
Air National Guard	680	168	24.7%
Air Force Reserve	471	102	21.7%
Total	**4305**	**980**	**22.8%**

Table 4: Military Component Response Demographics

Military Component Response Demographics		
Military Component	**Number Remaining After Partial-Completion**	**Percent of Responses**
Active Duty	516	52.65%
Air National Guard	168	17.14%
Air Force Reserve	102	10.41%
Civilian	194	19.80%
Total	**980**	**100.00%**

As shown in Table 3, 980 survey responses were retained for analysis because they had been fully completed. This makes the overall response rate 22.8%, with Active Duty Officers and Enlisted having the highest response rate. The Civilian component had the lowest response rate with 10.8%. The overall response rate was 980 career field members and possessed adequate statistical power to determine the significance. According to Jacob Cohen (1992), significance for this survey can be determined with 783 responses, from an uncertainty of $\alpha = 0.05$ and a small effect size.

As shown in Table 4, the military component response percentages were not equivalent. However, the response percentages were close to the percentage of these components to the overall force percentages, as shown in Table 5.

Table 5: Military Component Response Percentage Versus Component Percentage of Total Force

Officer Pay-Grade Response Demographics		
Military Component	**Percentage of Response**	**Component Percentage of Total Force (Air Force Magazine 2019)**
Active Duty	52.65%	49.20%
Air National Guard	17.14%	15.90%
Air Force Reserve	10.41%	10.40%
Civilian	19.80%	24.50%

The respondent demographics can also be analyzed based on pay-grade. Table 6, Table 7, and Table 8 display the percentage of response by rank within each military rank peerage. These peerages were decomposed due to the individuals at these ranks are stakeholders of Company Grade Officer capabilities in different manners. Enlisted Civil Engineer career field members are supervised or advise Company Grade Officers, Company Grade Officers will be required to display the competencies, and Field Grade Officers are the supervisors/employers of Company Grade Officers.

Table 6: Enlisted Pay-Grade Response Demographics

Enlisted Pay-Grade Response Demographics			
Enlisted Rank	**Military Component**	**Number Remaining After Partial-Completion Removal**	**Percent of Responses**
Master Sergeant (E-7)	Active Duty	0	0.00%
	Air National Guard	1	0.96%
	Air Force Reserve	0	0.00%
Senior Master Sergeant (E-8)	Active Duty	30	28.85%
	Air National Guard	8	7.69%
	Air Force Reserve	10	9.62%
Chief Master Sergeant (E-9)	Active Duty	27	25.96%
	Air National Guard	21	20.19%
	Air Force Reserve	7	6.73%
Total		**104**	**100.00%**

Table 7: Officer Pay-Grade Response Demographics

Officer Pay-Grade Response Demographics			
Officer Rank	**Military Component**	**Number Remaining After Partial-Completion Removal**	**Percent of Responses**
Second Lieutenant (O-1)	Active Duty	69	10.12%
	Air National Guard	8	1.17%
	Air Force Reserve	2	0.29%
First Lieutenant (O-2)	Active Duty	53	7.77%
	Air National Guard	9	1.32%
	Air Force Reserve	1	0.15%
Captain (O-3)	Active Duty	141	20.67%
	Air National Guard	42	6.16%
	Air Force Reserve	23	3.37%
Major (O-4)	Active Duty	97	14.22%
	Air National Guard	39	5.72%
	Air Force Reserve	29	4.25%
Lieutenant Colonel (O-5)	Active Duty	77	11.29%
	Air National Guard	32	4.69%
	Air Force Reserve	23	3.37%
Colonel (O-6)	Active Duty	22	3.23%
	Air National Guard	8	1.17%
	Air Force Reserve	7	1.03%
Total		**682**	**100.00%**

Table 8: Civilian Pay-Grade Response Demographics

Civilian Pay-Grade Response Demographics			
Civilian Pay-Grade	**Military Rank Equivalence**	**Number Remaining After Partial-Completion Removal**	**Percent of Responses**
GS-11	O-2	19	9.79%
GS-12	O-3	70	36.08%
GS-13	O-4	54	27.84%
GS-14	O-5	30	15.46%
GS-15	O-6	9	4.64%
NH-03	O-3/O-4	0	0.00%
NH-04	O-5/O-6	1	0.52%
WS-14	O-5	4	2.06%
WS-15	O-5	5	2.58%
WS-16	O-5	2	1.03%
Total		**194**	**100.00%**

As shown in Table 6, enlisted member responses were all from the senior enlisted peerage. The highest enlisted member response rate was from Chief Master Sergeants,

which comprised 52.88% of their responses. The Senior Master Sergeants comprised 46.15% of enlisted responses, while Master Sergeants made up only 0.96%. These responses are in reverse order based on percentage of these ranks as components of the total enlisted force. Chief Master Sergeants comprise only 1.01% of the total enlisted force, Senior Master Sergeants comprise only 1.96% of the total enlisted force, and Master Sergeants comprise 9.80% of the total enlisted force (Air Force Magazine 2019).

As shown in Table 7, the officer responses were not equivalent by rank. The responses were, however, nearly proportional to total force rank percentages. Second Lieutenants had a response percentage of 11.58% and comprised 12.61% of officers, First Lieutenants had a response percentage of 9.24% and comprise 11.16% of officers, Captains had a response percentage of 30.21% and comprise 33.28% of officers, Majors had a response percentage of 24.19% and comprise 21.7% of officers, Lieutenant Colonels had a response rate of 19.35% and comprise 15.59% of officers, and Colonels had a response rate of 5.43% and comprise 5.17% of officer (Air Force Magazine 2019).

As shown in Table 8, three Air Force Civilians types were invited to partake in this survey. The General Schedule (GS) employees comprised 93.81% of respondents. The GS employee's military rank equivalent ranged from O-2 for GS-11s to O-6 for GS-15s, and the percentage response for each rank was close to the actual distribution of the respective military rank (Under Secretary of Defense 2019). There was no available information regarding the actual distribution of GS pay-grades in the total Air Force. The Business and Technical Management Professionals (NH) had the lowest response percentage at 0.52% and were the military equivalent of O-3 to O-6, with responses only coming from O-5/O-6 equivalents (AcqDemo Program Office 2016). The final civilian

category invited to partake in the survey were Wage Grade Supervisors (WS). This component comprised 5.67% of respondents and had a military rank equivalent of O-5 (Marine Corps Community Services Okinawa, Japan).

3.4 Delphi Technique (Expert Elicitation)

The Delphi Study was conducted as the final step in creating the Civil Engineer Company Grade Officer Competency-Based Educational Model. The Delphi Study validated previous research method outcomes and identified missed topics from the literature, career field survey, and 2018 Education Working Group. The experts were given open-ended questions regarding topics identified in previous research steps and were encouraged to provide context to their response opinions. Additionally, each expert held positions which provides insight into the career field's future. This ensures that the competency model did not become antiquated immediately after conception.

3.4.1 Participant Selection

Prior to participant selection, the student researcher and research advisor completed an Institutional Review Board (IRB) package which was submitted to the Air Force Institute of Technology for approval. Ultimately, AFIT provided an exception to the Delphi Study because it had less than 20 expected participants and did not pose a threat to the experts.

Participant selection started with identifying potential expert candidates and contacting them to determine their availability and willingness to participate in the study. The overall expert panel is recommended to consist of 10 to 18 individuals (Okoli and Pawlowski 2004). Additionally, Delphi Studies are known to have higher attrition rates

even with the smaller size (Iqbal and Pipon-Young 2009). This high attrition rate meant looking for a number of potential candidates in excess of the 18 individual maximum size, in the hopes of the final participant count after attrition being within the acceptable limits.

The experts were selected based on experience, a strong record of superior performance, and representativeness across the Civil Engineer enterprise. The minimum experience requirement was 5 years of service as a Civil Engineer Field Grade Officer, 10 years of service as a Civil Engineer Company Grade Officer, and the attainment of the Civil Engineer Master Badge. The rationale for the 5 years of experience as a Civil Engineer Field Grade Officer was derived from the expert selection practices utilized by Delphi Studies in Gynecologic Oncology Research (Cohn et al. 2015). In these studies, expert selection criteria included 5 years of patient management experience, being a Board-Certified Clinician, and have shown a strong record of participation in clinical trials (Cohn et al. 2015). The requirement for 10 years of experience as a Company Grade officer was set from requirements for experience in practice (Ericsson et al. 2007; Ericsson et al. 2006). The requirement to have the Civil Engineer Master Badge was selected to match the concept of Board-Certified.

The strong performance record was incorporated in two ways. Firstly, the experts had to have achieved a Field Grade Officer rank, which are competitive. These promotions are, hypothetically, meritoriously based and therefore the superior performers are promoted over the inferior performers. Secondly, by reaching out to senior members of the career field, experts were selected based on reputation of superior performance (Ericsson et al. 2007; Ericsson et al. 2006).

Overall, 18 senior civil engineer officers were selected for participation in this research study, with 16 members being Colonels (O6), 1 member being a retired Brigadier General (O7), and 1 member being a Lieutenant Colonel (O5). Each of these members were peer nominated by a Civil Engineer Colonel as being a respected member of the community and possessing the required experience to provide valuable insight. Each of these distinguished officers were also members of the career field development team, and therefore had direct oversight of the entire enterprise. The lowest ranking member, the Lieutenant Colonel, was considered no less insightful than the other members, as his position was responsible for officer assignments.

After the initial list of panel members was identified, the Dean of the Civil Engineer School reached out to these members in a mass email and asked for their participation. In this email, each of the experts was blind-carbon-copied (BCC) so that they could not see who the other panel members were. This was done to ensure anonymity of responses. The Dean of the Civil Engineer School, being a Civil Engineer Colonel, was a peer of 89.5% of the panel members, was below the rank of 5.25% of the panel members and outranked 5.25% of the panel members. Being the same or lower rank than 94.75%, the influence of requestor rank should be considered negligible on the participation of the panel members. To mitigate the impact of command influence on the single lower ranking panel member, the email explicitly stated that participation in this study was voluntary and no attribution would occur if any member chose not to participate. Furthermore, additional communication between the panel members and the research team occurred through the student researcher, who was below the rank of all members by a minimum of two paygrades.

The response rate for the first round of this study was initially 11.1%, with only 2 panel members providing their opinions on the provided questions. Individual emails were then sent to each panel member who did not respond in an attempt to raise the value of this study. Six additional panel members provided responses, which increased the overall response rate to 44.4% for the first round. Due to the high level of visibility common of all designated experts, the full 18 panel members received the second round of questions, even if they did not respond to the first round's questions. The second round received an initial response rate of 16.66%, and a second set of personalized emails were dispatched in an effort to raise the rate. This resulted in a total of eight respondents for the second round with a constant 44.4% response rate. The final round was extended for three additional weeks at the behest of multiple panel members. Overall, the third round had a response rate of 66.67%, with 12 of the 18 members providing insight.

3.4.2 Instrumentation

The instrumentation included a modification to the original Delphi Technique. This modification came from more precise questions derived from carefully selected sources, the 2018 Education Working Group, Career Field Survey, and AFPC Data, rather than traditional open-ended questions (Cohn et al. 2015). Each question was written to extract responses which follow patterns of the expert's typical understanding yet were not aimed at determining the impact of the individual expert's background on their opinion (Cohn et al. 2015). The impact of the expert's individual background on their responses is notoriously difficult to assess due to the small sample size (Cohn et al. 2015). Power Analysis and Statistical Significance are not relevant for any of the following rounds, as there is no hypothesis being tested within the various questionnaires

(Cohn et al. 2015). Prior to the submission of the first and second round of the Delphi Study, a small Pilot Study was conducted to validate the verbiage of the questions, as well as to ensure the questions we unbiased and that a third party would understand what questions.

3.4.3 Data Collection

The study initiation was accomplished with an email drafted by the research team, critiqued and modified by the Civil Engineer School, and then endorsed and dispersed by the Civil Engineer Company Grade Officer education process owner. Each prospective panel member was Blind Carbon Copied on the same email to ensure anonymity for those who chose to participate. Appendix 11 shows the exact verbiage used to solicit initial Delphi Study participation.

All expert responses were submitted to the student researcher, with no further correspondence between the panel members and the Civil Engineer School Dean. The panel member names, email addresses, and other identifiable information were removed, and their responses were collated into a single document. This was done to ensure maximum anonymity of the participants throughout this study. Each expert's response was analyzed independently and the portion of their response which directly answered the question was highlighted. The experts commonly, as expected and desired, provided supplementary and anecdotal information which provided context for their opinions. Although this information helped provide an understanding of the expert's thought process, it could not be used to synthesize an overall opinion.

3.4.4 Data Analysis Procedures: Round 1

The first round's questions addressed competency-based education and the applicability of these educational models to Civil Engineer Company Grade Officers. These questions were formulated from the literature review and from the expected capabilities of Civil Engineer Company Grade Officers. This round did not have any influence from the 2018 Education Working Group, career field Survey, or Air Force Personnel Center position data. The question set was sent to each panel member in a Microsoft Word document, and the responses were all returned in the same format. Each panel member added their name to their responses, which had to be removed prior to analysis. No additional information, aside from the questions, were provided to the panel members during this round. Each response was then collated into the same document and was analyzed to find common themes, common verbiage, and uncommon opinions. The results were then combined into a single synthesized opinion on the question, while the statistics were retained for how many responses were in favor of which position.

3.4.5 Data Analysis Procedures: Round 2

The second round's questions integrated the previous research steps into a set of questions which specifically detailed task performance requirements for Civil Engineer Company Grade Officers. Because the 2018 Education Working Group was used as a baseline for the Career Field Survey, only discussion points not mentioned in the survey were presented as new information to the expert panel. Ultimately, this round aimed at identifying expert disagreement with survey results, where they felt gaps or overages had occurred, and to posture the overall model to receive consensus in the third round. In this round, additional information was provided to the experts in the form of separate

documents which detailed information from the AFPC and survey data. Appendix 12 shows the breakout of positions across the squadron, Appendix 13 shows the percent of officers assigned to each level and unit type, Appendix 14 shows the results of the career field survey, and Appendix 15 shows the results of the career field survey as it pertains to the development timeline.

Appendix 12 came from the AFPC position data and reveals to the experts a current snapshot of the location of Civil Engineer Company Grade Officer positions within the Civil Engineer Squadron. This was provided to ensure that the experts had relevant information about the actual layout of positions within the most common unit of assignment and to remove any assumptions that the experts may have had regarding the true allocation of positions. Because the research breaks out the timeline based on rank, the overall allocation of Company Grade Officers was provided, as well as a distinction of Lieutenant and Captain allocations.

Appendix 13 provided an overview of Civil Engineer Company Grade Officer positions throughout the entire career field. The allocation breaks out the entire data set into the units to which the member is assigned and displays the information as CGOs as a whole, and the lieutenant and captain components separately to ensure that the experts have a full perspective of the allocation.

Appendix 14 came from the interpreted results of the career field survey. The first column shows the Identifier for the Competency, which was shown in the survey. The second column shows the name of the competency, and the third column shows the ranking of the competency (with highest score first). The score was based on the number of individuals who voted for the importance of each competency, with 1 being allocated

for ratings of “not important” and 5 being given for ratings of “extremely important.” Then the scores were all added together and a final score was given in the “score/rating” column. This was provided to the experts to display how important the career field, who are designated as the stakeholders, found the listed competencies and to allow the experts to dispute or substantiate the competencies.

Appendix 15 provided the experts with the timeline results of the survey. Not every question had survey respondents provide a timeline, and in those cases “Not Provided” was placed. The percentage of each rank vote was placed, with the maximum value being highlighted in yellow. This was provided to the experts to determine agreement or disagreement with the survey results.

3.4.6 Data Analysis Procedures: Round 3

The third round sought to achieve consensus in the final model based upon the results from the second round. Additionally, each competency needed to have proficiency levels added to them. There was one attachment for this round of questions, in the form of an Excel sheet which allowed the experts to fill out four columns. The first column allowed the experts to select “accept as is,” “modify,” or “reject” for the competency as it was written. The second column allowed the experts to select “accept as is,” “modify,” or “reject” for the timeline of competency attainment as it was selected. The third column allowed the expert to select whether a competency should be binary or scaled. These three columns had prepopulated cells to allow the expert to just select a predetermined choice; however, the fourth column allowed them to provide any comments or supplementary information to substantiate their responses. Appendix 16 shows the attachment to accompany the selection of their responses.

In Appendix 16, the first column shows the previous competencies which had been used to create this umbrella competency. The second column showed the count of the competency in order of attainment rank. This count is not to be confused with importance, priority, or ranking as no competency is designated as more or less important than any other. The third column provides a category of the competency, which is used to designate what overall concept is being provided by the performance. The fourth column displays the new verbiage of the competency and is comprised of the verbiage associated with the composite components. The fifth column shows the previous ranking of the composite competencies in respective order to their display in column one. The sixth, seventh, eighth, and ninth columns all show the timeline of development, with "attainment" designating the time that the CGO should be competent.

3.5 Summary

The methodology used to establish the Civil Engineer Company Grade Officer Competency-Based Education Model was comprised of four components: an Education Working Group to provide baseline information about capability requirements and timelines for development, a career field survey to get stakeholder input on the working group results, position analysis derived from literature and position allocation data, and a Delphi Study to finalize and validate the model.

IV. Results and Discussion

This chapter details the analysis results from each research method and discusses how each outcome contributes toward establishing a Civil Engineer Company Grade Officer competency-based education model. This chapter's first section discusses the 2018 Education Working Group observations and how these outcomes influenced the career field survey questions. The second and third sections reveal the Air Force Personnel Center position analysis and career field survey outcomes, respectively, and discuss how these results contribute toward the Delphi Study questions. The fourth section reiterates the research questions and provides the relationship between these questions and the Delphi Study. The research questions are: 1) What are the required capabilities/competencies for Civil Engineer Company Grade Officers? 2) When should Civil Engineer Company Grade Officers achieve competence in the identified areas? 3) What are the temporal influences on the Civil Engineer Company Grade Officer's career? and 4) How could a Civil Engineer Company Grade Officer educational model incorporate Civil Engineer Competencies? The last six sections detail the Delphi Study round's questions and responses.

4.1 2018 Education Working Group Observations

The first working group observation was the lack of a standard lexicon. Multiple workshop participants had voiced their confusion regarding terms in common usage having different meanings to various individuals. This confusion resulted in members revisiting discussion topics to ensure their documentaion would accurately represent their

opinions to other groups. The working group did not create a definition library to solve this problem and merely repeated discussion topics to ensure agreement.

The final 2018 Education Working Group results are included in Appendix 17. These results showed participants having lower expectations for Second Lieutenant (O-1) capabilities, with the greatest number of “Optional” designations occurring at this rank. Of the 96 final competencies, 48 were non-mandatory for O-1s.

For the Senior Captain rank, at 7-10 years of official service, there were no “optional” competencies, only four competencies were “encouraged,” and 92 were listed as either “expected” or “required.” Most competencies trended toward being fully “required” for Senior Captains, with only five showing an age-out-of-depth concept. The age-out-of-depth concept is exhibited by an importance increase followed by a decrease, implying the progression beyond the vertex shows less competence requirements. The overall trend can be concerning, as it shows Senior Captains having mastered all areas even though they may be filling administrative roles.

With the general importance trend increasing with progression toward the Senior Captain rank, it was unexpected to find few competencies reach the “required” status before promoting to the Field Grade Officer ranks. It is possible that these competencies could reach required status during Field Grade Officer ranks, which is outside the scope of this research. Figure 6 shows the number of competency importance levels per rank.

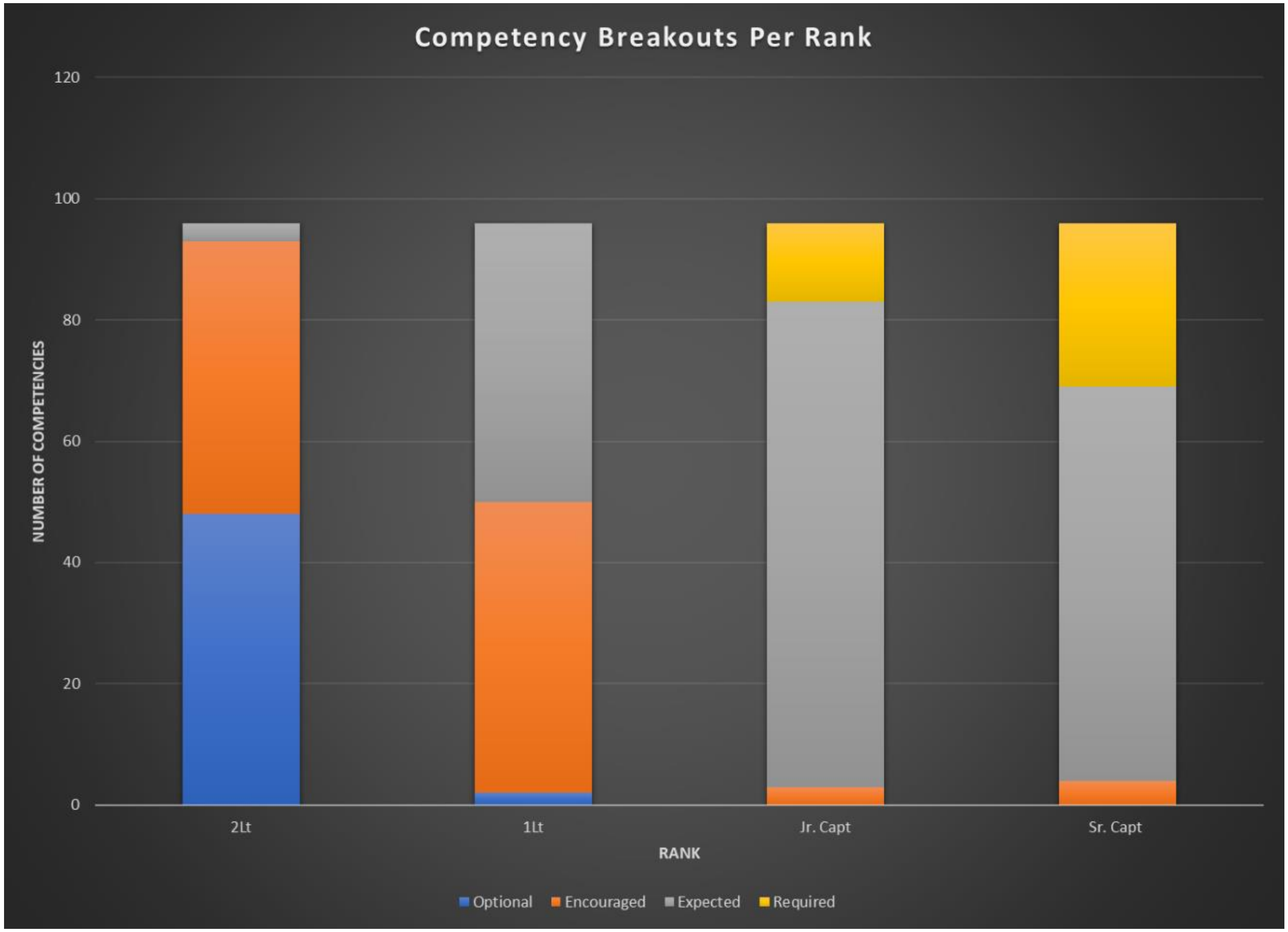

Figure 6: Competency Breakouts Per Rank

As shown in Figure 6, “optional” and “encouraged” categories reduce toward null over the 7-10 years period between commissioning and promoting to Major. Concurrently, “expected” and “required” numbers grew to majority, while “required” designations merely increased. Another surprising working group outcome was the Scope, Planning, and Programming competencies had numerous “optional” designations for Second Lieutenants. The Air Force Personnel Center position data shows that the majority of O-1s are assigned within the programming element; and one would assume the working group would have listed these competencies as “required.”

This methodology contributed toward the final competency-based education model by identifying basic tasks and approximate importance for each rank. Upon workshop completion, Civil Engineer School staff members combined tasks and competencies into integrated umbrella performance requirements. This reduced the number from 96 to 74 competencies for use in the career field survey.

4.2 Air Force Personnel Center Position-Based Data/Literature Discussion

The initial Air Force Personnel Center position allocation data analysis revealed Lieutenants held 199 positions and Captains held 376 positions. The data did not make distinction between Second Lieutenants and First Lieutenants, nor did it differentiate between Junior Captains (4-7 years of service) and Senior Captains (7-10 years of service). Company Grade Officer position allocation levels and can be seen in Figure 7, which shows the unit-level decomposition for all Company Grade Officers, whereas Figure 8 visualization of Captains and Lieutenants unit-level positions independently, respectively.

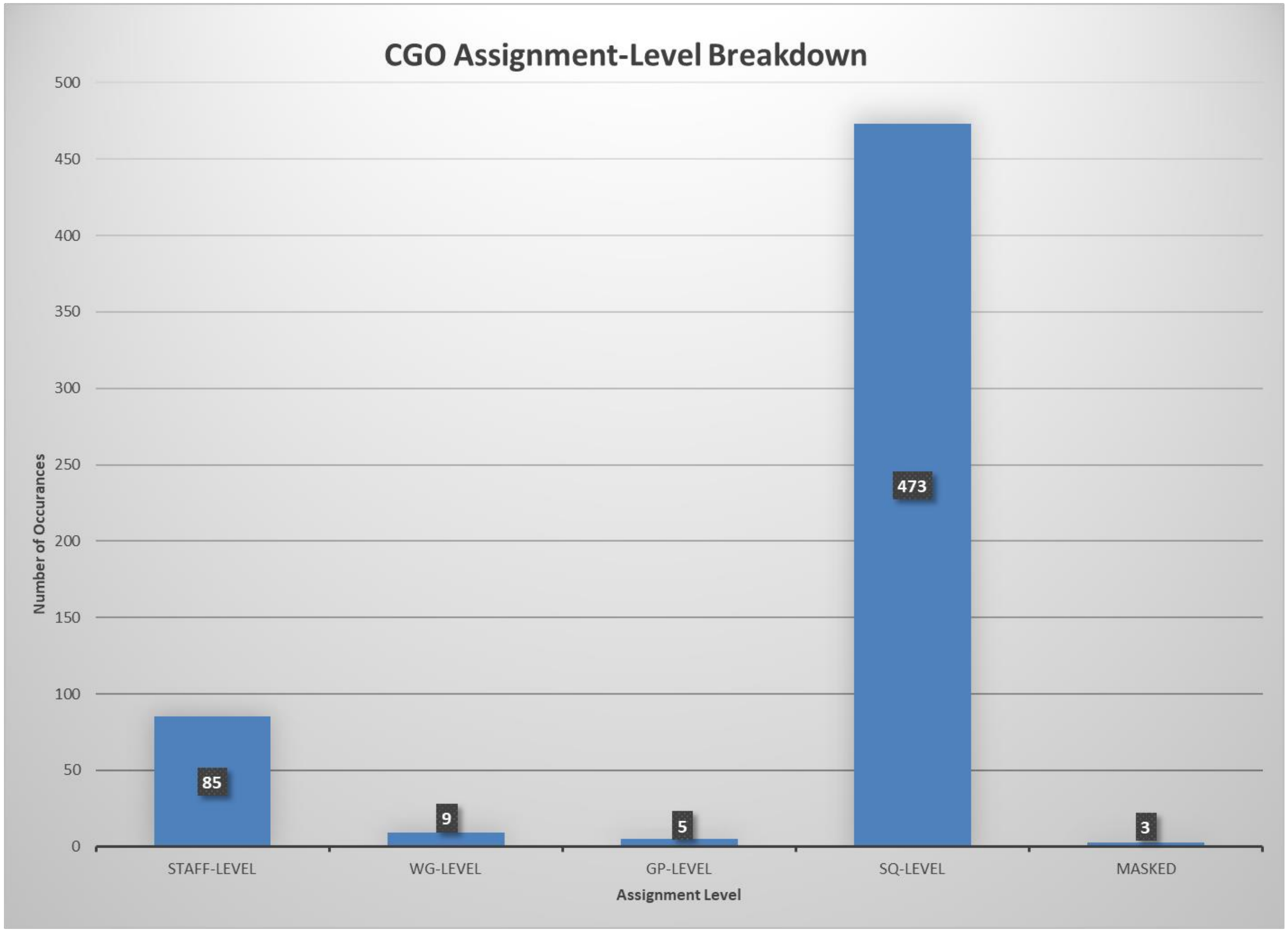

Figure 7: Company Grade Officer Assignment by Unit Type

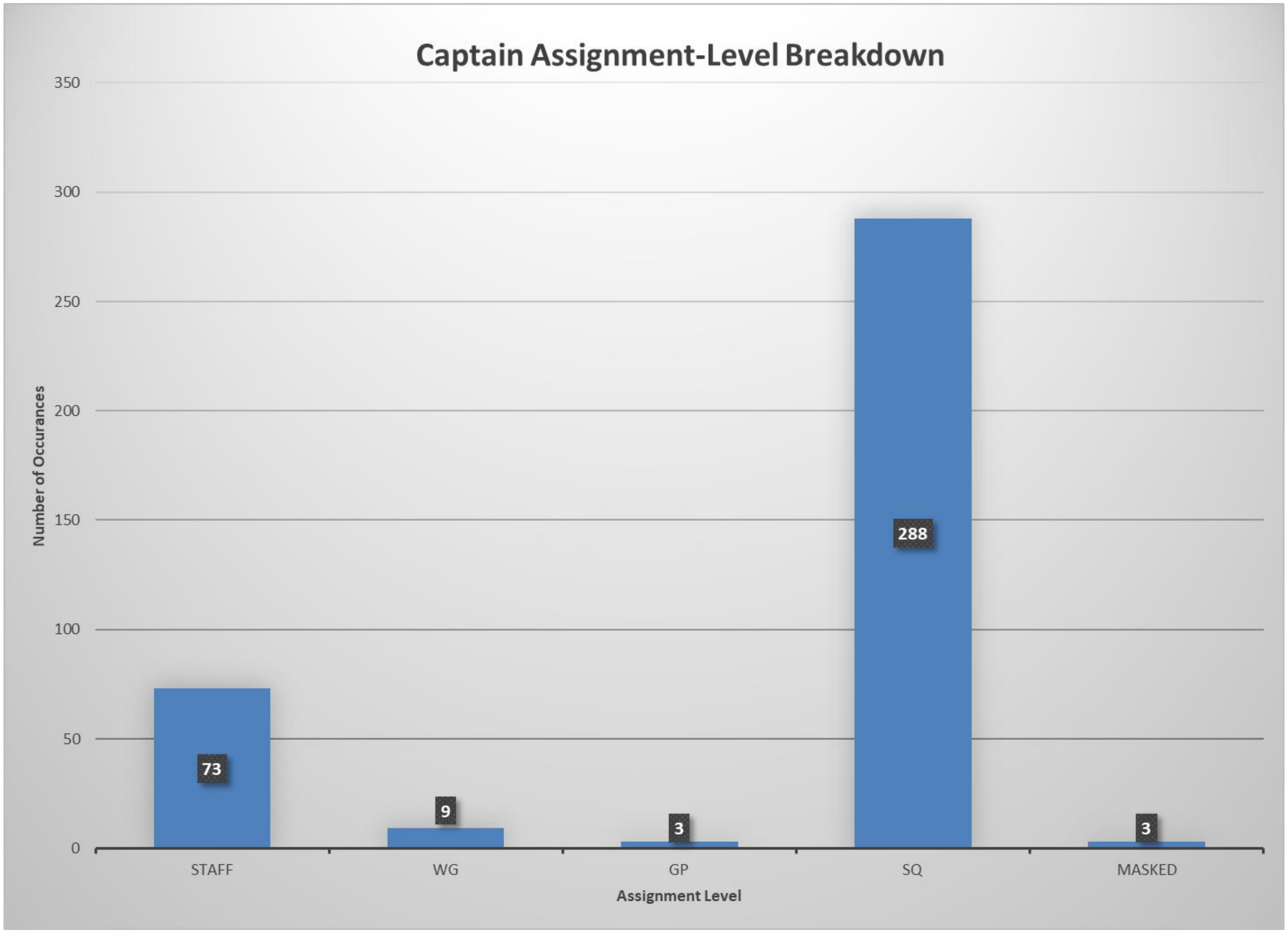

Figure 8: Captain Assignment by Unit-Type

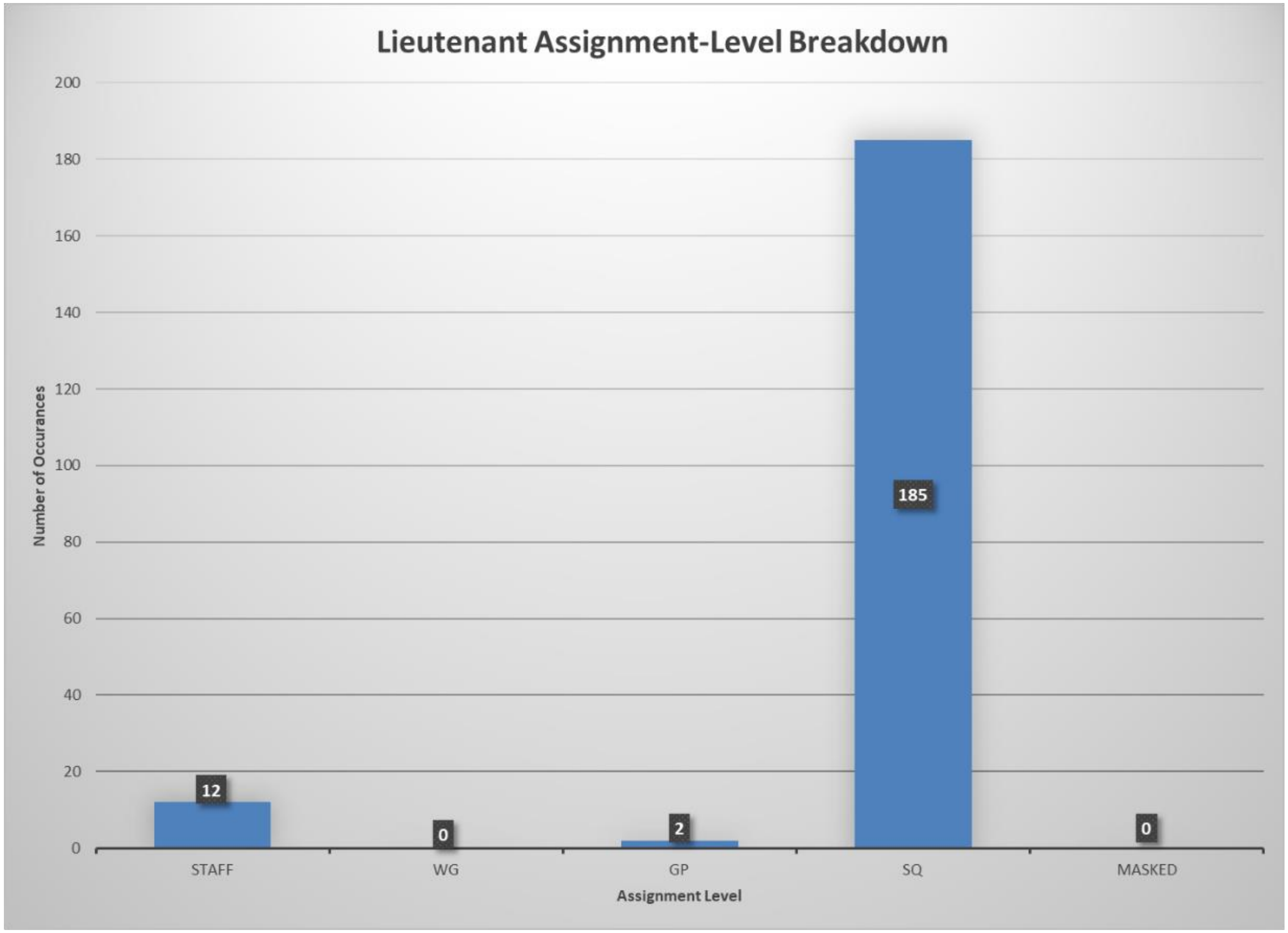

Figure 9: Lieutenant Assignment by Unit-Type

As shown in Figures 7-9, Squadron level assignments are the majority for Company Grade Officers (82.26%), Captains (76.59%), and Lieutenants (92.9%). The second largest Civil Engineer Company Grade Officer unit-type assignments are at various Staff Directorates. Approximately 14.78% of Company Grade Officers are assigned to Staffs above the Wing Level, which can be broken down into 19.41% of Captains and 6% of Lieutenants. Therefore, Captains, but not Lieutenants, may require Staff skill development.

The remaining 4% of Captains are assigned to Wing Staffs, Group Staffs, or are Classified/Masked. The remaining 1% of Lieutenants are assigned to the Group Level, with none being officially assigned to Wing Staffs or Classified/Masked positions. A concern with this data was the inability to determine if an individual was assigned as a Group Executive Officer, as it does not result in duty title changes such as it does for Wing Executive Officers and higher. The literature provided by Career Field Manager and the Air Force Personnel Center Company Grade Assignments Officer primarily focused on Squadron Level Civil Engineer capabilities and did not provide insight into additional areas. Additionally, the Career Field Education and Training plan substantiated the Air Force Personnel Center Data, by explaining that most Civil Engineer Officers are assigned to the base level (Department of the Air Force 2015). This indicates that the provided literature, assuming it accurately portrays requirements, should capture the majority of competency requirements for this portion of analysis.

While the Civil Engineer Company Grade Officers majority are assigned to Squadrons, there are numerous Squadron types to which they may report. Figure 10 shows the number of Civil Engineer Company Grade Officers assigned to each squadron types.

This data is then decomposed into Lieutenant and Captain components independently and shown in Figure 11, and Figure 12 respectively.

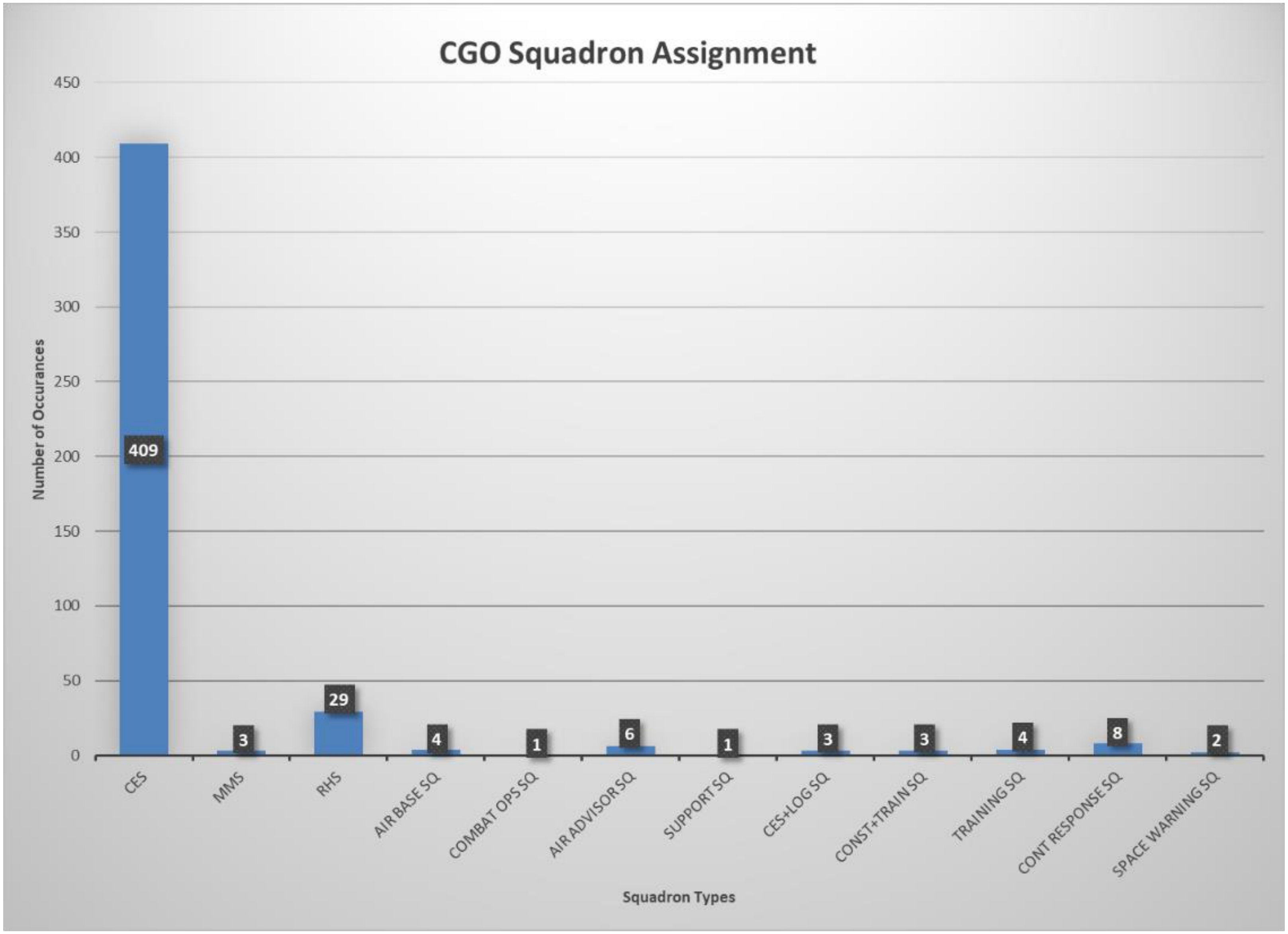

Figure 10: Company Grade Officer Positions by Squadron Type

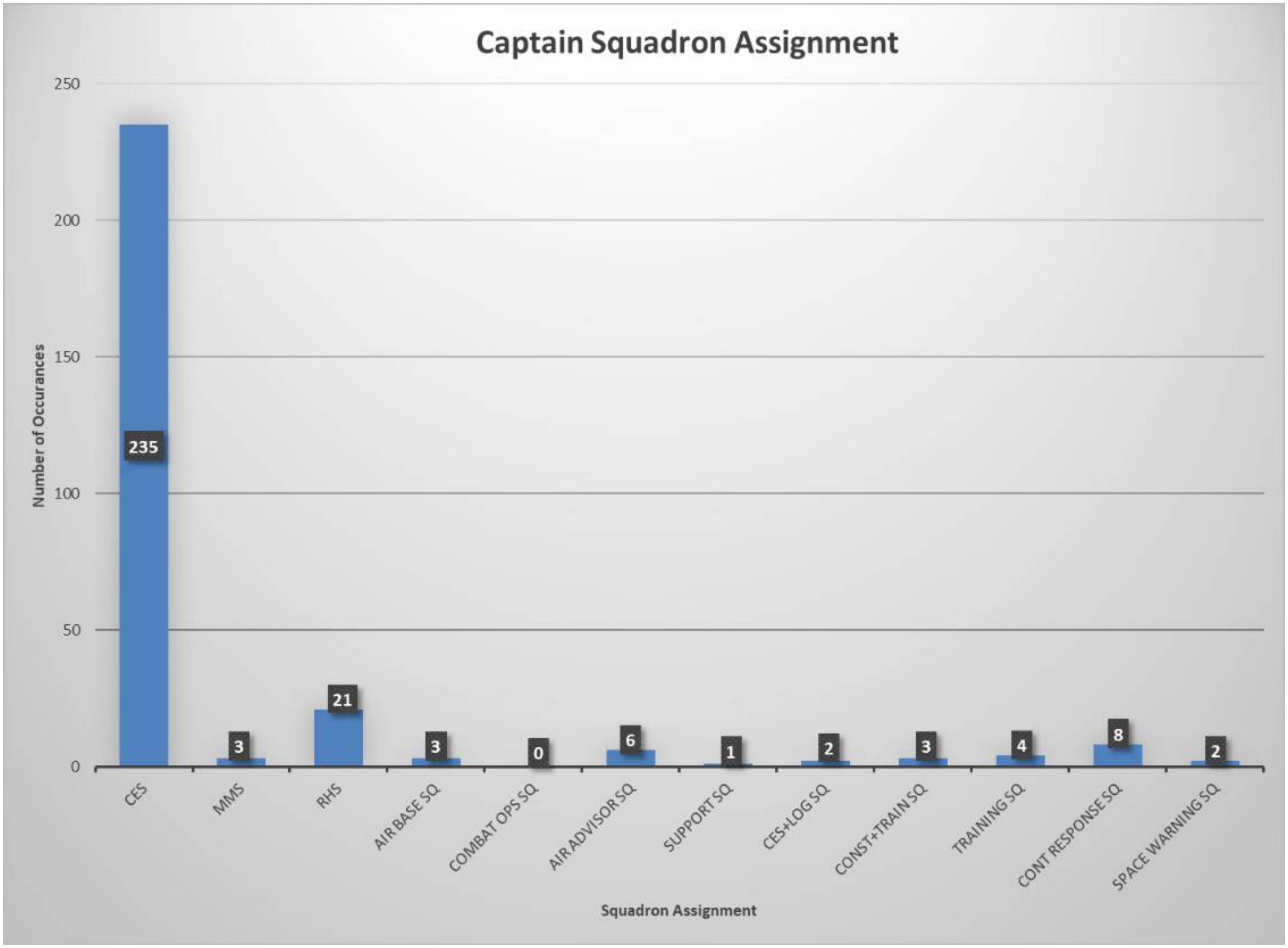

Figure 11: Captain Position by Squadron Type

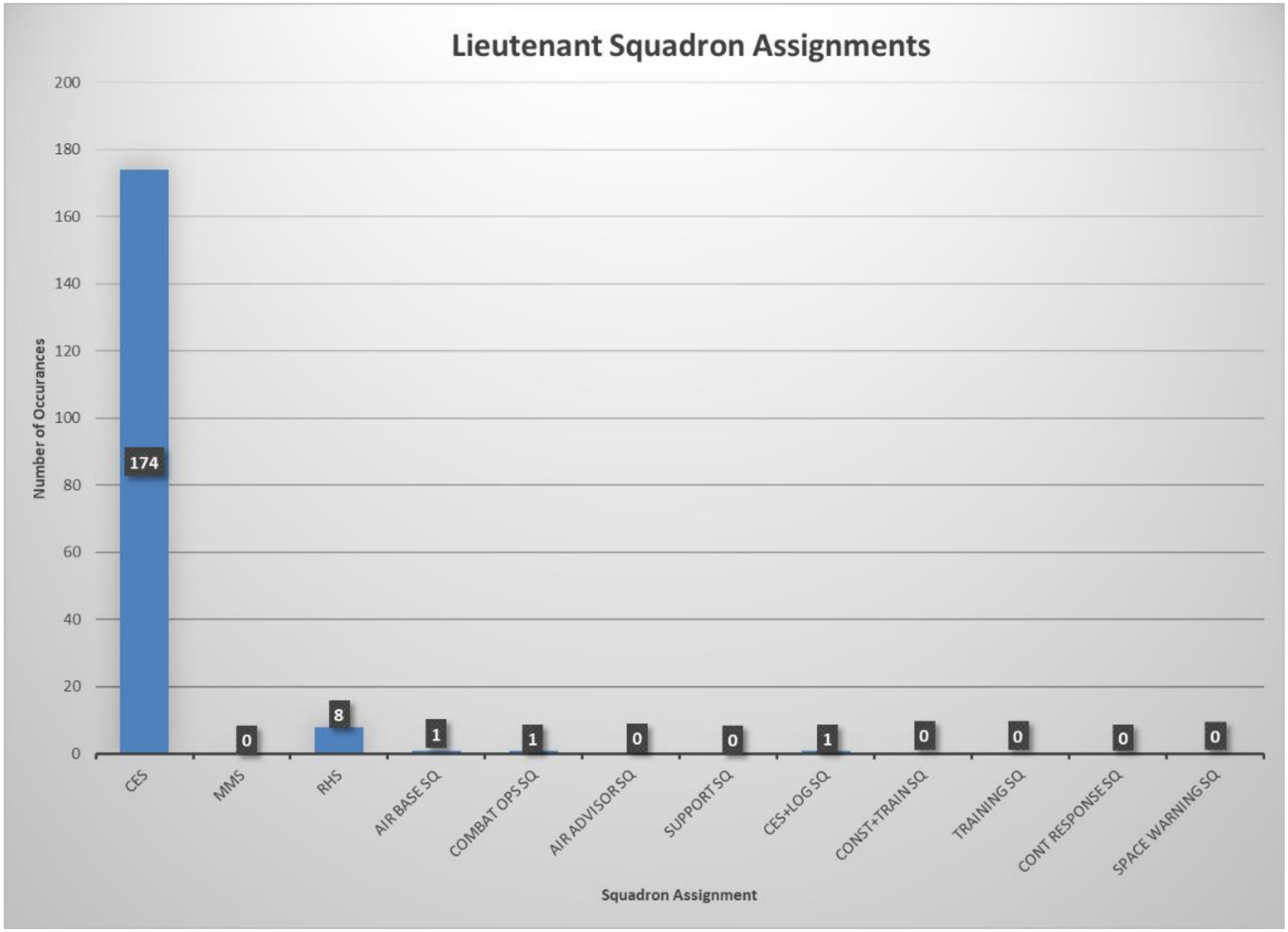

Figure 12: Lieutenant Positions by Squadron Type

As shown in Figures 10 through 12, Civil Engineer Squadrons hold the position majority, with 86.47% of Company Grade Officers being assigned. This percentage is decomposed into 81.60% of Captains and 94.05% of Lieutenants. RED HORSE Squadrons held the second highest number of positions, with 6.13% of Company Grade Officers being assigned. Like Civil Engineer Squadrons, RED HORSE Squadrons are maintained by the Civil Engineer career field. The remaining percentage was distributed in relatively small numbers to Materials Maintenance Squadrons (MMS), Air Base Squadrons, Combat Operations Squadrons, Air Advisor Squadrons, Support Squadrons, Joint Civil Engineer and Logistics Squadrons, Construction and Training Squadrons, Training Squadrons, Contingency Response Squadrons, and Space Warning Squadrons. Officer assignments for the other squadron types did not reach a recognizable number for any given type. This indicates that recommended literature will capture the majority of position requirements. The provided literature did not address the capabilities of RED HORSE Squadrons, which will result in a specific question being asked of experts in the Delphi study to bridge this gap. The complete breakout will also be provided to the experts to determine if skill requirements from the other squadron types are worthy of inclusion.

The second largest number of Civil Engineer Company Grade Officers are assigned to Staff Directorates above the wing level. The recommended literature did not address Staff Directorate capabilities, which will require Delphi Study questions to analyze the knowledge gap. Figure 13 shows the number of Company Grade Officers assigned to various staff organizations. Figure 14 and Figure 15 show the breakout of both Captains and Lieutenants to staff assignments, respectively.

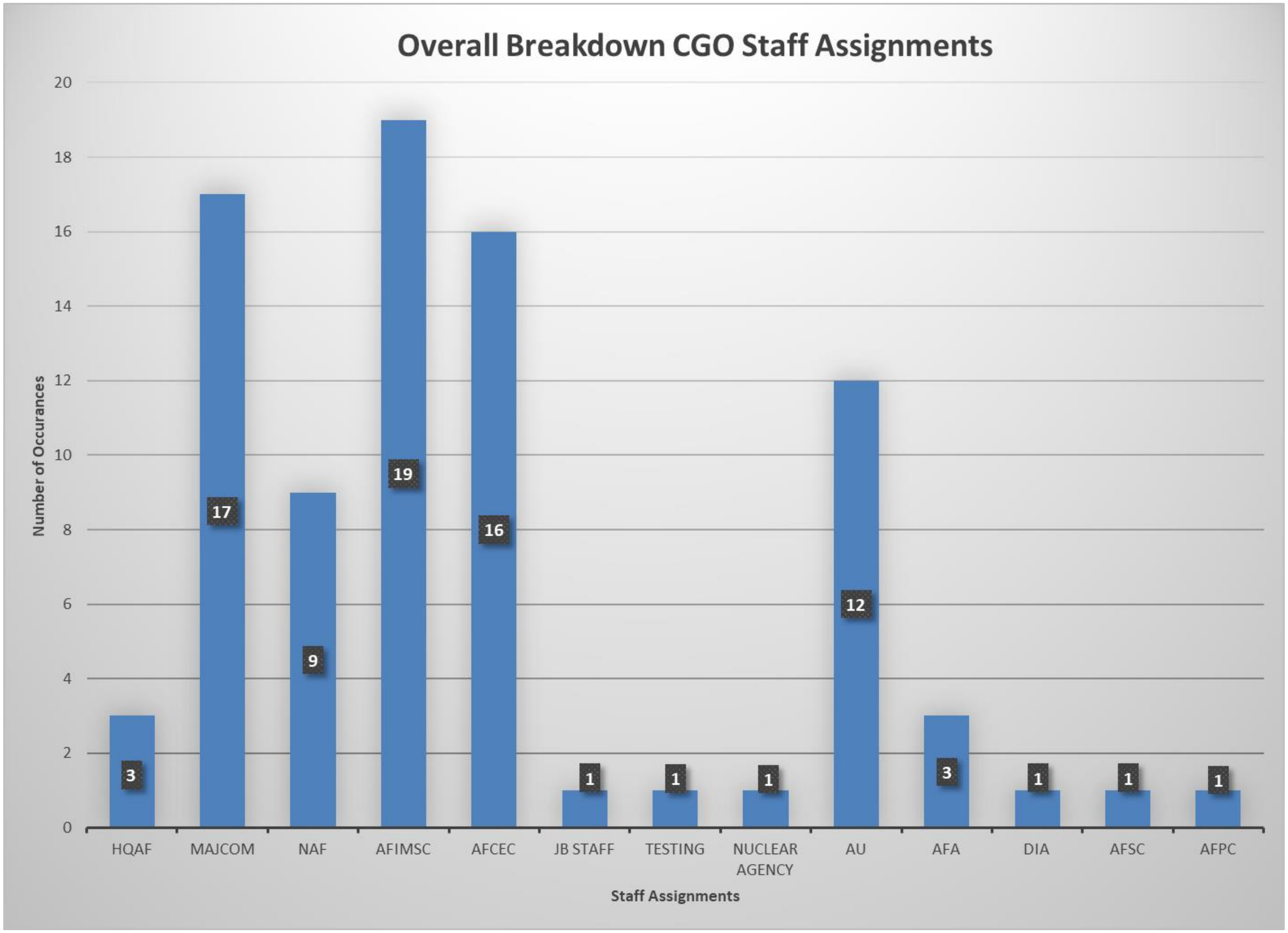

Figure 13: Company Grade Officer Staff Unit Assignments

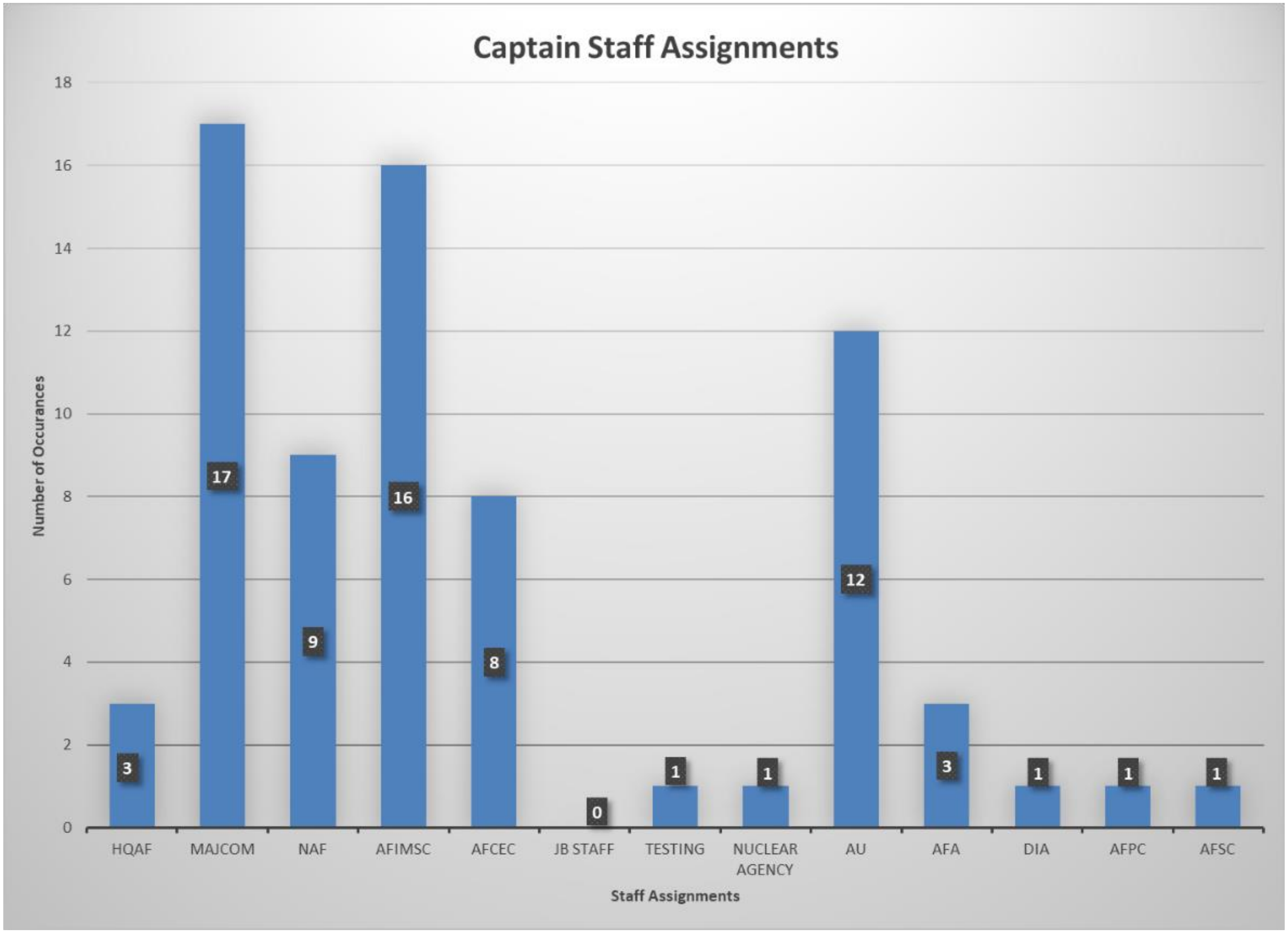

Figure 14: Captain Staff Unit Assignments

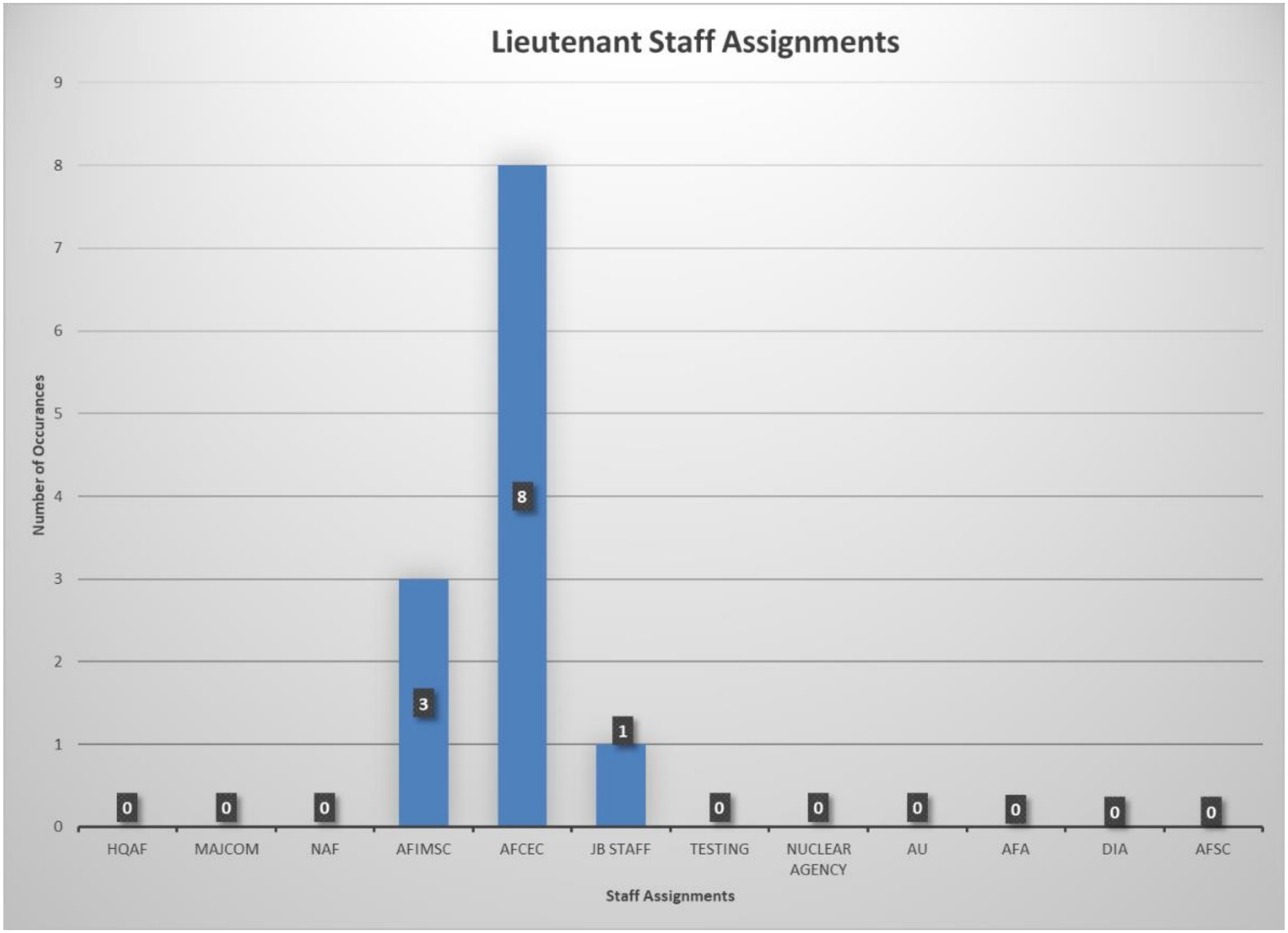

Figure 15: Lieutenant Staff Unit Assignments

As shown in Figure 13, The Air Force Civil Engineer Center and Air Force Installation and Mission Support Center were the largest staff components to which Company Grade Officers are assigned. These staff organizations are outside the Chain of Command and provide support which historically came from Major Commands. The Air Force Civil Engineer Center is an Air Force Installation and Mission Support Center component, the combination of which possess 42.35% of Company Grade Officer staff positions. Air Force Chain of Command Staffs above the Wing Level, including Numbered Air Force, MAJCOM, and Headquarters Air Force, held the second largest number of Civil Engineer Company Grade Officer positions, at 34.12%. Education staff positions, at the Air Force Academy and Air University, held the third largest number of staff positions, at 17.65%. The remaining trace amounts were distributed amongst Joint Base Staff, Testing, the Nuclear Agency, Defense Intelligence Agency, Air Force Space Commander, and the Air Force Personnel Center. Figure 14 shows Captain position percentages closely match overall Company Grade Officer peerage assignment and Figure 15 shows that Lieutenants are only really assigned to AFCEC or AFIMSC.

A data concern comes from the fact that the authorized position rank did not always align with incumbent officer rank. It is impossible to determine if this data represents an anomaly or if it is common to have rank misalignment. In total, 107 positions, equating to 18.61% of positions, were misaligned based on the rank. The misalignments included positions held by Company Grade Officer of a different rank or by a Field Grade Officer. A visual representation of these misalignments can be seen in Figure 16.

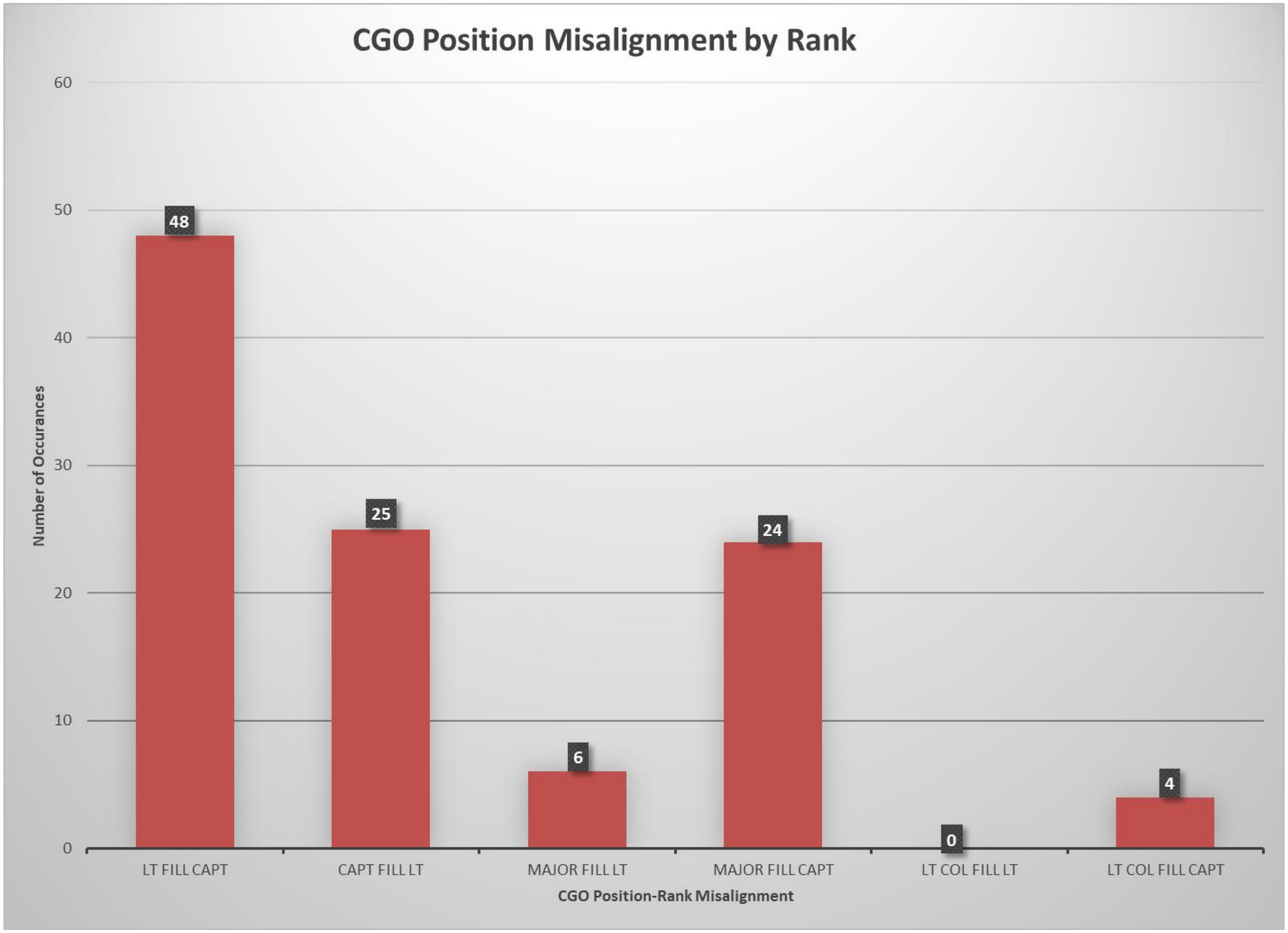

Figure 16: Company Grade Officer Positions Misaligned by

As shown in Figure 16, the largest misalignment occurred with Lieutenants holding Captain positions. The second largest misalignment was Captains holding positions designed for Lieutenants. These 73 positions equate to 12.6% of the sample and may imply rank irrelevancy on competency attainment. Additionally, 34% of the misalignments were caused by Field Grade Officers holding Company Grade Officer positions. Majors were found to hold both Lieutenant and Captain Positions, while Lieutenant Colonels held only Captain billets. These misalignments primarily occurred on Staff Directorates. Furthermore, 33 Field Grade Officers positions were held by Company Grade Officers. All such misalignments occurred with Captains filling higher roles and equated to 7.2% of the 456 Field Grade Officer positions. The breakdown of this rank misalignment can be seen in Figure 17.

Figure 17: Field Grade Officer Positions Held by Company

As shown in Figure 17, 32 Major positions and 1 Lieutenant Colonel Position were held by Captains. No Lieutenants held any Field Grade Officer positions. Unlike the data shown in Figure 16, there are more locations for misalignments to occur, with Staff units not holding the majority of this misalignment. The breakdown of the unit type for Figure 17 can be seen in Figure 18.

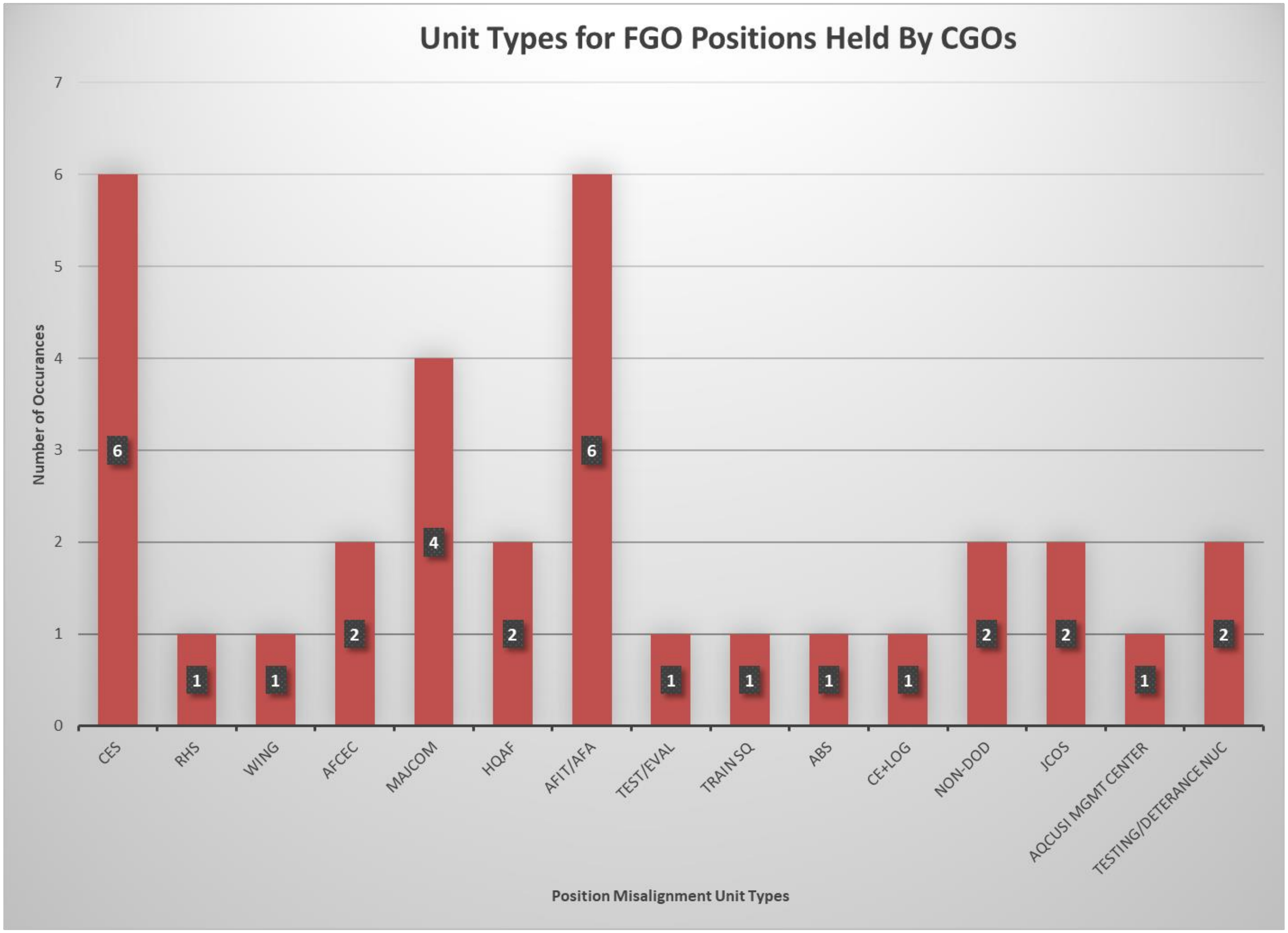

Figure 18: Field Grade Officers Position Held by Company Grade Officers: Misalignment by Unit Type.

As shown in Figure 18, Company Grade Officers held Field Grade Officer positions in 15 unit-types within the United States Air Force’s hierarchical structure. This can be concerning for model development because the knowledge, skills, abilities, or other position attributes may be overlooked. Additional concerns come from position misalignments occurring at nearly all levels, as shown in Figure 19.

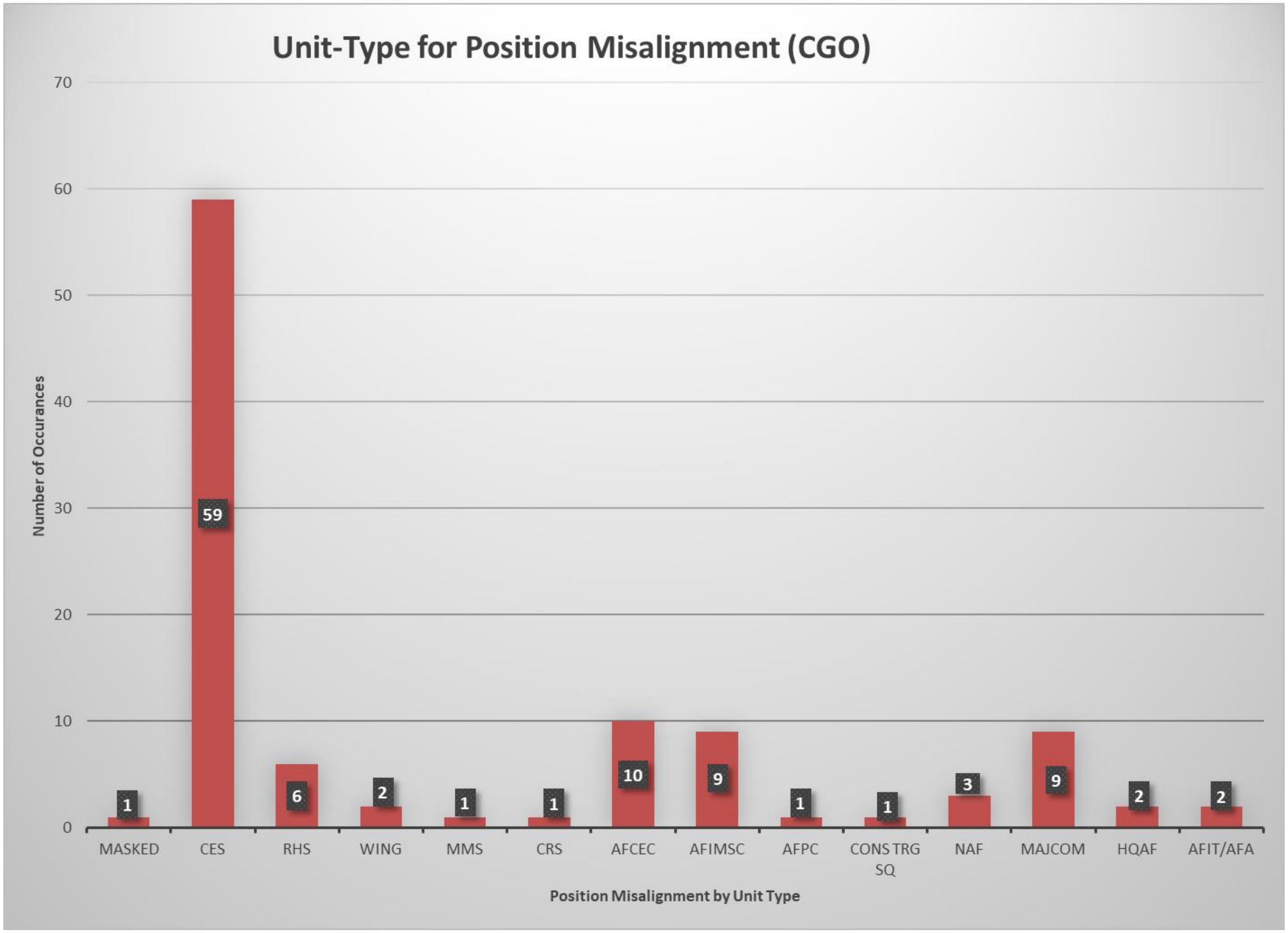

Figure 19: Unit-Type for Company Grade Officer Position Misalignment

As shown in Figure 19, Field Grade Officers hold Company Grade Officer positions at all United States Air Force hierarchical levels. Most of these position misalignments occurred within Civil Engineer Squadrons, unlike when Company Grade Officers fill Field Grade Officer positions. The concerns associated with these misalignments will generate a Delphi Study question.

Additional AFPC data analysis revealed the failure to utilize standard position duty titles. The 78 Civil Engineer Officers standard duty titles can be seen in the Career Field Education and Training Plan AFSC 32EX Civil Engineer Officer (CFETP) Appendix 2, published on 1 May 2015 (Department of the Air Force 2015). The failure to use standard duty titles was found in 140 AFPC data points, equating to 24.3% of all Civil Engineer Company Grade Officer positions. In most cases, duty titles could be deciphered and recategorized with similar positions. This deciphering came from comparing the duty title to the duty titles within the CFETP and reconciling based on organizational assignments.

This nomenclature confusion even extends into United States Air Force Publications, with different publications having separate definitions for competencies (Stafford 2017). To exemplify this, Competencies are defined within Air Force Manual 36-2647 as “Observable, measurable patterns of knowledge, skills, abilities, behaviors, and other characteristic needed to perform institutional or occupational functions successfully” (Stafford 2017; Department of the Air Force 2019). Now compare this definition to that of the Air Force Doctrine Document II Leadership Annex 1-1 Force Development, which states: “Competencies are attributes an individual possess to successfully and consistently perform a given task, under specified conditions, or meeting a defined standard of performance” (Stafford 2017; Department of the Air Force 2006).

These definitions lack a standard specificity level and can reveal an exclusion of attributes based on generalized terms. This same concern was mentioned by the 2018 Education Working Group Panel Members.

The information within the literature details the requirements for Flights, Elements, and Positions within Civil Engineer Squadrons. The Air Force Officer Classification Directory describes the Civil Engineer capabilities as providing infrastructure and real property support to both the United States and Allied Nations, programming, creating Civil Engineer budgets, project management, drafting construction drawings, surveying and site development, performing feasibility studies, understanding energy and environmental programs, and asset management (Air Force Personnel Center 2018). The prerequisite for Civil Engineer Officer positions is a degree in engineering or architecture (Air Force Personnel Center 2018). Aside from the degree requirements, the only mandatory training required for Civil Engineer Officers is WMGT 101: Air Force Civil Engineer Basic Course or WMGT 102: Introduction to the Base Civil Engineer Organization for Reserve Forces (Air Force Personnel Center 2018).

Clarification on requirements for specific Flights, Elements, or Positions can then provide further insight into the creation of this model. Table 9 shows the percentage of Company Grade Officers, Captains, and Lieutenants that are positioned in the five assignable flights and squadron staff. The sixth flight, the Fire and Emergency Services, is unassignable for Civil Engineer Officers and as such is neglected from this model.

Table 9: Company Grade Officer Flight Allocation within Civil Engineer Squadrons

Civil Engineer Squadron Flight Assignments			
Flight	**Company Grade Officer Percentage**	**Captain Percentage**	**Lieutenant Percentage**
Squadron Staff	0.49%	0.84%	0%
Explosive Ordinance Disposal (EOD)	8.07%	13.45%	0.58%
Readiness and Emergency Management Flight (CEX)	9.54%	12.61%	5.26%
Operations Flight (CEO)	19.56%	18.49%	21.05%
Engineering Flight (CEN)	52.57%	46.22%	61.40%
Installations Management Flight (CEI)	7.09%	7.14%	7.02%
Undistinguished	2.69%	1.26%	4.68%

As shown in Table 9, most Civil Engineer Company Grade Officers, and Lieutenants and Captains independently, are assigned to Engineering Flight (CEN). The position allocation within CEN can be seen in Table 10. Due to the varied requirements for each flight, the Delphi Panel members will be asked about any concerns that have about the percentage of individuals assigned to a single flight.

Table 10: Engineering Flight Company Grade Officer Position Percentages

Engineering Flight (CEN) Position Percentages			
Flight	**Company Grade Officer Percentage**	**Captain Percentage**	**Lieutenant Percentage**
Flight Commander	2.79%	4.55%	0.95%
Deputy Flight Chief	7.44%	11.82%	2.86%
Project Management, Chief	5.12%	7.27%	2.86%
Project Manager	12.09%	7.27%	17.14%
OIC, Construction Management	2.79%	3.64%	1.90%
Construction Manager	1.40%	0.00%	2.86%
Quality Assurance	0.47%	0.91%	0.00%
SABER Chief	0.93%	1.82%	0.00%
Portfolio Optimization, Chief	3.72%	3.64%	3.81%
Deputy Portfolio Optimization, OIC	0.93%	1.82%	0.00%
Energy Manager	1.40%	1.82%	0.95%
Programmer	18.60%	7.27%	30.48%
NEXGEN IT Officer	0.47%	0.91%	0.00%
Expeditionary Engineering, Chief	0.47%	0.00%	0.95%
Undistinguished	41.40%	47.27%	35.24%

As shown in Table 10, the largest Engineering Flight data point cluster was undistinguishable positions. The two most populous identifiable positions were Programmer at 18.60% and Project Manager at 12.09%. Programming was much more common for Lieutenants, with 30.48% assigned to the position compared to only 7.27% of Captains. The advertised capabilities of Engineering Flight Members includes: “Comprehensive planning, programming, Comprehensive Asset Management Plan (CAMP) integration, and execution of base level facility/infrastructure requirements that exceed the operations flight in-house capabilities, lean cradle-to-grave project development and execution organization” (Department of the Air Force 2015). Furthermore, “CE officers in this flight perform base comprehensive planning, project programming, environmental planning, technical design, and construction surveillance for projects to maintain, restore, and upgrade base facilities and infrastructure systems” (Department of the Air Force 2015).

The Operations Flight (CEO) had the second largest number of position allocations, as shown in Table 9. Even though CEO had the second largest number of positions, it still possessed less than half CEN's allocations. The position allocation within CEO can be seen in Table 11.

Table 11: Operations Flight Company Grade Officer Position Percentages

Operations Flight (CEO) Position Percentages			
Flight	Company Grade Officer Percentage	Captain Percentage	Lieutenant Percentage
Flight Commander	12.50%	18.18%	5.56%
Deputy Flight Commander	2.50%	0.00%	5.56%
Operations Engineering, Chief	37.50%	47.73%	25.00%
Operations Engineer	1.25%	2.27%	0.00%
Operations Officer	1.25%	2.27%	0.00%
Public Works Officer	2.50%	4.55%	0.00%
R&O Officer	13.75%	6.82%	22.22%
R&O OIC	22.50%	13.64%	33.33%
R&O Deputy	1.25%	0.00%	2.78%
Executive Officer	2.50%	2.27%	2.78%
Service Contracts OIC	1.25%	0.00%	2.78%
Mission Engineering	1.25%	2.27%	0.00%

As shown in Table 11, four positions make the majority of Company Grade Officer allocations in CEO: Operations Engineering Chief, Requirements and Optimization OIC, Requirements and Optimizations Officer, and Flight Commander. This equates to 73.75% of Company Grade Officers in Operations Flight being assigned to the Operations Engineer Element (CEOE). CEOE advertised capabilities include "oversees service contracts, operates material control, and customer service functions" (Department of the Air Force 2015, Headquarters United States Air Force 2012).

The Readiness and Emergency Management Flight (CEX) held the third largest number of positions, at 9.54%. This flight has less than half the allocations of Operations

Flight and less than a fifth of Engineering Flight positions. This may be concerning due to the unique nature of this flight brining it outside the scope of common engineering disciplines. The breakout of CEX positions can be seen in Table 12.

Table 12: Readiness and Emergency Management Flight Company Grade Officer Position Percentages

Readiness and Emergency Management Flight (CEX) Position Percentages			
Flight	Company Grade Officer Percentage	Captain Percentage	Lieutenant Percentage
Undistinguished	41.03%	46.67%	22.22%
Flight Commander	58.97%	53.33%	77.78%

As shown in Table 12, most CES positions were indistinguishable. The only position which could be distinguished was Flight Commander. These positions are administrative but must aid Civil Engineer Squadrons in becoming the “focal point for all contingency support and prepares the wing for operations during natural disasters, major accidents, war, and other base emergencies” (Department of the Air Force 2015). The advertised capabilities of this flight include: “CE officers in this flight provide planning, program management, and training for integrated wing readiness plans, wing EM plans, CE readiness, and the AF Incident Management System (AFIMS), Oversight of the Prime BEEF program and deployment manager functions as well as the EM functions, briefs the Base Civil Engineer (BCE) monthly of status of unit’s readiness as reported in Status of Resource and Training System (SORTS), Defense Readiness Reporting System and the Air and Space Expeditionary Force (AEF) unit type code (UTC) Reporting Tool (ART)” (Department of the Air Force 2015).

The Explosive Ordinance Disposal Flight (CED) was the fourth largest flight, with less than 1.5% difference from CEX for position allocations. This flight's skill requirements are also outside the scope of common engineering disciplines but is a volunteer only flight. The breakout of CED positions can be seen in Table 13.

Table 13: Explosive Ordinance Disposal Flight Position Percentages.

Explosive Ordinance Disposal (CED) Position Percentages			
Flight	**Company Grade Officer Percentage**	**Captain Percentage**	**Lieutenant Percentage**
EOD Director of Operations	3.03%	3.13%	0.00%
EOD Flight Commander	75.76%	78.13%	0.00%
EOD Officer	21.21%	18.75%	100.00%

As shown in **Table 13**, Flight Commander was the majority of CED positions, with EOD Officer taking all but 3% of the remainder. EOD Officer advertised capabilities include: "provides identification, evaluation, diagnosis, render-safe, recovery, and final disposition of foreign or domestic conventional, nuclear, chemical, and countering the threat of biological unexploded ordnance (UXOs), IEDs and weapons of mass destruction (WMDs). Flights support on and off-base worldwide response to aerospace systems/vehicles and conventional munitions; counter-IED operations, combating WMDs; nuclear weapon and response Task Force (RTF) operations; UXO and recovery of airbases denied by ordnance (RADBO) operations; operational range clearance; mortuary services; defense support to civil authorities (DSCA); Irregular Warfare (IW) security force assistance, counterinsurgency (COIN), stability operations, humanitarian mine assistance (HMA) and building partnership capacity (BPC); as well as Very

Important Persons (VIP) protective support to US Secret Service, Department of Homeland Security and Department of State" (Department of the Air Force 2015).

The Installation Management Flight (CEI) held the fewest number of positions, employing only 7.09% of Civil Engineer Company Grade Officers. The breakout of Installation Management Flight positions can be seen in Table 14.

Table 14: Installation Management Flight Position Percentages.

Installation Management Flight (CEI) Position Percentages			
Flight	**Company Grade Officer Percentage**	**Captain Percentage**	**Lieutenant Percentage**
Flight Commander	13.79%	23.53%	0.00%
Deputy Flight Commander	17.24%	17.65%	16.67%
Environmental Compliance, Chief	3.45%	5.88%	0.00%
Environmental Chief	3.45%	5.88%	0.00%
Environmental Officer	27.59%	17.65%	41.67%
Installation Management Officer	17.24%	17.65%	16.67%
Military Family Housing	3.45%	5.88%	0.00%
Asset Management	10.34%	0.00%	25.00%
Real Property Officer	3.45%	5.88%	0.00%

The Installation Management Flight has a diverse requirement and its elements are highly dissimilar. The asset accountability element advertised capabilities include: "incorporates real property, resources, force management and the IT administrator" (Department of the Air Force 2015). The environmental element advertised capabilities include: "retains the focus on environmental compliance, the Environmental Impact Assessment Plan (EIAP), and optimization of natural assets" (Department of the Air Force 2015). The Housing Management Element's advertised capabilities include: "ensures access to affordable, quality housing facilities and services" (Department of the Air Force 2015).

4.3 Career Field Survey Discussion

The Civil Engineer career field survey results prioritized the competencies by overall importance and by rank. Only nine competencies were ranked less than moderately important to all Civil Engineer Company Grade Officers. This result shows that stakeholders valued each competency, which makes it challenging to remove any from the final education model. An area of concern within the testing apparatus was the inability for participants to offer additional competencies not included in the initial list. This concern will be rectified through Delphi Study gap analysis questions. The importance of the competencies per rank can be seen in Figure 20.

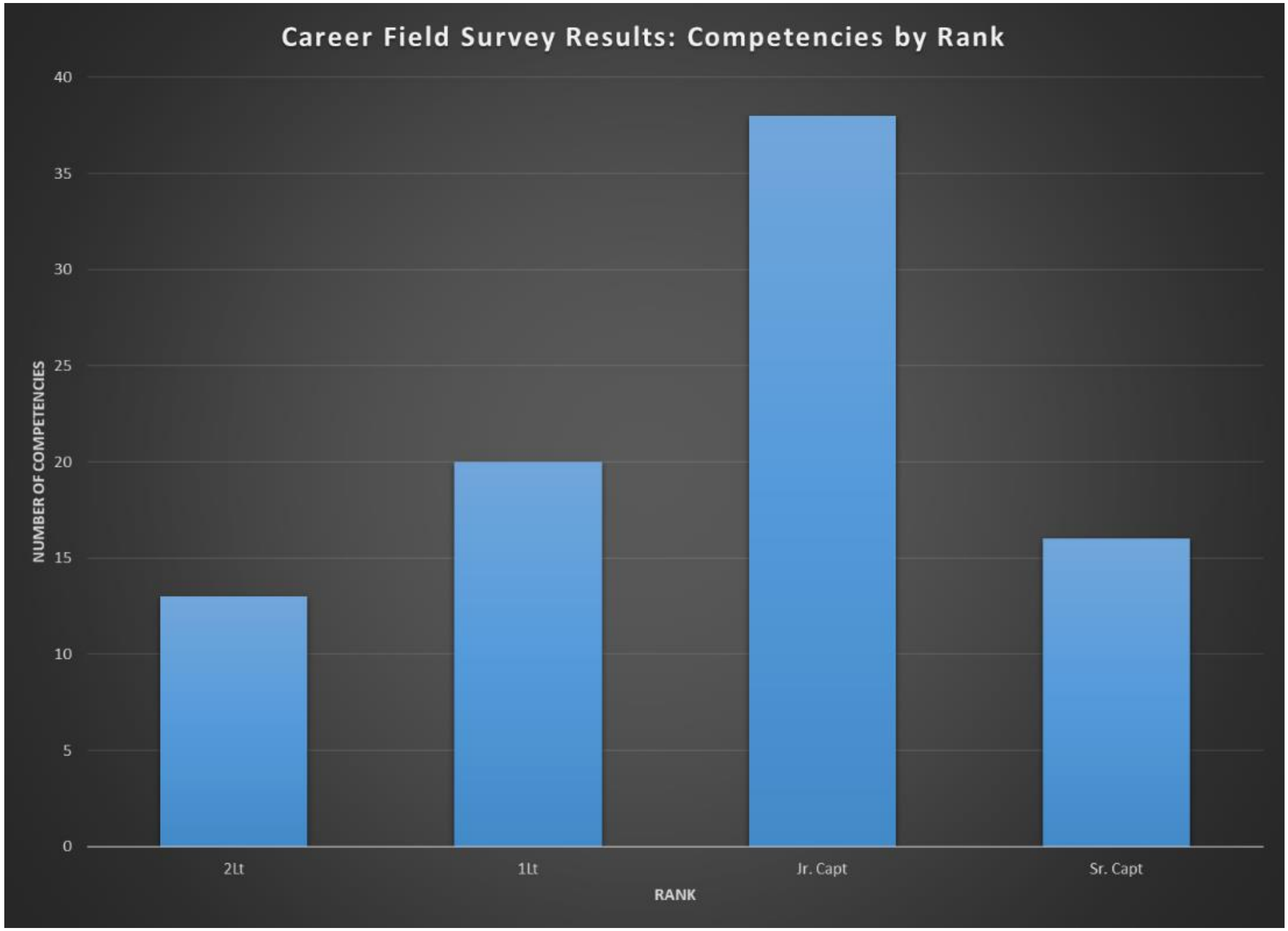

Figure 20: Career Field Survey Results: Competencies per Rank.

As shown in Figure 20, Second Lieutenants have 13 competencies, which increase to 38 for Junior Captains, and then decrease to 17 for Senior Captains. This may be due to the reduction in technical requirements associated with increased rank, as Senior Captains begin to fill a more administrative role. Of the 17 Competencies prioritized for Senior Captains, only 1 regarded the development of Civil Engineer Plans. The remaining 16 revolved around leading others, navigating organizational relationships, ensuring readiness, or advocating/supporting Civil Engineer positions. The breakout of competency per rank can be seen in Appendix 18. The ranking of the competencies and the timeline for development were directly provided to the experts for validation without any additional research being performed on them.

4.4 Relationship Between Delphi Study and Research Questions

Each Delphi Study question was aimed toward resolution of the overall research questions. To reiterate the purpose of this research endeavor, the research questions are as follows:

1. What are the required capabilities/competencies for Civil Engineer Company Grade Officers?
2. When should Civil Engineer Company Grade Officers achieve competence in the identified areas?
3. What are the temporal influences on the Civil Engineer Company Grade Officer's career?
4. How would a Civil Engineer Company Grade Officer educational model incorporate Civil Engineer competencies?

Figure 21 shows the which Delphi Study questions provide insight toward solving which research question. Because each preceding research method was included for validation within the Delphi Study, each of the research questions was aligned with questions for the experts.

Relationship Between Delphi Study Questions and Research Questions		
Research Question Number	**Research Question**	**Delphi Study Question Number**
1	What are the required capabilities/competencies for Civil Engineer Company Grade Officers?	Round 1: Question 3
		Round 1: Question 5
		Round 2: Question 2
		Round 2: Question 4
		Round 3: Questions 1-18
2	When should Civil Engineer Company Grade Officers achieve competence in the identified areas?	Round 1: Question 7
		Round 2: Question 5
		Round 3: Questions 1-18
3	What are the temporal influences on the Civil Engineer Company Grade Officer's career?	Round 1: Question 1
		Round 2: Question 1
		Round 2: Question 2
4	How would a Civil Engineer Company Grade Officer educational model incorporate Civil Engineer competencies?	Round 1: Question 2
		Round 1: Question 4
		Round 1: Question 6
		Round 2: Question 3
		Round 3: Questions 1-18

Figure 21: Relationship between Delphi Study Questions and Research Questions

4.5 Delphi Study Round 1 Questions

The Delphi Study's first round's first question was: "Currently, Civil Engineer Company Grade Officers are only required to attend the Air Force Civil Engineer Basic Course (WMGT 101). The Career field Education and Training Plan explains that further educational planning should be done between the CGO, their supervisor, and their commander. To what extent do you believe that 1) CE CGOs are developing education plans with their superiors, 2) CE CGOs are being allowed to attend courses that develop

them for their current positions and/or develop them for other positions, and 3) Do you believe that the current educational development is adequate to meet the needs of the career field and the Air Force?" Each question sought expert opinion on the current Civil Engineer education plan effectiveness. The first question component investigated if current education plans matched the advertised CFETP requirements. The second question component investigated if education plans were being created and if the current career field command climate is allowing Company Grade Officers to attend developmental education. The final question component solicits expert opinion about current model effectiveness in meeting Air Force and Civil Engineer career field needs.

The first round's second question was: "The Competency-Based Educational Model has been mandated for Airman development. This educational model would revolve around establishing a set list off competencies, proficiency levels for each competency, a development timeline, and the tracking of CGO capabilities against these competencies. This educational model can be seen as a large deviation from the status quo. In your opinion, how will tracking specific competencies and proficiencies impact the effectiveness of CE CGOs?" This question seeks expert opinion on how the Force Development Commander's directive will impact Civil Engineer Officer effectiveness, through deviating from existing education plans. Essentially, the first question inquires if the current educational system is operating effectively and the second asks if the current state is not effective, could this new model be used instead.

The first round's third question: "The Air Force has three publications which outline the CE position, element, and flight capability requirements. These publications include: The Career Field Education and Training Plan (CFETP), The Air Force Officer

Classification Directory, and the P-Plan for Implementation of PAD 12-03 Volumes 1-3. In your opinion: 1) Do you believe that these capability descriptions accurately portray actual requirements, 2) Are there any additional capabilities which should be listed, and 3) Are there any capabilities which are not needed?" Air Force publications specifically mention the Civil Engineer development as being "ad hoc," which brings into question the accuracy of advertised position capabilities. This question is broken into three components which each ask experts about the accuracy of published position capabilities. The first question component directly asks if advertised position descriptions are accurate. The second component asks if advertised capabilities fully encompass Civil Engineer Company Grade Officer requirements. The third and final component asks the experts if any listed capability is no longer required.

The first round's fourth question asks: "Air Force Publications strongly infer that local adaptations to generalized requirements are to be expected and accepted. These local adaptations could have an impact on how proficiency levels are evaluated from the perspective of the commanders/staff directors. In your opinion, to what extent will local adaptations of position requirements influence: 1) How competencies and proficiencies are evaluated, and 2) Do you believe that current squadron commanders are capable of performing standardized evaluations of competencies and proficiencies?" This question asks experts if local adaptations to position requirements would affect competency establishment and assessment. This first component asks the experts if they feel that local position requirements are sufficiently unique as to make standardized assessment impossible/impractical. The second component asks if current squadron commanders/staff directors are adequately prepared to evaluate competence.

The first round's fifth question was: "The CFETP/AFOCD reference that Civil Engineers 'provide combat engineering support to deployed Air Force and Joint Units and Weapon Systems.' The concept of 'Combat Engineering' varies between the branches and it has been taught at WMGT 101 that AF Civil Engineers do not perform joint doctrine Combat Engineering. In your opinion 1) What is the definition of "Combat Engineering" from the AF CE perspective, 2) Does AF CE perform Combat Engineering, 3) Do we appropriately prepare CE CGOs to perform Combat Engineering?" This question seeks to remove confusion related to Civil Engineer combat engineering capabilities. WMGT 101: Air Force Civil Engineer Basic Course teaches the United States Air Force does not perform Combat Engineering. Yet, both the CFETP and the Air Force Officer Directory both claim that Civil Engineers provide combat engineering support. To clarify this capabilities discrepancy, the first question component asks experts to define Air Force combat engineering. The next question component asks experts if Air Force Civil Engineers perform combat engineering. The purpose of these first two components was to obtain a common understanding of which competencies may have been overlooked in previous data gathering endeavors for this research. The other military branches define combat engineering in a different manner, and the use of common verbiage may reveal an underdeveloped area. The final question component focused on if the existing developmental model properly prepares Civil Engineers to perform the Air Force's version of combat engineering. Because there was contention in the "combat engineering" definition, it is important to both gain clarity to its definition and to establish if current methods of training meet the agreed upon definition.

The first round's sixth question was: "According the Air Force Publications, Civil Engineer Officer Badge upgrades occur purely based on time within the career field, rather than due to specific capabilities or skills. Do you believe that competency-based education could and/or should be used to evaluate when a Civil Engineer Officer is prepared for upgrade to Master and Expert Badge Levels?" Under current standard operating procedures, Civil Engineer Officers receive badge upgrades based on career field service time. The experts are being asked if competencies should be integrated into badge upgrades, which are advertisements of skill.

The first round's seventh and final question was: "The CFETP presents a series of recommended courses and a timeline of attendance for CE Officer development. To what extend do you believe that CE CGO capabilities should be standardized by mandating competency attainment dates, as in an educational timeline?" It asks the experts to analyze the existing education state, which recommends courses for certain points in a career, and determine if a mandated competency-based should be incorporated.

4.6 Delphi Study Round 1 Results

The questions for Round 1 were sent to all 18 panel members who had been selected to participate in the study and had not requested to be removed from the distribution list. Of these panel members, only 8 experts provided opinions to the provided questions and no experts requested to be removed prior to the start of the subsequent rounds. Unfortunately, not all 8 participating experts completely answered each question and as such the subsequent subsections will show a fluctuation in expert numbers.

4.6.1 Question 1

The first Delphi Study round's first question had three independent subcomponents. In the first component, experts revealed a consistent opinion that Company Grade Officers are likely not developing training plans with their superiors. Four experts, relating to 50% of question respondents, believed that education planning was inconsistent across units. An additional three experts, relating to 37.5% of question respondents, believed that development educational planning was rare, and one final member believed the plans were not being made well. As mentioned in the literature, the synthesized expert opinion would provide a closer approximation of truth than any individual input. The synthesized expert opinion is: [Educational plan development, with the guidance and advise of superiors, is both rare and inconsistent across organizations. While career milestones may be planned, commander/supervisor experience is likely resulting in educational plans not being effectively created and is not being prioritized because it is not required.] Table 15 displays expert response excerpts which closely summarize question answers. A complete response from each expert can be seen in Appendix 19.

Table 15: Delphi Study Round 1: Question 1: Component 1 Response Excerpts

Delphi Study Round 1: Question 1: Component 1 Response Excerpts	
Question:	**CE CGOs are developing educational plans with their superiors?**
Designation	**Excerpt**
Expert 1	"Fewer than 5% of CGOs are developing education and training plans"
Expert 2	"may be developing educational plans" "I believe it is inconsistent" "I suspect not all CE CGOs are aware of, let alone have reveiwed, the CFETP or available courses"
Expert 3	"depends on the commander/superviors and their experience and their willingness to make and take the time to mentor" "depends on officer's personal desires" "specific career field education plans are not the norm"
Expert 4	"I don't think its happening at too many squadrons"
Expert 5	"I suspect it runs the entire spectrum from no involvment to high involvement" "doesn't happen as much as we'd like"
Expert 6	"If at all, I think this is loosly part of mentioing but not as highly priortized when populating the career field timeline"
Expert 7	"-probably not very well"
Expert 8	"I do not believe CGOs are developing educational plans with their supervisors"

The question's second component revealed that three experts, equating to 37.5% of question respondents, believed that Company Grade Officer attendance in education and development courses was rare, if at all. An additional two experts mentioned that while the attendance may be rare, Company Grade Officers would be allowed to attend courses if they requested it. Furthermore, two panel members believed that commanders and supervisors were encouraging course attendance. Finally, one expert believed course attendance, encouragement, and/or allowance was inconsistent between units. The synthesized expert opinion is: [Leadership is divided on developmental education importance for both current and future positions. Company Grade Officer course attendance is inconsistent even in cases where supervisors and commanders may allow or encourage such development.] Table 16 displays the excerpts from the expert responses which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 20.

Table 16: Delphi Study Round 1: Question 1: Component 2 Response Excerpts

Delphi Study Round 1: Question 1: Component 2 Response Excerpts	
Question:	**CE CGOs are being allowed to attend courses that develop them for their current positions and/or develop them for other positions**
Designation	**Excerpt**
Expert 1	"I also do not believe that more than 25% of CGOs/FGOs are attending courses"
Expert 2	"I believe that most of the superiors of CE CGOs would allow, if not encourage, CGO attendance of courses that are appropriately timed for their development"
Expert 3	"I think there course are available and officers are being allowed to attend, but again, there needs to be an active leadership and/or an officer interested" "There is no forcing mechanism"
Expert 4	"I don’t think that is the case. I believe it should be the case"
Expert 5	"I believe there is very significant support for CGOs to attend training courses"
Expert 6	"This is a very 'leadership specific' question, which relies on a number of variables to include ops tempo, unit funding, and timing"
Expert 7	"Our CGOs are encouraged to attend"
Expert 8	"CGOs are not planning to attend courses"

The first question's final component, relating to the current education model's adequacy in meeting Air Force and Civil Engineer career field demands, had the most disparate responses of any first question component. Four experts, equating to 50% of question respondents, believed that existing Company grade Officer education methods were inadequate. To counterpose this, three experts believed that current methods were adequate. The remaining respondent believed, regardless of current plan effectiveness, mandating a standardized education plan may be unrealistic. The synthesized expert opinion is: [The current educational development model is not universally accepted as being adequate to meet Civil Engineer career field or Air Force requirements. While the educational model needs improvements, mandate a universal educational model may be impractical due to the breadth of technical requirements.] The following figure shows the individual responses from each of the panel members. Table 17 displays the excerpts from the expert responses which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 15.

Table **17: Delphi Study Round 1: Question 1: Component 3 Response Excerpts**

Delphi Study Round 1: Question 1: Component 3 Response Excerpts	
Question:	**Do you believe that the current educational development is adequate to meet the needs of the career field and the Air Force?**
Designation	**Excerpt**
Expert 1	"I do not believe the current system of NON-Mandatory attendance to CE School courses is adequately meeting the needs of the career field"
Expert 2	"I believe that only requiring CGO attendance of WMGT 101 is woefully inadequate" "The CFETP Part II. Section B paragraph 2 listed courses should be mandated based on the time and/or position specified in the various sub-paragraphs" "we do a disservice to our young engineers when we fail to provide them the training and/or experience to enable their achievement of a professional engineer's license or other commensurate certification"
Expert 3	"No, more deliberate career field development is needed"
Expert 4	"No. We need to provide a few more courses…designed at the right time in officer careers…for growth and skillset development"
Expert 5	"I believe the current educational development is adequate"
Expert 6	"I believe that the opportunities are available to pursue education and training in specific areas such as pavements evaluation and design. However, it is unrealistic to mandate a field of study that encompasses technical competencies across a wide-ranging spectrum"
Expert 7	"our current educational development is adequate but not where we need it to be"
Expert 8	"The education development opportunities are adequate with the exception of educating our officers to lead a Readiness and Emergency Management Flight"

4.6.2 Question 2

The first round's second question had experts nearly unanimously believing that competency-based education would benefit the career field. Seven experts, equating to 87.5% of respondents, believed that shifting to this model would improve the effectiveness of Civil Engineer Company Grade Officers. Two of these seven respondents, however, believed the competencies should match those required for professional licensure or registration. Only one panel member believed that this model would not be useful. The synthesized expert opinion is: [Establishing and tracking competencies would improve Civil Engineer Company Grade Officers performance, but supervisors should be allowed to make assessment criteria decisions. Ensuring adequate breadth development should include no greater than 10-20 competencies to reduce commander burden, should be mandated, and should closely tie to existing professional licensure/registration requirements.] Table 18 displays the excerpts from the expert responses which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 22.

Table 18: Delphi Study Round 1: Question 2: Response Excerpts

Delphi Study Round 1: Question 2 Response Excerpts	
Question:	**The Competency-Based Educational Model has been mandated for Airman development. This educational model would revolve around establishing a set list off competencies, proficiency levels for each competency, a development timeline, and the tracking of CGO capabilities against these competencies. This educational model can be seen as a large deviation from the status quo. In your opinion, how will tracking specific competencies and proficiencies impact the effectiveness of CE CGOs?**
Designation	**Excerpt**
Expert 1	"this sort of CFETP STS driven training and educational requirements is VITAL to helping our CGOs " "This is consistently identified as a chronic problem for our ECES' in the CENTCOM AOR"
Expert 2	"I don't believe that tracking specific competencies beyond looking at a CE CGO's major and the positions and amount of time in the position is necessary" "tracking a set of specific competencies is helpful in guiding an officer's development but we tend to do this already when CE Senior Leaders " "I think a CE officer who has broader experience across several squadron flights versus one who has achieved experience in a singular flight like Engineering, is better prepared to command a squadron"
Expert 3	"It IS a deviation from the AF CE status quo, but it's the right way to develop Civil Engineer officers with targeted competencies" "it may be difficult for all officers to complete the entire breadth of CE competencies unless it is either very deliberate development "
Expert 4	"I believe this would enhance their growth and development" "it should be targeted to only those top 10 to 20 skills we need them to have to: fight, build, sustain, develop, program, recover, etc. We cannot put 72 occupational competencies on the street and expect our officers to pursue all 72"
Expert 5	"I think it could have significant impact and is very intriguing, but I wonder to what extent would CGOs actively pursue these proficiency levels? Would completing these be tied to anything significant (IDE consideration, occupational master/expert badge, "
Expert 6	"I would caution repeating this scenario by creating "checklists" that aren't backed by a requirement. As a member of a profession, why not leverage existing/recognized professional licensures or certifications rather than generate potentially hollow competency lists"
Expert 7	"While I think it is very important to measure/assess competencies, at this time, I think it will be too cumbersome for individuals and supervisors/commanders to track both competencies and proficiencies"
Expert 8	"Why not use the already established professional engineer licensing process and continuing education credits to ensure competency?"

4.6.3 Question 3

The third question was broken down into three independent components. In the first component, experts did not achieve consensus on Air Force literature accuracy for Civil Engineer position requirements. Five experts, equating to 62.5% of question respondents, believed these publications are no longer accurate for determining position requirements. Two experts believed these documents were somewhat accurate but did not provide all required tasks and other requirements. One expert did not have familiarity with these documents. The synthesized expert opinion is: [Air Force publications are not updated regularly nor provide completely accurate descriptions of Civil Engineer position capabilities. These documents can provide useful information about position requirements but should not be used to establish an educational model.] Table 19 displays the excerpts from the expert responses which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 23.

Table 19: Delphi Study Round 1: Question 3: Component 1 Response Excerpts

Delphi Study Round 1: Question 3: Component 1 Response Excerpts	
Question:	**Do you believe that these capability descriptions accurately portray actual requirements?**
Designation	**Excerpt**
Expert 1	"In my opinion, and having not fully reviewed the P-Plan for PAD 12-03 vol 1-3" "I believe that the word descriptions of what each CES Flight, Element does is helpful to determine the education and training required for our CE officers"
Expert 2	"Yes I generally believe that the CFETP and AFOCD do a decent job in capability descriptions, except in the area of specifying training requirements for cross trainees from other career fields" "recommend specifically stating the requirement"
Expert 3	"Unfortunately, I am not familiar with the updated CFETP" "Asking several officers, there was a mixed bag with most last seeing the CFETP when they were a Lt being told about it at AFIT 101 or shortly thereafter" "pyramid being the biggest take away" "should more closely align to what is in CE enlisted CFETPs" "The AFOCD provides minimal input for this task. PAD 12-03 is not current, so it is not an accurate. And it does not address all CE core competencies in sufficient detail or based on current ways of doing business"
Expert 4	"No. I think officers may be familiar with the first two…but not the P-Plan."
Expert 5	"Can't say… not familiar with any of these documents."
Expert 6	"and I have never heard of the last document" "but this document is not something that would guide a young officer"
Expert 7	"– No. The AFOCD for CE hasn't been updated since 31 Oct 10 (introduction) and 2015 for context. "
Expert 8	"Can't provide an informed answer. Its been awhile since I read PAD 12-03 and I need to find a copy of the CFETP"

The second question component focused on additional capabilities not captured in publications and had uniform expert responses. Although eight experts participated in this round, only six provided responses to this question component. For the six responding experts, 33% believed some capabilities should be added, 33% believed nothing additional should be listed, and 33% did not have an opinion or did not know. The synthesized expert opinion is:[Published literature are not well known for Civil Engineer officers and advertised capabilities should be rearranged into Specialized Training Standards (STS), like enlisted. Finally, advertised capabilities should consider matching those of professional registration/licensure.] Table 20 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 24

Table 20: Delphi Study Round 1: Question 3: Component 2 Response Excerpts

Delphi Study Round 1: Question 3: Component 2 Response Excerpts	
Question:	**Are there any additional capabilities which should be listed?**
Designation	**Excerpt**
Expert 1	"As CE officers we need to be knowledgeable across the various missions sets the typical CES provides to the wing, base, joint team" "Additionally, there are warfighter skills that CE officers must also know and perform. Many are outlined in or are required in AFI 10-209/210 RH / Prime BEEF Programs" "should be arranged into a Specialized Training Standard (STS) just like our enlisted CE AFSCs are so there is a roadmap "
Expert 2	"I believe we should re-consider and implement a requirement for CE officers to achieve before pinning on O-4 either an Architect's or Professional Engineer (PE) license, Project Management Professional (PMP), Certified Construction Manager (CCM), or possibly an environmentally related certification (BCEE, BCEEM, CEP, NREP, etc). This will drive a more deliberate educational, training and experiential development program for CE officers"
Expert 3	"I think we got the majority of them. My only recommendation would be to bounce this off of our Sister Service competencies"
Expert 4	"Can't say… not familiar with any of these documents"
Expert 5	"– I would like new perspective on registration (FE, PE, etc), and if we still care that EOD-Q officers are engineers (there are still some prior-enlisted EOD techs that would like to be CE officers but don't have engineering degrees that qualify)."
Expert 6	"Can't provide an informed answer. Its been awhile since I read PAD 12-03 and I need to find a copy of the CFETP"

The third question's third component had varied expert responses. When asked if any existing capabilities listed within Air Force publications were irrelevant, two expert said yes, two said no, two said maybe, and two did not know. The synthesized expert opinion is therefore: [While most existing capabilities should be maintained, they need to be reprioritized to establish educational plans. Furthermore, such capabilities as Housing management, which does not directly relate to opening, establishing, building, defending, sustaining, operating, maintaining, and divesting bases, should be removed in the future.] Table 21 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 25.

Table 21: Delphi Study Round 1: Question 3: Component 3 Response Excerpts

Delphi Study Round 1: Question 3: Component 3 Response Excerpts	
Question:	**Are there any capabilities which are not needed?**
Designation	**Excerpt**
Expert 1	"I think housing management, including dormitory management, should be fully divested to a privatized entity, or possibly reassigned to FSS"
Expert 2	"I think AF Engineering is pretty clear….we open, establish, build, defend, sustain, operate, maintain, divest bases. If our capabilities are not tied to those basic warfighting requirements then we can probably divest"
Expert 3	"Can't say… not familiar with any of these documents."
Expert 4	"– Probably all/most are still needed"
Expert 5	"Can't provide an informed answer. Its been awhile since I read PAD 12-03 and I need to find a copy of the CFETP."

4.6.4 Question 4

The first round's fourth question had two independent components. The first component focused on how local adaptations to standard practices influences on position requirements and how unit commanders and staff directors could assess competencies. Six experts, equating to 75% of respondents, explained that local adaptions to position requirements would influence competency assessment, whereas 25% believed there would be no impact. The synthesized expert opinion is: [Local adaptations to generalized requirements will likely impact competency assessment, which will be exacerbated when Civil Engineer Company Grade Officers are supervised by non-CE officers. These deviations much be controlled through setting highly measurable baselines for minimum proficiency, such as in enlisted STSs. A recommended impact reduction measure is establishing in-residence or distance learning classes.] Table 22 displays the excerpts from the expert responses which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 26.

Table 22: Delphi Study Round 1: Question 4: Component 1 Response Excerpts

	Delphi Study Round 1: Question 4: Component 1 Response Excerpts
Question:	**How competencies and Proficiencies are evaluated?**
Designation	**Excerpt**
Expert 1	"I fully believe that we have successfully developed Enlisted CFETP STS Upgrade Training requirements, tasks, conditions and standards" "Officers can and should be handled in a similar manner"
Expert 2	"I believe that local adaptations, especially for CE CGOs in guard, reserve or non-traditional CES or RED HORSE squadrons" "will mean a standard proficiency baseline will experience creep or dilution"
Expert 3	"Given the difference in local training environments and what tools, equipment, scenarios and other methods are available could affect how evaluations are conducted or if they can even be fully successful in meeting a desired objective" "there should still be a minimum achievable proficiency that can be measured in a repeatable way. This necessitates core courses taught in residence or distance learning to achieve a common understanding "
Expert 4	"They will happen" "I think if we focus our competencies on generalized requirements we, as engineers, will figure out the local adaptations as necessary"
Expert 5	"It would likely cause additional work to how proficiencies are evaluated. If "county options" are allowed"
Expert 6	"diverse array of disciplines; thus my earlier comments that we should focus on developing professionals that achieve recognized industry standards"
Expert 7	"– Local adaptions will play a large role in evaluation; they have to"
Expert 8	"Local adaptations should be additive to the basic competency. The standard competency should have a standard proficiency evaluation"

The second question component asked experts if current Squadron Commanders could assess Company Grade Officer competencies. No expert provided a direct yes or no response, but instead offered conditional answers. Half of responding experts, equating to 4 individuals, believed that current squadron commanders could conditionally perform the standardized evaluations. Two experts believed that current squadron commanders could perform the evaluations without first receiving formal instruction. Finally, 17% of respondents believed there would be inconsistent competency assessments. The synthesized expert opinion is: [Current Squadron Commanders could conditionally perform competency and proficiency assessment, if provided with standardized tools. Instruction on these tools could occur at AFIT and would be particularly important for Reserve Command Civil Engineer officers. Although there may be some inconsistency, Civil Engineer Squadron Commanders should be fully trusted.] Table 23 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 27.

Table 23: Delphi Study Round 1: Question 4: Component 2 Response Excerpts

Delphi Study Round 1: Question 4: Component 2 Response Excerpts	
Question:	**Do you believe that current squadron commanders are capable of performing standardized evaluations of competencies and proficiencies?**
Designation	**Excerpt**
Expert 1	"However, they will be required to complete training and education to get "signed-off" on tasks by experts across various flights in a CES" "Likewise, a officer may get trained and signed off by a GS-09 in R&O section on any tasks listed in the STS for the officer to know / perform at the appropriate rank level"
Expert 2	"Yes I believe current active duty CE and Reserve and Guard AGR squadron commanders are capable of performing standardized evaluations or know which resources " "I'm not convinced that all traditional reserve squadron commanders have the same foundation when in some cases"
Expert 3	"This would be a mixed bag…with many interpretations of how to measure proficiency...or how important it is to measure proficiency against a standard…consistently. However, we should trust our leaders who are selected to lead our Airmen" "much thought would need to be given for the non-traditional jobs or even jobs outside the CE squadron, how and by whom would those officers be evaluated?"
Expert 4	"Not quite yet. I think it may require a AFIT education push to fully explain what we are trying to get to with standardized evaluations of competencies"
Expert 5	"Yes, but only if the evaluations are significantly standardized"
Expert 6	"While Sq/CCs are capable, I don't believe they have time to serve in this oversight capacity" "Officer technical competency must be assumed, because any available time for mentoring will likely need to focus on military necessity"
Expert 7	"– Only if provided tools to do so; otherwise, evals will not be standardized across the force"
Expert 8	"No. Squadron commanders need either 1) a standardization and evaluation position or 2) a centralized board to nominate officers to when ready for eval"

4.6.5 Question 5

The first round's fifth question had three independent components. The first component asked experts to define Air Force Civil Engineer combat engineering. Six experts, equating to 75% of respondents, believed Civil Engineers performed combat engineering in an Air Force unique role. The remaining 25% believed that the Air Force performs combat engineering in the same fashion as the Army, Navy, and Marines and that the definition of the term should reflect that. The synthesized expert opinion is: [Air Force Civil Engineers perform combat engineering which shares some components with sister services but also has unique capabilities and roles. The Army focuses on mobility, counter-mobility, and survivability in creating a maneuver space for combatant commanders. Air Force Civil Engineer combat engineering involves the performance of general and geo-spatial engineering under combat conditions, contingency/expeditionary construction and bed down, disaster preparedness, base recovery after attack, base denial, installation mission support, operate installations in combat zones.] Table 24 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 28.

Table 24: Delphi Study Round 1: Question 5: Component 1 Response Excerpts

	Delphi Study Round 1: Question 5: Component 1 Response Excerpts
Question:	**What is the definition of "Combat Engineering" from the AF CE perspective?**
Designation	**Excerpt**
Expert 1	"AF CE is designed to perform General Engineering and Geo-Spatial Engineering under combat conditions."
Expert 2	"Combat Engineering encompasses contingency/expeditionary construction and beddown and operations" "base recovery after attack operations" "base denial"
Expert 3	"We provide both combat support and combat operations " "thought of as more 'combat engineering support' " "AF CE should always be prepared to be directly involved in 'Combat Engineering' roles"
Expert 4	""Combat Engineering" is how Air Force Civil Engineers enable the Air Force and Joint warfighting missions" "COMPLETELY DIFFERENT then how an Army Engineer or a Navy Engineer"
Expert 5	"I do not believe Airmen engineers conduct combat engineering with the exception of EOD. I believe we are combat support engineers"
Expert 6	"We must evolve our thinking about "combat engineering" from the Army centric model employed in Iraq and Afghanistan" "We operate and recover the installation as a weapon system from which we launch combat sorties to sustained cyber effects"
Expert 7	"– I still think we align with the Army and JP 3-34 definitions of combat engineering…mobility, countermobility and survivability"
Expert 8	"Engineers provide maneuver space for combatant commanders. "Combat Engineering" is the action of creating maneuver space in the battlefield environment."

The second question component asked experts if Civil Engineers perform combat engineering. Seventy-five percent of responding experts believed that the Air Force CE performs combat engineering while 25% believe that they did not. The synthesized expert opinion is: [Air Force Civil Engineers perform combat engineering which more closely aligns with combat engineering support than the definition within Joint Publication 3-34. Explosive Ordinance Disposal capabilities are an exception to this rule and a joint definition should be created to avoid future confusion.] Table 25 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 29.

Table 25: Delphi Study Round 1: Question 5: Component 2 Response Excerpts

Delphi Study Round 1: Question 5: Component 2 Response Excerpts	
Question:	**Does AF CE perform Combat Engineering?**
Designation	**Excerpt**
Expert 1	"They typically do not support ground combat elements in direct contact with enemy direct fire weapons" "AF CE does directly support air maneuver forces which are our aircraft weapon systems that must project power from airbase weapon systems (think Aircraft Carrier on land) in permissive, semi-permissive and non-permissive/contested joint operational areas" "Our engineer forces are also trained to respond to enemy attack to recover our airbases/bases in general by performing expedient troop construction/repair/recovery often in UXO/Explosive hazards/CBRN environments. We are also performing engineer missions at forward contingency locations where in-direct fire, IEDs, and yes direct fire enemy attacks can occur on the base or during a convoy operation or off-base construction site"
Expert 2	"Definitely"
Expert 3	"Yes, there are examples where AF DOES perform combat engineering" "should be in the mindset of the officers being educated/trained that Air Force has civil engineers capable of 'Combat Engineering"
Expert 4	"Generally, yes. We have been. Some of our Base Recovery After Attack (BRAAT) skillsets have absolutely eroded and atrophied"
Expert 5	" do not believe Airmen engineers conduct combat engineering with the exception of EOD. I believe we are combat support engineers"
Expert 6	"Absolutely. If we didn't perform combat engineering, there would not be a military necessity to keep uniformed engineers" "eed to be more active in how we define "combat" as a Service—"
Expert 7	"No, not as defined by JP 3-34"
Expert 8	"Yes"

The third question component was to determine if the current educational model accurately captures combat engineering requirements. The expert responses were divided, with 62.5% believing Company Grade Officers were being adequately prepared for combat engineering roles and 37.5% believing they were not. The synthesized expert opinion is: [Current education does not fully prepare Civil Engineers to perform combat engineering. Although AFIT 485 and the Joint Engineering Operations Course do a good job of enhancing the home-station training, exercises, and non-combat deployments, there is room for improvement. Part of the problem comes from the paradigm shift of what a deployment entails, with common deployments occurring to non-combat zones. Skill improvements are needed for reading OPLANs, determine best build and maneuver space, provide fundamental engineering skills to design, construction, and project manage.] Table 26 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 30.

Table 26: Delphi Study Round 1: Question 5: Component 3 Response Excerpts

Delphi Study Round 1: Question 5: Component 3 Response Excerpts	
Question:	**Do we appropriately prepare CE CGOs to perform Combat Engineering?**
Designation	**Excerpt**
Expert 1	"Although there's always opportunity for improvement, I think the combination of AFIT's 485 course and the Joint Engineer Operations Course (JEOC) do a good job"
Expert 2	"Overall, we do not fully prepare Air Force CE CGOs for "true" Combat Engineering roles" "Our exercise programs also do not prepare our officers to perform in combat environments"
Expert 3	"I'd say we could do better"
Expert 4	"No and I don't think we necessarily should be"
Expert 5	"There is definitely room for improvement"
Expert 6	"Not fully" "May not be until we get back into C-IED and similar environments that it will really matter"
Expert 7	"Yes; but, not the full spectrum potential actions. CGOs need the skills to read an OPLAN, determine how to best build maneuver space for the plans success, then provide foundational engineering skills to include design, construction, and project management."

4.6.6 Question 6

The first round's sixth question asked experts if badge upgrades should be linked to competency attainment. Fifty percent of the experts plainly agreed with the idea, 12.5% conditionally agreed, and 37.5% disagreed. The synthesized expert opinion is: [Aligning Senior and Master badge upgrades with competency attainment may provide advantages in determining superior performers and incentivize attending development courses. If adding these requirements would jeopardize the career field's pride in wearing the badge, then it should not be taken". Table 27 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 31.

Table 27: Delphi Study Round 1: Question 6 Response Excerpts

	Delphi Study Round 1: Question 6 Response Excerpts
Question:	**According the Air Force Publications, Civil Engineer Officer Badge upgrades occur purely based on time within the career field, rather than due to specific capabilities or skills. Do you believe that competency-based education could and/or should be used to evaluate when a Civil Engineer Officer is prepared for upgrade to Master and Expert Badge Levels?**
Designation	**Excerpt**
Expert 1	"In my opinion, YES. I think there should be some sort of incentive to complete your education and training requirements in line with how the enlisted force achieves their Senior and Master badge" "It could also be used by a Sq/CC regarding who are their strongest / top performing / best CGOs / FGOs when OPR time comes"
Expert 2	"I think we over complicate things and unnecessarily add to the administrative burden" "seven and 15 years in the career field should be adequate for active duty CE officers"
Expert 3	"In the past the Master badge was tied (at least loosely) to attendance at WMGT 585 at AFIT. I believe the award of the badge should be connected to a milestone educational event that signifies a major accomplishment. This would help solidify the importance of career field education"
Expert 4	"I think the basic badge should remain as is….that is, earned AFTER successful accomplishment of BOTH WMGT 101 and the accompanying field trip to Silver Flag" "For both the Master and Expert Badges, I think they should be tied to both achievement in an educational training program and time. That is, we could leave it at 7 years and 15 years respectively BUT the officer should achieve a set number of competencies that are accomplished through and OJT AF Form 623-like training plan.)"
Expert 5	"This has been considered before… challenge lies in having the resources to implement something like this" "But I do think the career field would value something like this particularly when it deals with hiring a new officer to an organization"
Expert 6	"If we ensure meaningful training and experience during assignments to engineer units, then I believe the current system is working" "I do note the badge for an understanding of the amount of time served within CE."
Expert 7	"– Not unless there is a consistent/deliberate/defined evaluation criteria" "I'm just ecstatic that our CE officers actually want to wear their badges and are proud of them (unlike a lot of AF AFSCs that DO NOT wear badges)…we shouldn't do anything that would detract from this or make it too difficult to be proud to be an engineer."
Expert 8	"Yes. How and who assesses skill level will be a challenge"

4.6.7 Question 7

The first round's seventh and final question focused on standardized mandatory competency development timelines. The experts nearly all agreed that mandating an educational timeline would benefit the career field. Fifty percent of expert respondents plainly agreed, while 50% conditionally agreed. The synthesized expert opinion is: [Mandating standardized educational timelines can benefit the Civil Engineer career field, but some courses should be left optional. The current badge upgrade timelines could be used as a timeline template.] Table 28 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 32.

Table 28: Delphi Study Round 1: Question 7 Response Excerpts

	Delphi Study Round 1: Question 7 Response Excerpts
Question:	**The CFETP presents a series of recommended courses and a timeline of attendance for CE Officer development. To what extend do you believe that CE CGO capabilities should be standardized by mandating competency attainment dates, as in an educational timeline?**
Designation	**Excerpt**
Expert 1	"In my opinion, the less we leave it up to the member and over tasked supervisor/Commander to figure things out the better"
Expert 2	"I believe that the Formal Education courses listed in the CFETP Part II, Section B, paragraph 2 should be mandated as specified for active duty and Reserve and Guard AGR positions—some of which are timeline driven" "The timeline driven requirements will likely have to be modified for Traditional Reserve and Guard CE officers to account for their limited availability of 24 days IDT and their annual tour"
Expert 3	"standardizing without being overly prescriptive would fulfill the intent that all 32E primary AFSC CE officers attain competency by a specified time in their careers"
Expert 4	"They should be linked. However, there will always be exceptions and I'm not sure how we deconflict those exceptions.)"
Expert 5	"We expect so much out of our CGOs and it really depends on the assignment. The competencies I expect my officers to have on the staff are somewhat different from a CGO at base level or RED HORSE assignment" "and I can see how it could benefit both the CGO in terms of what they should be able to do by the end of a given assignment and the supervisor in terms of what their subordinate should be able to do and what they as supervisors are responsible for in terms of providing training"
Expert 6	", I would suggest evaluating what jobs (i.e.-programming) that we expect all officers to understand and then look at what capabilities are required "
Expert 7	"- Only if it is tied to a badge upgrade "
Expert 8	"Competency based Civil Engineer Officer Badge upgrades should drive the educational timeline. Squadron Commanders should prepare their officers to upgrade to Master within "X" years and Expert within "Y" years"

4.7 Delphi Study Round 2 Questions

The second round's first question was based on the number of competencies to be included in the model and was worded as: "There were 96 original competency-based tasks generated from the 2018 Education Working Group, which were reduced to 73 prior to the survey. Based upon responses within the previous round of the Delphi Study, panel experts indicated that the number of competencies, no matter how essential they are, may be too many to address in an educational development model. In your opinion, how many competencies do you believe are realistic?" The first Delphi Study round revealed concerns on the number of competencies previously identified. This question seeks to identify if multiple experts believe the number of competencies should be reduced. This question's results will be used in the third round to identify the final number of competencies.

The second round's second question had five components, each based on the Air Force Personnel Center Data results. The first component was: "The Air Force Personnel Center maintains current CE CGO & FGO position allocations but does not record allocation levels over time. A condensed version of the AFPC allocations are attached. The data supports that the vast majority of CGO positions, 82.26%, are allocated for the squadron level. Do you believe that there are crucial non-squadron skills that CE CGOs should develop early in their career?" This question provided experts with perspective that most positions are within Civil Engineer Squadrons and asks the experts if there are non-squadron skills which should be developed.

The second question's second component asks: "From those CE CGOs that are assigned to staff, 41% are assigned to AFCEC or AFIMSC. Are there any special skills

which should be developed in young CGOs which relate to these highly technical staff positions?" This question was motived by the different requirements of Staff Directorates when compared to the Civil Engineer Squadron. Many Civil Engineer Officers serve on a staff at some point in their career and the unique skill set may not have been covered in the survey, due to the lower representation of positions.

The second question's third component focuses Rapid Engineer Deployment Heavy Operational Repair Squadron Engineers (RED HORSE) capabilities. The question asks: "RED HORSE positions make up approximately 6% of positions. In your opinion what RED HORSE capabilities should be developed in all CE CGOs?" Although these positions comprise only 6%, their skill-set and capabilities are championed as a unique Air Force capability, and important competencies may have been overlooked in previous parts of the study due to the lower number.

The fourth question component was further broken into three subcomponents, with each related to the concept of rank-to-position misalignment. The question and components ask: "Currently, 24.35% of CE CGO assignment billets are rank misaligned, meaning that the position rank and the assigned individual rank do not match. The misalignment between Captain and Lieutenant positions and actuals is about 52%. (1) What level of concern do you have with the CGO rank mismatch of positions and individuals assigned? (2) Do you believe that this will continue, and that competency timelines should be indifferent? (3) The data indicates that 24% of misaligned positions are Captains holding FGO billets. Due to the nature of the data, it was not possible to determine if these positions were Senior Captains/Major Selects. In that regard how does this misalignment affect a CGO competency timeline?" Competency-based education

models are best suited for situations in which an individual has specific and measurable performance requirements. High variability in position requirements could invalidate this model for Civil Engineer Company Grade Officers. The first subcomponent asks experts if they have any concern with the nearly 25% rank and position misalignment. The second subcomponent asks the experts if they believe that this misalignment will continue and if education timelines should be indifferent to it. Essentially, even if there are misalignments, should the model be held as it is agreed upon? The third and final subcomponent asks the experts if the misalignments should impact the timeline of development. Essentially, if the Company Grade Officer is holding a position which would arguably have greater competence requirements, should that the timelines be accelerated.

The fifth and final second question component focused on the disproportionate number of CEN positions, and is worded as: "2018 Education Working Group discussions with limited validation during the AFPC data analysis, indicated a large number of CE CGOs within the engineering flight. Some members of the 2018 Education Working Group had mentioned serving for 6 years exclusively in the CEN flight. The AFPC data revealed that approximately half of all CE CGOs assigned to CE Squadrons are within CEN. (1) What concern (if any) do you have with exclusive CEN experience? Do you believe that these officers (when they eventually rotate to the other flights) have the appropriate breadth of experience? (2) In the context of a CGO competency timeline, should the career field mandate flight rotations on a given time interval?" This question asks experts how they feel about the breadth versus depth of experience received by this

notion and if they would support a mandatory rotation requirement, to ensure competency is attained via experience in other flights.

The third and final question was broken into two components, with both components focusing on the survey data analysis. The first question component asked: "Attached are the survey results for the career field competency survey. Each of the questions had five categories of importance, which the respondent could choose to show the importance of the competency. For the sake of analysis, each of the importance levels was then given a weight of 1 (Not Important) to 5 (Extremely Important). The number of respondents who selected a level were then multiplied by a weight and added together. The higher score indicated that the cumulative responses determined a higher level of importance. (1) Do you agree with the ranking of the competencies from the career field survey? (2) Do you believe that some should be moved (if so which ones)? (3) Do you believe that some of the listed competencies are not relevant (which ones)? (4) Do you believe that a competency may have been missed (please identify)?" This first component asked experts to validate the survey results through four subcomponent questions. The first subcomponent directly asks the experts if they agree with the resulting prioritization. The second subcomponent asks the experts if they believe the career field misaligned a requirement. The third component asks if the experts believe whether any of the competencies should be removed. The survey did not offer the participants an option to say that the competency is not required, merely if it is not important. The fourth subcomponent asks the experts if they believe a competency has been missed, which was also not an option for the survey.

The second and final third question component focuses on the survey respondents ranking of when the competencies should be attained and is worded as: “Attached are the survey results related to a competency timeline. Some of the survey questions did not have available responses for timelines of competence attainment and are labeled as ‘Not Provided.’ The percentages are based upon the number of responses related to each of the categories. The highlighted cell in each row represents the maximum vote for the row and would serve as the time at which the CE CGO would require competence in the category. Do you agree with the results or do you feel the timeline should be adjusted?” The first part informs the experts that the survey did not have questions related to the timeline for every competency. The next part explains that the provided information presents percentages for when the respondents believed the competency should be attained. The third part explains that the highlighted section of each competency shows the maximum percentage. The question then asks the experts if they agree with the results or if they should be modified.

4.8 Delphi Study Round 2 Results

The questions for Round 2 were sent to all 18 panel members who had been selected to participate in the study and had not requested to be removed from the distribution list. Of these panel members, only 8 experts provided opinions to the provided questions and no experts requested to be removed prior to the start of the subsequent rounds. Unfortunately, not all 8 participating experts completely answered each question and as such the subsequent subsections will show a fluctuation in expert numbers.

4.8.1 Question 1

The second round's first question focused on the number of competencies which should be included in the model. In the previous round, it was revealed that some experts were concerned that there were too many competencies to develop Civil Engineer Company Grade Officers. One expert, equating to 12.5% of responses, believed competencies should be grouped into 4-6 total terms. Two panel members believed there should be less than 15 competencies, one believed 20 competencies, two believed less than 30-40 competencies, one believed between 50-75 competencies, and one did not enumerate their response. Overall, 62.5% of experts believed there should be between 15-30 competencies, which results in an approximate number of 18 competencies to be used in the actual model. The synthesized expert opinion is: [Even though Civil Engineer Company Grade Officers must exhibit numerous capabilities while performing their duties, 73 competencies would create an overly cumbersome education model. A reduction to 15-30 competencies would align with the Pareto Principle and expert majority opinion.] Table 29 displays the excerpts from the expert responses which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 33.

Table 29: Delphi Study Round 2: Question 1 Response Excerpts

	Delphi Study Round 2: Question 1 Response Excerpts
Question:	**Number of Competencies: There were 96 original competency-based tasks generated from the Pilot Study, which were reduced to 73 prior to the survey. Based upon responses within the previous round of the Delphi study, panel experts indicated that the number of competencies, no matter how essential they are, may be too many to address in an educational development model. In your opinion, how many competencies do you believe are realistic?**
Designation	**Excerpt**
Expert 1	"Competency-based tasks for CE CGOs could be boiled down to 15 or less tasks" "a number of tasks were too specific to a particular job in a particular organization" "or they were general skills most CGOs--not just CE CGOs should have" "or were not grade appropriate for a CGO"
Expert 2	"The whole idea that a specific number is too many/not enough is not relevent to the development of a CFETP STS Section"
Expert 3	"73 is definitely too many… I would suggest comparing to how many competencies are required for most CE Enlisted career fields or, if the data is available, other officer career fields" "my off-the-cuff suggestion is no more than 30-40 (though still seems high)"
Expert 4	"20 or so broader competencies that they can remember"
Expert 5	"I don't think you can give all 73 defined competencies the same level of attention as I don't think the CE School/Grad School/USAFA have the resoruces to develop single course for each of these competencies" "Competencies could be grouped into 4-6 overarching competencies that can easily be used to awnser "What do Air Force Civil Engineers do?""
Expert 6	"I think 50-75 competencies, before a CGO pins on Major"
Expert 7	"15 (Pareto Principle)"
Expert 8	"I think 30-40…maybe up to 50 but I 73 is too many"

4.8.2 Question 2

The second round's second question focused on identifying relevant non-squadron skills. According to the Air Force Personnel Center Data, 82.26% of Civil Engineer Company Grade Officers are assigned to the squadron level, and this may have influenced the survey results. This question aims to identify any critical skills which may have been overlooked in the previous endeavors. Four experts, equating to 50% of respondents, believed that no additional competencies needed to be identified. One expert believed that there may be additional requirements but did not provide any specific recommendations. Finally, three experts believed that some crucial non-squadron specific skills are missing and provided their inputs. These inputs included understanding AFCEC/AFIMSC/MAJCOM/HAF staff function and how to leverage these functions to perform various missions. Furthermore, Civil Engineer Company Grade Officers should understand how their squadron supports and influences Wing Staff, Medical Group, Operations Group, Maintenance Group, and the other Mission Support Group Squadron functions. The synthesized expert opinion is: [Squadron-based skills are essential to meet the goal of developing Civil Engineer Squadron Commanders. Additional essential non-squadron skills include knowing how to contact AFCEC/AFIMSC/MAJCOM/HAF, communication and professional writing skills, and understanding Civil Engineer support functions to Wing Staff, Medical Group, Operations Group, Maintenance Groups, and other Mission Support Squadrons.] Table 30 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 34.

Table 30: Delphi Study Round 2: Question 2: Component 1 Response Excerpts

Delphi Study Round 2: Question 2: Component 1 Response Excerpts	
Question:	**The Air Force Personnel Center maintains current CE CGO & FGO position allocations but does not record allocation levels over time. A condensed version of the AFPC allocations are attached. The data supports that the vast majority of CGO positions, 82.26%, are allocated for the squadron level. Do you believe that there are crucial non-squadron skills that CE CGOs should develop early in their careers?**
Designation	**Excerpt**
Expert 1	"No"
Expert 2	"who to talk with at the MAJCOM, AFIMSC, AFCEC, and HAF staffs" "learn all about the MSG sister units for use and familiar with Wg staff functions, OG and MDG and MXG missions and how CE supports that stuff"
Expert 3	"I'm not aware of any crucial non-squadron skills to be developed early"
Expert 4	"Not particularly, but if we do, we should focus them within the AFIMSC and AFCEC arenas"
Expert 5	"No"
Expert 6	"I do find value in CGOs developing Executive, CAG, or similar skills early"
Expert 7	"Yes"
Expert 8	"Communication skills like executive writing/briefing and critical, time-compressed thinking"

The second question component also focused on Staff Directorate skills gap-analysis. Approximately 41% of Civil Engineer Company Grade Officers are assigned to staff positions at either AFCEC or AFIMSC. This question aimed to identify staff skills from these positions which should be developed for all Company Grade Officers. four experts believed that no additional competencies should be added from Staff skill sets. Two experts believed there were required competencies, but then listed Institutional skills such as professional writing and communication. Finally, two members believed that Company Grade Officers should understand how staffs interact with bases and with other staff sections to support the mission. The synthesized expert response is: [Many Company Grade Officer capabilities can be learned while serving in Civil Engineer Squadrons, and these skills can be utilized while working in Staff Directorates. Staff skills which should be developed for Civil Engineer Company Grade Officers include understanding how Staffs interact with each other and with bases.] Table 31 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 35.

Table 31: Delphi Study Round 2: Question 2: Component 2 Response Excerpts

Delphi Study Round 2: Question 2: Component 2 Response Excerpts	
Question:	**From those CE CGOs that are assigned to staff, 41% are assigned to AFCEC or AFIMSC. Are any special skills which should be developed in young CGOs which relate to these highly technical staff positions?**
Designation	**Excerpt**
Expert 1	"I disagree as many are simply program/project manageement and staff work"
Expert 2	"They need to understand the PPBS process, Joint Planning, Doctrine, improve writing and briefing skills…work on leadership and management of civilians/contractors"
Expert 3	"Most AFCEC and AFIMSC officers are senior captains that will be considered for promotion to Major prior or just after departure from AFCEC or AFIMSC" "This effects their ability to be a "full up round" whe they arrive having to understand the intricavies of staff work, not just the focus on their area of technical expertise"
Expert 4	"working closely with the supporting squadron at the location or going TDY to a base to take part in learning those skills; Planning, Programming, Budgeting, Execution (PPBE) skills should also be learned"
Expert 5	"Understanding the importance of the other staff functions and how they contribute to the mission" "It is not just the bases the staff works with but also horizontally across the staff"
Expert 6	"Time management, exectuvie/staffing, and some type of technical (civil, electrical, etc) engineering skill"
Expert 7	"No Technical depth gained witin the CES should prepare the CGO for a staff position"
Expert 8	"Not all AFCEC/IMSC positions are "highly technical," many are project and program management positions similar to what we had CGOs doing on MAJCOM staffs not too long ago"

The third question component focuses on Rapid Engineer Deployment Heavy Operational Repair Squadron Engineers (RED HORSE) capabilities. Five experts believed that Company Grade Officers should be able to lead small CE units in cradle-to-grave construction projects. Additionally, one expert brought up beddown planning, one brought up resource management, and one brought up resource management. The synthesized expert opinion is: Civil Engineer Company Grade Officers should be capable of leading small units in cradle to grave management of FSRM projects, including beddown execution, resource management, and supply chain knowledge. Table 32 displays the expert responses excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 36.

Table 32: Delphi Study Round 2: Question 2: Component 3 Response Excerpts

Delphi Study Round 2: Question 2: Component 3 Response Excerpts	
Question:	**RED HORSE positions make up approximately 6% of positions. In your opinion what RED HORSE capabilities should be developed in all CE CGOs?**
Designation	**Excerpt**
Expert 1	"Leadership of a small CE detachment/unit and cradle to grave management (including scope, budget, schedule, quality management, along with related logstics) of a FSRM or non-MILCON project should be developed in all CE CGOs"
Expert 2	N/A
Expert 3	"The ability to use engineering skills (or other technical skills depending on degree) in their discipline to develop requirements, design, and construction projects" "leading a team to construct such a project" "integrate AF Civil Engineer skills in beddown and some level of construction capability"
Expert 4	"Leadership, warfighting" "full spectrum of readiness"
Expert 5	"Ability to take a relatively smiple O&M project from start to finish" 'leading a cross-functional team of engineers" "Supply chain management"
Expert 6	"Planning, programming, design, construction management"
Expert 7	"Competency 5.2"
Expert 8	"Small unit troop leading skills, construction management, limited/expedient design, resource management"

The fourth question component was further divided into three independent subcomponents. The first part focused on expert opinion regarding position-rank misalignment. No experts displayed great concern, one showed medium concern, two showed minimal concern, and five showed no concern for non-key positions. The synthesized expert opinion is: [Outside Squadron Commander, Engineering Flight Chief, and Operations Flight Chief positions, position-rank misalignments are not concerning. The MyVector and Talent Marketplace programs should alleviate any centralized concerns while Squadron Commanders can alleviate decentralized concerns.] Table 33 displays the expert responses excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 37.

Table 33: Delphi Study Round 2: Question 2: Component 4: Subcomponent 1 Response Excerpts

Delphi Study Round 2: Question 2: Component 4: Subcomponent 1 Response Excerpts	
Question:	**Currently, 24.35% of CE CGO assignment billets are rank misaligned, meaning that the position rank and the assigned individual rank do not match. The mismatches between Captain and Lieutenant positions and actuals is about 52%. What level of concern do you have with the CGO rank mismatch of positions and individuals assigned?**
Designation	**Excerpt**
Expert 1	"I am not overly concerned, but no flight chief position should be an O-1, while certain flights should be O-3 minimum (CEN and CEO). Otherwise, assignment at grade or one below is permissible and should not be frowned upon"
Expert 2	"I think we must get this cleaned up"
Expert 3	"not a high level of concern"
Expert 4	"not much"
Expert 5	"not much, I'd probably care more if I was the CE Comannder who owned those billets"
Expert 6	"very little"
Expert 7	"very little"
Expert 8	"medium concern….some positions may be misclassified and for many positions the requirement is very dependent on the circumstances of the positon and the person" "a perfect example was putting 2Lt's in PRTs oin Afghanistan; they were typically one deep engineers on the team but they didnt have the skills to do the job they were sent to do"

The fourth component's second subcomponent asked experts if these misalignments would continue and that if it should influence the development timeline. One expert believed this question was not applicable, five experts believed that this misalignment would continue but that it should not impact development timelines, and one believed that it would not continue. The synthesized expert opinion is: [Position-rank misalignment will likely continue, and development timelines should not be influenced by these deviations. Competence should be a window or timeline, which alleviates much of this concern.] Table 34 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 38.

Table 34: Delphi Study Round 2: Question 2: Component 4: Subcomponent 2 Response Excerpts

Delphi Study Round 2: Question 2: Component 4: Subcomponent 2 Response Excerpts	
Question:	**Do you believe that this will continue, and that competency timelines should be indifferent?**
Designation	**Excerpt**
Expert 1	"yes it will continue in the near future" "competency timelines should be indifferent"
Expert 2	"I think we must get this mess cleaned up"
Expert 3	"I would suggest competency timelines that apply to the career field should remain unchanged"
Expert 4	"No it shouldn't be different"
Expert 5	"I believe it will continue" "I could ee that the competency timelines may be indifferent"
Expert 6	"yes"
Expert 7	"N/A"
Expert 8	"I do believe it will continue, but competency timelines aren't necessarily indifferent, there should still be general levels of competency expected at certain 'gates' in a career"

The final question subcomponent specifically asks experts if Company Grade Officers holding Field Grade Officer positions should influence development timelines. Four experts explained that the Company Grade Officers should be able to fill roles which local leadership believes them capable of performing. Two experts believe these roles may be detrimental for those who are underqualified to fill them. One expert believed that filling Field Grade Officer positions can accelerate competency attainment, and one believed there would be no significant impact. The synthesized opinion of the experts is as follows: Company Grade Officers filling Field Grade Officer roles may accelerate competence attainment but should not influence development timelines. Table 35 displays the expert responses excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 39.

Table 35: Delphi Study Round 2: Question 2: Component 4: Subcomponent 3 Response Excerpts

Delphi Study Round 2: Question 2: Component 4: Subcomponent 3 Response Excerpts	
Question:	**The data indicates that 24% of misaligned positions are Captains holding FGO billets. Due to the nature of the data, it was not possible to determine if these positions were Senior Captains/ Major Selects. In that regard how does this misalignment affect a CGO Competency Timeline?**
Designation	**Excerpt**
Expert 1	"As long as a commander assesses that a Senior Captain (7-10 years) is capable for a FGO position, we should support"
Expert 2	"I think we must get this cleaned up"
Expert 3	"This is not new…during my entire career, myself and others have filled positions with rank mismatches." "I actually believe that this accelerates a CGO competency to take on FGO duties"
Expert 4	"need to work the competencies into a "window"
Expert 5	"the officer will be forced into a position where they may not have all the desired competencies needed in order to be successful in the position"
Expert 6	"while I think achieving CGO competencies is doable, even if assigned to a FGO postion, supervisors/other outside CE may believe the CGO already knows everything to fill a FGO position"
Expert 7	"there are positions coded for O-4s that the right O-3s can excel in"
Expert 8	"misalignment shouldn't drive us to try and force more "experiences" in a shorter amount of time"

4.8.3 Question 3

The second round's third question was broken into two independent components focusing on information provided by the 2018 Education Working Group and the Air Force Personnel Center data. The first component addressed concerns with most Civil Engineer Officer positions being assigned to Engineering Flight. The question asked experts if they felt that CEN exclusive experience would deprive Company Grade Officers of knowledge breadth. Seven experts believed that long periods of time spent in Engineering Flight would be slightly detrimental to Officer development. One expert counterposed this opinion and stated no concern with the status quo. The synthesized expert opinion is: [Extensive Engineering Flight experience is important for pursuing professional licensure or registration. Squadron Commanders should move Company Grade Officers between the flights to develop knowledge breadth, which can be augmented with specific training days.] Table 36 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 40.

Table 36: Delphi Study Round 2: Question 3: Component 1 Response Excerpts

Delphi Study Round 2: Question 3: Component 1 Response Excerpts	
Question:	**Pilot Study discussions with limited validation during the AFPC data analysis, indicated a large number of CE CGOs within engineering flight. Some members of the Pilot Study mentioned serving for 6 years exclusively in the CEN flight. The AFPC data revealed that approximately half of all CE CGOs assigned to the CE Squadron are within CEN. What concerns (if any) do you have with exclusive CEN experience? Do you believe that these officers (when eventually rotated to the other flights) have appropriate breadth of experience?**
Designation	**Excerpt**
Expert 1	"Some CE CGOs need to be on the technical track to ensure they get the qualifying experience to allow them to pursue their professional engineering or architectural license, but 6 years seems long" "should be limited to whats needed for professional licensing"
Expert 2	"No I don't think we can have them spenind more than 4-6 years in that CEN related jobs. There must be an opporuntity to LEAD AIRMAN ENGINEERS" "They must know how to run Operations Flt"
Expert 3	Even if CEN is where the Officer positions are on the books, that is a foul. Half may be assigned to CEN at any one time, but shouldn't be for long periods of time. As well, I would hope that we've broken the paradigm that all CE officers need to start in engineering"
Expert 4	"I have some concerns as ideally an officer would rotate more often within a squadron" "I've seen plenty of CE officers be successful who grew up primaarily in engineering flight"
Expert 5	"Lack of breadth would be largest concern. They need to understand how different flights operate in order to be more effective as a future CE Squadron Comander"
Expert 6	"Classic breadth vs. depth concern"
Expert 7	"None, Yes"
Expert 8	"I have some concerns, mostly with troop leading/interaction opportunities and exposure (or lack of) to the often more dynamic nature that CEX or CEO opportunities might offer"

The second question component asked experts if they believed mandatory flight rotations should be implemented to ensure experience breadth. Two experts supported making flight rotations mandatory, three experts were opposed to mandating rotations, and three believed rotations should not be mandatory but a guide should be established to aid units. The synthesized expert opinion is: [Mandatory flight rotations should not be implemented for Company Grade Officer development, but a guide should be produced as a Squadron Commander resource. Squadron Commanders should maintain the flexibility to develop those under their charge, but Company Grade Officers should rotate between 2-3 jobs in their first 3-4-year assignment.] Table 37 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 41.

Table 37: Delphi Study Round 2: Question 3: Component 2 Response Excerpts

Delphi Study Round 2: Question 3: Component 2 Response Excerpts	
Question:	**In context of a CGO competency timeline, should the careerfield mandate flight rotations on a given time interval?**
Designation	**Excerpt**
Expert 1	"Yes.Rotate though at least two positions in a 3 or 4 year assignment to provide for more breadth of experience and exposure to other parts of the squadron"
Expert 2	"We should set some basic standards/ guidelines for officers to be in the various flights"
Expert 3	If it is necessary due to commanders not taking their own initiative to grow our officers with varied jobs and experiences, then YES" "with 2-3 jobs (in various flights) at a minimum"
Expert 4	"NO. Squadron Commanders need to have the flexibility within their units to either move officers around OR leave them (and their expertise) in an Engineering Flight that needs appropriate (i.e. - experienced) resources"
Expert 5	"Commanders to provie them needed flexibility to run their squadron the way they see fit"
Expert 6	"Not mandate, but use as a guide"
Expert 7	"No, my opinion is that is CES/CC business"
Expert 8	"I don’t think rotations should be mandated, BCEs have enough demand to juggle with vacancies and deployments and org constructs"

4.8.4 Question 4

The second round's fourth question had four independent subcomponents and focused on the career field survey results. The first subcomponent solicited expert opinions on the survey prioritization results. Three experts believed that the rankings were generally accurate, with one of these three recommending that the top 50 competencies should be consolidated. The remaining experts provided changes which are reflected in Table 38, which displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 42.

Table 38: Delphi Study Round 2: Question 4: Component 1 Response Excerpts

	Delphi Study Round 2: Question 4: Component 1 Response Excerpts
Question:	**Attached are the survey results for the careerfield competency survey. Each of the questions had five categories of importance, which the respondent could choose to show the importance of the competency. For the sake of analysis, each of the importance levels was then given a weight of 1 (Not Important) to 5 (Extremely Important). The number of respondents who selected a level were then multiplied by a weighht and added togehter. A higher score indicated that the cumulative responses determined a higher level of importance. Do you agree with the ranking of the competencies from the careerfield survey? or should they be moved?**
Designation	**Excerpt**
Expert 1	"For the one listed, the following resonated with me: 2.3, 4.1, 7.6, 8.2, 11.2, 8.1, 8.3, 2.1, 5.5, 7.7, 7.5, and if modified 9.4 after replacing contested with "contingency"" "a number of tasks were too specific to a particular job in a particular organization (e.g..., 3.3, 3.5, 4.3, 4.10, 4.12, 7.1, 7.4, 9.3, 10.9, 12.4, etc) or they were general skills most CGOs - not just CE CGOs - should have (e.g., 1.1, 6.4, 7.3, 10.1, 10.2, 10.4, 10.5, 12.2, 12.3, 12.5,, or were not grade appropriate for a CGO (e.g., 10.8, 11.1, 12.1, versus competency-based tasks."
Expert 2	"There isnt enough competencies for emergency mgt, EOD, and fire"
Expert 3	"Ones that stick out are 4.9 and 8.3 should be around 21(8.3) and 22(49)" "10.2 should be top 10" "1.2 should be top 15" "1.4 in the top 25" "4.7 in top 30" "3.2 in top 30" "1.3 should not be significantly below 1.4" "11.1, 11.4,. and 11.5 may be more appropriate for FGOs"
Expert 4	"Generally yes"
Expert 5	Concur with the methodology used, but I tend to disagree with some of the rankings" "I think more of our expeditionary competencies should be ranked higher" "I see that competency 5.3 "Design a simplified facility for construction" ranks #65"
Expert 6	"Not if they are applied to CGOs in the careerfield - a lot of the competencies are beyond CGOs (e.g.: 10.3, 12.1, 10.2, 10.7, 10.5, 12.2, 10.1, 10.6, 11.4, 11.5, 11.1, etc) 8.1, 3.2 should move higher"
Expert 7	"Yes"
Expert 8	"Yes, in general I agree with the ranking" "Top 50ish capture the big ticket competencies…although I would still proposed that some could/should be combined"

Due to there being very little consensus on moving the competencies, Appendix 43 shows the provided responses in an additional way. Each of the competencies was written with the expert's opinions to move being categorized beside it. The requests to move were synthesized and adjustments were made based upon the principle of majority rules.

The second question component specifically asked the experts if they feel that any competency should be removed from the list. Table 39 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 44.

Table 39: Delphi Study Round 2: Question 4: Component 2 Response Excerpts

Delphi Study Round 2: Question 4: Component 2 Response Excerpts	
Question:	**Do you believe that some of the listed competencies are not relevant (which ones)?**
Designation	**Excerpt**
Expert 1	"No " "Eliminate those tasks that are too specific to a particular job in a particular organization (e.g.., 3.3, 3.5, 4.3, 4.10, 4.12, 7.1, 7.4, 9.3, 10.9, 12.4, etc.,) or involve general skills most CGOs-not just CE CGOs-should have (e.g., 1.1, 6.4, 7.3, 10.1, 10.2, 10.4, 10.5, 12.2, 12.3, 12.5,, or were not grade appropriate for a CGO (e.g. 10.8, 11.1, 12.1, etc.,)"
Expert 2	"I know there isnt enough specific competencies for emergency mgt, EOD, and fire"
Expert 3	"11.1, 11.4, and 11.5 may be more appropriate for FGOs"
Expert 4	"Yes, some should be consolidated"
Expert 5	"No"
Expert 6	"It seems 1.1, 1.4, 1.3 are relevant only to CCs/Chiefs"
Expert 7	"No"
Expert 8	"I think they are all relevant"

There was no synthesis of opinion of this question and Appendix 45 shows the responses to this question. Each of the competencies was written with the expert's opinions to remove being categorized beside it. The requests to move were synthesized and adjustments were made based upon the principle of majority rules.

The third question component asked experts if any competency was missing from the survey list. The experts gave the following synthesized response: [While the competency list was comprehensive, some non-core areas would be considered beneficial if added, including: Asset Management, Explosive Ordinance Disposal, Housing Management, Environmental Management, and Energy Management.] Table 40 displays the expert response excerpt which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 46

Table 40: Delphi Study Round 2: Question 4: Component 3 Response Excerpts

Delphi Study Round 2: Question 4: Component 3 Response Excerpts	
Question:	**Do you believe that a competenecy may have been missed (please identify)?**
Designation	**Excerpt**
Expert 1	"No, but I think some of the competencies could have been grouped under broader "umbrella competencies"
Expert 2	"I know there isnt enough specific competencies for emergency mgt, EOD, and Fire"
Expert 3	"I didn't see any competencies that directly call-out asset management though one could argue that some of the competencies contain asset management principles"
Expert 4	"There is not mention of EOD competencies (similar to CBRN competencies)
Expert 5	"No"
Expert 6	"I don't see many/any that pertain to environmental management, energy resiliency/management, housing management…these may not be "core""

4.8.5 Question 5

The second round's fifth and final question solicited expert opinion on the survey competency development timeline results. Two thirds of experts believed the survey respondents proposed timeline was accurate and did not need any modification. One third expert believed the timeline should be adjusted but did not offer a solution themselves. Table 41 displays the expert response excerpts which most closely summarize their answer to the question. A complete response from each expert can be seen in Appendix 47. Additionally, Appendix 48 shows the attachment provided to the experts to help answer this question.

Table 41: Delphi Study Round 2: Question 5 Response Excerpts

	Delphi Study Round 2: Question 5 Response Excerpts
Question:	**Attached are the survey results related to a competency timeline. Some of the survey questions did not have available responses for timelines of competence attainment and are labeled as "Not Provided". The percentages are based upon the number of responses related to each of the categories. The highlighted cell in each row represents the maximum vote for the row and would serve as the time at which the CE CGO would require competence in that category. Do you agree with the results or do you feel the timeline should be adjusted?**
Designation	**Excerpt**
Expert 1	"4.1 & 4.9-should be moved to First Lieutenant" "5.4- expeditionary locations can be fairly basic for which a 2d Lt" "6.5-it doesnt take an expert to recognize a safety hazard and raise the alarm, definitely move this to the left to 2d Lt" "7.4- move left to 1st Lt" "9.4- shift to left to Junior Captain" "10.3-shft right to Senior Captain" "12.3-shift to Senior Captain"
Expert 2	N/A
Expert 3	"Items listed as 7.3, 9.X and 11.X should be Senior Captains or even later as FGO (reference above)" "8.X should be Junior Captain. "3.3, 3.4, 4.4, 7.8 to Junior Captain" "1.3, 1.4, 3.2, 4.9, 5.2, 7.7 1Lt" "1.1, 1.2, 2.3, 3.1 2Lt"
Expert 4	"I agree"
Expert 5	"Agree with Results"
Expert 6	"2.2 seems to early" "3.1 & 3.2 should be included for CGO (probably by Sr Lt/Early Capt) "4.4 should be added for Sr Capt"
Expert 7	"Top 15 Competencies should be developed at the earliest opportunity"
Expert 8	"I would defer to the lower/more junior level vice the straight percentages (e.g. 4.2, 5.2, 5.3, 8.1)" "Some are dependent on what jobs you have (e.g. 4.9, 4.6, 7.2, 7.9)"

4.9 Delphi Study Round 3 Questions

The third Delphi Study round sought to achieve consensus on the final Civil Engineer Company Grade Officer Competency-Based Education Model. The round consisted of only two overarching questions, which were provided to the experts in a Microsoft Word document, with the proposed model being provided on a Microsoft Excel handout.

The third round's first question was worded as: "Final Competency List and Development Timeline Model: The results of the previous Round have been analyzed and were used to inform the attached model (Excel Sheet). There was majority agreement in the previous round on the consolidation of Competencies into larger "umbrella" topics, to reduce the overall number. In the attached list, the competencies are not prioritized but are listed by development time (the ones at the top are for Second Lieutenants, with Senior Captains at the bottom). In the provided Excel sheets, each of the 18 competencies have drop down lists for both Competency and Timeline. Please select "Agree as is", "Modify", or "Reject" for the competencies and timeline (Column K and L). No comments are required for an "Agree as is", but please provide comments for any modify or reject selections (Column N/O). *Note: In the excel sheet, the numbers in the "ID" column are those competencies which went into constructing the "Modified Competency", the "Concept" Column is a general summation of the Competency, and the "Previous Ranking" shows the rankings of the competencies which were compiled into the umbrella concept." This question starts by explaining that responses should be submitted on the provided Excel sheet and explained the changes which have occurred since the previous round. It further explains that the numerous competencies provided in

the previous rounds have been consolidated into 18 umbrella competencies which provide the overarching aspects of the previous round. Because the provided Excel sheet had multiple columns which have pre-recorded options for response, there was also a column where the experts could provide any comments they wanted on any aspect of the study. The purpose of this question is to achieve consensus or to determine if alterations should be made to the competency verbiage and timeline.

The third round's second and final question was worded as, "Proficiency Levels: The final question for this research study is about the proficiency level for each competency. Proficiency can be either binary (pass/fail) or scaled (Novice, Beginner, Practitioner, Advanced, Master/Expert). The Scaled proficiency levels imply that the testing of the CGOs abilities should increase overtime and that they should not merely be adequate at performing a task but should aim toward mastery. An example of this would be: A Second Lieutenant should be able to perform square foot cost estimates, but a Captain should be able to perform unit cost estimates. For each competency in the model please use the drop-down list to select either Binary or Scaled (Column M). Comments are not required but are highly encouraged to provide substantiation of the final model." This question starts with asking the experts to choose either a binary or scaled proficiency option for every competency, and then explains what the difference in choices means and provides an example. The final part of the question reiterates to the experts that they can provide comments to substantiate their stances. The purpose of this question is to provide the groundwork for how these competencies will be judged by the stakeholders during the evaluation of CGO competence.

4.10 Delphi Study Round 3 Results

The questions for Round 3 were sent to all 18 panel members who had been selected to participate in the study and had not requested to be removed from the distribution list. Of these panel members, only 12 experts provided opinions to the provided questions and no experts requested to be removed prior to the start of the subsequent rounds. Unfortunately, not all 8 participating experts completely answered each question and as such the subsequent subsections will show a fluctuation in expert numbers.

4.10.1 Question 1

The first question component involved the newly formed umbrella competency titled "Engineering Judgement and Critical Thinking." Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round's first question can be seen in Table 42.

Table 42: Round 3: Question 1 Full Responses

Competency 1				
Title	**Proposed Competency**		**Proposed Timeline for Development**	
Engineering Judgement and Critical Thinking	Anticipate and adapt engineering approaches in a dynamic operating environment with good engineering judgement and critical thinking.		Second Lieutenant	
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Scaled	"This is a graduated competency that a new Lt will hone through Capt years"
Expert 5	Modify	Accept	Binary	" Anticipate and adapt engineering approaches in a dynamic operating environment employing engineering judgement and critical-thinking. "
Expert 6	Accept	Accept	Binary	None
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Scaled	As a CE officer gains experience (and knowledge) their judgement and critical thinking should also continue to develop/refine. As a 2Lt they will have book smarts but little experience to inform judgement iot anticpate and adapt
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Modify	Scaled	I think this competency spans the entire timeline, especially critical thinking skills
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 42, 10 of the 11 experts accepted the competency verbiage as "anticipate and adapt engineering approached in a dynamic operating environment with good engineering judgement and critical thinking." Expert 5 requested that the competency be modified by replacing the words "with good" with "employing." This verbiage change will be adapted, as it does not change the competency intent but does remove the ambiguity of the word "good," which would leave room for interpretation to the competency assessor. Overall, the approval rating for this competency was 90.9% and will be included in the final model.

Also as shown in Table 42, 9 of 11 experts agreed with the development timeline showing competency attainment in the first 0-2 years, as a Second Lieutenant. Expert 4 thought that this competency should show attainment occurring as a Second Lieutenant but being refined throughout their time as a Company Grade Officer. This notion was echoed by Expert 11, who believed the competency spanned the entire timeline. However, 81.8% of the experts agreed that the competency should displayed as a Second Lieutenant. Therefore, since the percentage of experts in agreement exceeds the common notion of a majority, the competency will be listed as being required for Second Lieutenants.

Further shown in Table 42, 8 of 11 experts agreed that this competency should be measured against a binary proficiency measure. This means that 72.7% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. Of the three experts who championed the scaled proficiency level, two were the experts who also believed the development timeline should show all four Company Grade Officer Categories. The remaining expert,

Expert 9, commented that the skills would be refined over time, but did not encourage a change to the development timeline. Therefore, since the percentage of experts in agreement exceeds the majority, Competency 1 shall have a Binary proficiency type in this educational model.

4.10.2 Question 2

The second component question involved the newly formed umbrella competency titled “Engineer Operations Safety and Real Property Vulnerabilities.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round’s second question can be seen in Table 43.

Table 43: Round 3: Question 2 Full Responses

Competency 2				
Title	**Proposed Competency**		**Proposed Timeline for Development**	
Engineer Operations Safety and Real Property Vulnerabilities	Identify safety hazards during civil engineer operations/activities and vulnerabilities to base infrastructure and real property assets. Analyze these concerns and provide recommendations to appropriate decision-makers to organize response options.		Second Lieutenant First Lieutenant	
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Scaled	"This is a graduated competency that a new Lt will hone through Capt years"
Expert 5	Accept	Modify	Scaled	"Recommend including across development timeline; recommend scaled to promote continuous learning and SA and integration into thought proces"
Expert 6	Accept	Reject	Binary	"If a competency is attained at 2d Lt, it seems redundant to likewise list attainment at the 1st Lt stage"
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Scaled	"same comment as above but not as pronounced…w/ experience comes better awareness and ability to analyze/inform"
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 43, all experts accepted the competency verbiage as "Identify safety hazards during Civil Engineer operations/activities and vulnerabilities to base infrastructure and real property assets. Analyze these concerns and provide recommendations to appropriate decision-makers to organize response options." With a 100% approval rating, this competency will be included in the final model with proposed verbiage.

Also as shown in Table 43, 8 of 11 experts agreed with the development timeline showing competency attainment over the first 0-4 years, as a Second Lieutenant and First Lieutenant. Expert 4 thought that this competency should show attainment occurring as a Second Lieutenant but being refined throughout their time as a Company Grade Officer. This notion was echoed by Expert 5, who believed the competency spanned the entire timeline. Expert 6 rejected the proposed development timeline because they felt it was redundant to overlap two ranks. However, 72.7% of the experts agreed that the competency should be displayed as a Second Lieutenant and First Lieutenant. Therefore, since the percentage of experts in agreement exceeds the common notion of majority, the competency will be listed as being required for Second Lieutenant and First Lieutenant.

Further shown in Table 43, 8 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 72.7% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. Of the three experts who championed the scaled proficiency level, two were the experts who also believed the development timeline should show all four Company Grade Officer Categories. The remaining expert, Expert 9, commented that the skills would be refined over time, but did not encourage a

change to the development timeline. Therefore, since the percentage of experts in agreement exceeds the majority, Competency 2 shall have a Binary proficiency type in this educational model.

4.10.3 Question 3

The third component question involved the newly formed umbrella competency titled “Civil Engineer Support Provisions and Staff Interactions.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round’s third question can be seen in Table 44.

Table 44: Round 3: Question 3 Full Responses.

Competency 3				
Title	**Proposed Competency**			**Proposed Timeline for Development**
Civil Engineer Support Provision and Staff Interactions	Understand and communicate Civil Engineer Enterprise organic resources and capabilities with other United States Air Force units, such as Wing Staffs, Operations Groups, Maintenance Groups, Medical Groups, other Mission Support Squadrons, or sister services. This enterprise wide understanding includes the interaction between AFCEC, AFIMSC, MAJCOMs, and HAF staffs, as well as between the staffs and bases. The communication abilities should include joint collaboration, status of resources and expected real property risks of actions, and how CE can support various missions.			Second Lieutenant First Lieutenant
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Modify	Scaled	"Unless I misunderstand "attainment" definition, I believe this is an evolutionary competency, and would carry it out to the Senior Capt level. Member may/may not be able to achieve all the competencies as currently written…it may need to be broken into two separate levels (especially the last sentence -- probably stand alone competency)."
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Scaled	"Experience and training will drive the development time over the course of a CGO's years. Unlikely a first assignment LT is going to be proficient until Capt"
Expert 5	Accept	Accept	Scaled	None
Expert 6	Accept	Modify	Scaled	"A 2d lt may know facts but it may not be informed by context and experience. Especially when the audience may be more senior, it would be disingenuous to expect a 2d Lt to explain the interaction beteween MAJCOMs and HAF as a 2d Lt when the Lt may not have experienced a PPBE cycle and/or have had only one base-level assignment and no higher HQ tour."
Expert 7	Modify	Modify	Scaled	"Modify - The competency is critical, but not realistic for the Reserve officer outside of Wing level organizations. Our interaction from a MAJCOM/component level is really mid-Capt and above; and our units don't interact with AFIMSC or AFCEC"
Expert 8	Accept	Accept	Scaled	"2Lt - Wg & below; 1Lt/Jr Capt - above/outside Wg"
Expert 9	Modify	Modify	Binary	"I would separate this into 2 competencies: 1) do they understand and can they explain all that a CE squadron does (CEO, EM, EOD, Fire, Env, Asset Mgt, Housing) - that should be at the 2Lt level. 2) Do they have the enterprise wide perspective and can they communicate it inside and outside the AF...this one is scalable from a 2Lt (maybe even 1Lt) up"
Expert 10	Modify	Accept	Scaled	"It may be possible that a 2d Lt would not interact with the MAJCOM and, if they did, would be a Novice or Beginner. I do not know if "
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 44, 8 of 11 experts accepted the competency verbiage as "Understand and communicate Civil Engineer Enterprise organic resources and capabilities with other United States Air Force units, such as Wing Staffs, Operations Groups, Maintenance Groups, Medical Groups, other Mission Support Squadrons, or sister services. This enterprise-wide understanding includes the interaction between AFCEC, AFIMSC, MAJCOMs, and HAF staffs, as well as between the staffs and bases. The communication abilities should include joint collaboration, status of resources and expected real property risks of actions, and how CE can support various missions." Expert 7 voiced that the competency is "critical" but that it should be modified for Reserve Officers due to the different nature of their Major Command. The verbiage is requested to reflect that Civil Engineer Company Grade Officers within the Reserve Command do not commonly interact with the Air Force Installation and Mission Support Center or the Air Force Civil Engineer Center. Further verbiage changes were requested by Expert 9, who desired the competency to be divided into two subcomponents to reflect a competence evolution between the ranks of Second Lieutenant and First Lieutenant. Expert 10 requested modification to the verbiage but did not specify how the wording should be changed and explained a concern more in line with development time. Overall, the approval rating for this competency was 72.7% and will be included in the final model with the originally proposed verbiage.

Also as shown in Table 44, 6 of 11 experts agreed with the development timeline showing competency development occurring over the first 0-4 years, as a Second Lieutenant and First Lieutenant. Expert 1, Expert 4, Expert 6, Expert 7, and Expert 9 voiced that the competency is evolutionary and would be developed over the course of

the career. Furthermore, Expert 8 chose the “Accept” choice of response but provided a comment about modifying it into multiple sections. If Expert 8 is included in the dissenting group, then simple majority is given to the competency development timeline needing adjustment. A looking at the proficiency level requirement provided additional insight into the development timeline adjustment.

Further shown in Table 44, 7 of 11 experts agreed that this competency should be measured against a scaled proficiency measure. That means that 63.6% of the panel experts believe the competency should be measured as evolutionary over the career rather than as a pass/fail. With taking the simple majority for scaled proficiency and adjustment to the development timeline, Competency 3 will be scaled with Second Lieutenants and First Lieutenants being required to know the interaction at and below the wing level, and Captains being required to perform the entire competency.

4.10.4 Question 4

The fourth component question involved the newly formed umbrella competency titled “Civil Engineer Personnel Development and Training.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round’s fourth question can be seen in Table 45.

Table 45: Round 3: Question 4 Full Responses

Competency 4				
Title	**Proposed Competency**			**Proposed Timeline for Development**
Civil Engineer Personnel Development and Training	Understand Civil Engineer Officer and Enlisted force development requirements, guidelines, and recommendations to assist in personal, peer, and subordinate proficiency attainment. Additionally, develop and assist others in developing personal and professional goals to assure career-long development. Finally, aid the development of contingency and deployment-related skills through leading or participating in home station training			First Lieutenant
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Modify	Scaled	I believe this is an evolutionary competency, and would carry it out to the Senior Capt level
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Accept	Binary	None
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Modify	Scaled	"This competency should be scaled from 1st Lt to Col. Unless a CGO is assigned to AFPC, he or she will not have the credibility to advise officers and enlisted on development requirements to the same level as a squadron commander or higher."
Expert 7	Modify	Modify	Scaled	"Modify - I recommend this competency fall into the Junior Capt range. While the first 4 years (Lt years) are heavy on training and building career field understanding, I see more mentoring and learning at the individual level and not yet mastery involved in guiding proficiency in others. In the Reserve model, any Lts who are non-prior service have a steep learning curve and expectation is the learn, absorb and seek mentors. Expect these roles would be assumed as junior Capts when taking on more involved supervisory roles. I do agree with the leading home station training--so maybe there are too many elements in this umbrella. "
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Binary	"This one is likely scalable as well but not as clear as 1 and 2…knowledge will allow the competency to be met but experience will make an individual a more effective advisor/mentor"
Expert 10	Modify	Accept	Scaled	"Believe that they should know the development guidelines. But, they should be at the Practicioner level for assisting in professional career-long devellpment goals."
Expert 11	Accept	Modify	Scaled	"I think this competency spans 2-10 years (and really longer) since as leaders, we're always mentoring subordinates to further their development. The competency doesn't include civilian requirements… should it since we also lead civilians? Perhaps this is more of a developed competency at the FGO ranks. "
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 45, 9 of 11 experts accepted the competency verbiage as "Understand Civil Engineer Officer and Enlisted force development requirements, guidelines, and recommendations to assist in personal, peer, and subordinate proficiency attainment. Additionally, develop and assist others in developing personal and professional goals to assure career-long development. Finally, aid the development of contingency and deployment-related skills through leading or participating in home station training." Expert 7 and Expert 10 both requested verbiage modification, but neither provided proposed changes. Expert 7 expressed concern over too many competency components and Expert 10 only discussed changes to the timeline requirements. With an 81.8% acceptance of current verbiage, Competency 4 will be included in the model with the originally proposed wording.

Also as shown in Table 45, 7 of 11 experts agreed with the development timeline showing competency attainment over years 2-4, as a First Lieutenant. Expert 1 requested modification and advocated for a scaled proficiency level, which would carry the educational timeline till Senior Captain. Expert 6 requested a similar modification as Expert 1 but extended the rank of development till Colonel (O-6). Unfortunately, Field Grade Officer ranks are outside the scope of this thesis and therefore can only include up to Senior Captain. Expert 7 requested a change to Junior Captain, but also requested a scale proficiency level. Expert 10 requested modification to the development timeline but did not indicate which rank or ranks it should be moved too. With a simple expert majority of 63.6%, First Lieutenant will remain as the minimum rank for this competency. However, the comments and support of scaling will see the inclusion of both Junior and Senior Captain.

Further shown in Table 45, 6 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 54.5% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. However, Expert 9 marked binary as the choice but championed scaled in their comment. With written opinions being a higher priority than an Excel selection, this shifts the majority to scaled at 54.5%. With most comments associated with scaled proficiency requesting ranks up to or exceeding Senior Captain, Junior and Senior Captain will be included in Competency 4.

4.10.5 Question 5

The fifth component question involved the newly formed umbrella competency titled “Stakeholder Engagement.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round’s fifth question can be seen in Table 46.

Table 46: Round 3: Question 5 Full Responses

Competency 5				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Stakeholder Engagement	Coordinate with stakeholders to identify and define civil engineer requirements, determine scopes of work, establish approximate cost and schedule, and recommend method of execution. This communication should occur during both the planning and execution of work, and should continue with after-action discussions upon work completion.	First Lieutenant		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Accept	Binary	None
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Accept	Binary	None
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Modify	Binary	Depending on their job, a 2Lt could/should be able to do this
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Modify	Scaled	"I think this competency also spans 2-10 years. Should also be scaled as there's a significant difference in discussing stakeholder requirements for a single, small-scoped project compared to working with stakeholders on new mission requirements (ex: F-beddown) or requirements involving multiple installations (ex: European Infrastructure Consolidation)"
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 46, all experts accepted the competency verbiage as "Coordinate with stakeholders to identify and define civil engineer requirements, determine scopes of work, establish approximate cost and schedule, and recommend method of execution. This communication should occur during both the planning and execution of work and should continue with after-action discussions upon work completion." With a 100% verbiage acceptance, Competency 5 will be included in the model with the originally proposed wording.

Also as shown in Table 46, 9 of 11 experts agreed with the development timeline showing competency attainment over years 2-4, as a First Lieutenant. Expert 9 requested modification to conditionally include Second Lieutenants, depending on their position. However, the occupational competencies are core and cannot include exceptions to the rule as governing the competence timeline. Additionally, this position did not receive support from the other experts and therefore could not be adjusted. Expert 11 advocated to include both Junior and Senior Captain with a scaled proficiency level. However, this position did not receive support from the other experts and could not be included in the model. With 81.8% of experts supporting the proposed development timeline, First Lieutenant will be included in the model as the development timeline.

Further shown in Table 46, 10 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 90.9% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With the majority supporting the binary option, it will be included in the model for Competency 5.

4.10.6 Question 6

The sixth component question involved the newly formed umbrella competency titled “Contract Management and Support.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round’s sixth question can be seen in Table 47.

Table 47: Round 3: Question 6 Full Responses

Competency 6				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Contract Management and Support	Develop the specifications/technical work requirements and solicitation package for contracted support of design, construction, and service contracts. Evaluate submittals, proposed drawings, and provided specifications for code, rule, and regulation, and design requirements. During contract execution, assess, monitor, and document contractor performance for contract compliance and recommend actions to contracting officer.	First Lieutenant		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Scaled	"I would add this to 2d Lt and Jr Capt levels. This sort of work is also graduated in the experience and exposure to construction projects…it takes time and not all CGOs get this early in career"
Expert 5	Accept	Modify	Scaled	"There is an awful lot packed into this one….which drives a recommendation to scale it across a full CGO timeline. "
Expert 6	Accept	Modify	Scaled	"Scale from 1st Lt to Capt."
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Modify	Binary	"See above (cmt 5)"
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Modify	Scaled	Recommend 2-7 years development (1Lt - Jr Capt)"
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 47, all experts accepted the competency verbiage as "Develop the specifications/technical work requirements and solicitation package for contracted support of design, construction, and service contracts. Evaluate submittals, proposed drawings, and provided specifications for code, rule, and regulation, and design requirements. During contract execution, assess, monitor, and document contractor performance for contract compliance and recommend actions to contracting officer." With a 100% verbiage acceptance, Competency 6 will be included in the model with the originally proposed wording.

Also as shown in Table 47, 6 of 11 experts agreed with the development timeline showing competency attainment over years 2-4, as a First Lieutenant. Of the dissenting panel members, Expert 4 championed Second Lieutenant through Junior Captain on a scaled proficiency level, Expert 5 included the whole spectrum on scaled proficiency, Experts 6 and 11 championed First Lieutenant through Captain, and Expert 9 included Second and First Lieutenants. While First Lieutenant was included in every expert answer, there was not enough support amongst the experts to include ranks outside First Lieutenant. Therefore, only First Lieutenant is included within the model.

Further shown in Table 47, 7 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 63.6% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 6.

4.10.7 Question 7

The seventh component question involved the newly formed umbrella competency titled "Programming and Program Support." Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round's seventh question can be seen in Table 48.

Table 48: Round 3: Question 7 Full Responses

Competency 7				
Title	**Proposed Competency**			**Proposed Timeline for Development**
Programming and Program Support	Develop a comprehensive project programming package to request appropriate resources and authorization at both permanent and contingency locations.			First Lieutenant
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Modify	Binary	"In my opinion, Lt's should not be in project programming business, they need to first learn other core CE competencies -- like rows 9, 10 and 15 first. What has been happening too often is 2Lts get thrown into programming and never get to learn "core engineering" as a Lt, then one day become Eng Flt CC or Sq/CC and have no idea how to execute a project/contract. They can't go back on learn rows 9 and 10 as a Capt. Recommendation is to change this Attainment to 4-7 year Capt. Another reason why this is important to me is that "Engineers Officers" join CE to do engineering. Let the Lts do engineering first, it's why they became an "engineer" "
Expert 4	Accept	Modify	Scaled	"This competency should start in the 2d Lt timeframe and continue to Jr Capt level. Additionally, I would submit that there should be a requirement to include both FSRM and MILCON level package work"
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Accept	Binary	None
Expert 7	Modify	Accept	Binary	Recognize that expectation for the majority of our officers (at the Reserve unit level) do not have exposure of requirement for programming home station requriements, but this is absolutely a required competency in their expeditionary role. Is it possible to leave off the end of the last sentence identifying permenent and contingency?
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Modify	Binary	See above (cmt 5)
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Scaled	"Recommend 2-10 years development (1Lt - Sr Capt). In our USAFE-AFAFRICA/A4C Africa branch, some of our projects have receievd a high degree of scrutiny, largely due to cost overruns associated with the AB 201 MILCON at Agadez. I think on average, a 1Lt's experience level would not have been enough for projects of this nature (high-vis and dynamic environment)"
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 48, 10 of 11 experts accepted the competency verbiage as "Develop a comprehensive project programming package to request appropriate resources and authorization at both permanent and contingency locations." The only dissenting expert, Expert 7, requested modification by removing the last sentence because Reserve Command Civil Engineer Company Grade Officers do not generally perform programming at home station. To accommodate this request without changing the competencies intent or meaning, an "and/or" will be used to replace the "and" of the proposed verbiage. This meets the demand for Active Duty Officers to meet the stateside and contingency requirement, while Reserve Command can utilize the "or" part for just contingency operations. With the overall support for this competency, Competency 7 will be included in the model with the minor modification to the wording.

Also as shown in Table 48, 8 of 11 experts agreed with the development timeline showing competency attainment over years 2-4, as a First Lieutenant. Of the dissenting panel members, Expert 3 requested the competency be moved to Junior Captain to mitigate against the current trend of Civil Engineer Lieutenants being placed within the Programming Element and being stuck there for long periods of time. Essentially, moving this competency into the later Company Grade Officer years would act as assurance that Lieutenants are given a greater opportunity to learn other skills. Expert 4 requested the competency be scaled with instruction starting with Second Lieutenants and ending with Junior Captains. Expert 7 referenced their comment on Competency 5, which would include Second Lieutenants. Therefore, the dissenting Expert 3 and 5 have taken opposite viewpoints. Furthermore, Expert 11 chose "accept" for the proposed timeline but commented that the competency should be developed from First Lieutenant to Senior

Captain. Due to written comments having precedence, this adjusted the support to 7 of 11 experts. Ultimately, 63.6% of experts agree with the originally proposed timeline as First Lieutenant. Due to a majority, First Lieutenant will be included in the model as the development timeline.

Further shown in Table 48, 9 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 7.

4.10.8 Question 8

The eighth component question involved the newly formed umbrella competency titled “Organic Civil Engineer Emergency Capabilities.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round’s eighth question can be seen in Table 49.

Table 49: Round 3: Question 8 Full Responses

Competency 8				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Organic Civil Engineer Emergency Capabilites	Understand the local organic capabilities Civil Engineers provide during emergency situations and lead Civil Engineer Unit Control Center (UCC) operations or serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).	First Lieutenant Junior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Accept	Binary	None
Expert 5	Accept	Accept	Scaled	None
Expert 6	Accept	Modify	Scaled	"Scale from 1st Lt to Capt. I suspect that in some cases the Ops Chief (O-3/O-4) may lead the primary UCC "main"/busy shift versus a 1st Lt"
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Binary	"A 2Lt could/should be able to man an ESF but I would leave this one as is due to the "lead CE UCC" aspect"
Expert 10	Accept	Accept	Scaled	"Scale based on level of training (i.e. ICS 300/300, EOC Manager, etc.)"
Expert 11	Accept	Accept	Scaled	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 49, all experts accepted the competency verbiage as "Understand the local organic capabilities Civil Engineers provide during emergency situations and lead Civil Engineer Unit Control Center (UCC) operations or serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC)." With 100% expert support on the proposed verbiage, Competency 8 will be included in the model with the current wording.

Also as shown in Table 49, 10 of 11 experts agreed with the development timeline showing competency attainment over years 2-7, as a First Lieutenants and Junior Captains. The sole dissenting member, Expert 6, requested the competency be scaled from First Lieutenant to Captain. Additionally, Expert 9 chose "accept" for the proposed development timeline, but commented that Second Lieutenants should be able to perform this competency. This bring the dissenters to 2 of 11 experts. Due to the majority of 81.8% agreeing with the proposed timeline, First Lieutenant and Junior Captain will be included for Competency 8 in the educational model.

Further shown in Table 49, 7 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 63.6% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 8.

4.10.9 Question 9

The ninth component question involved the newly formed umbrella competency titled "Preparation and Recovery After Attack." Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire.

The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round's ninth question can be seen in Table 50.

Table 50: Round 3: Question 9 Full Responses

Competency 9				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Preparation and Recovery After Attack	Aid in identifying and executing plans to mitigate mission impact during unplanned disruptive events. In the occurrence of a disruptive event, organize and direct airfield recovery efforts, including validating and communicating minimum operating strips to senior leaders for approval. Ensure the development and maintenance of engineer portion of installation contingency plans.	First Lieutenant Junior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Binary	"Include the Sr Capt level to attain this competency. Doing this work may not occur until a CGO is a CEX Flt/CC. "
Expert 5	Accept	Accept	Scaled	None
Expert 6	Accept	Modify	Scaled	"If the development phase crosses between more than one rank, than the attainment should be scaled and not binary."
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Binary	None
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 50, all experts accepted the competency verbiage as "Aid in identifying and executing plans to mitigate mission impact during unplanned disruptive events. In the occurrence of a disruptive event, organize and direct airfield recovery efforts, including validating and communicating minimum operating strips to senior leaders for approval. Ensure the development and maintenance of engineer portion of installation contingency plans." With 100% expert support on the proposed verbiage, Competency 9 will be included in the model with the current wording.

Also as shown in Table 50, 9 of 11 experts agreed with the development timeline showing competency attainment over years 2-7, as a First Lieutenants and Junior Captains. Expert 4 requested modification to include Senior Captains. Expert 6 mentioned that development is listed across two ranks but did not state a change for proposed ranks. With the 81.8% of experts in agreement, First Lieutenant and Junior Captain will be included in the model for Competency 9.

Further shown in Table 50, 9 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 9.

4.10.10 Question 10

The tenth component question involved the newly formed umbrella competency titled "Troop Leading Procedures." Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on

any specific competency. The expert opinions on the third round's tenth question can be seen in Table 51.

Table 51: Round 3: Question 10 Full Responses

Competency 10				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Troop Leading Procedures	Lead small multi-disciplinary civil engineer units under mission command orders in contingency environments, to include executing cradle to grave endeavors, utilizing troop labor execution methods.	First Lieutenant Junior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Modify	Scaled	"Scaled is more appropriate & consider modifying to Sr Capt level."
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Scaled	"This TLP skill set should be across all levels of a CGO development. It is a career long learning process to apply a level of mastery at leading simple missions to much more complex"
Expert 5	Accept	Accept	Scaled	"Officers should have the opportunity to lead a few of these projects at different points in their careers."
Expert 6	Accept	Modify	Scaled	"Size, complexity,degree/distance of separation from the parent CE unit, etc of the multi-disciplinary CE unit should inform the experience and competency required."
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Binary	None
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 51, all experts accepted the competency verbiage as “Lead small multi-disciplinary civil engineer units under mission command orders in contingency environments, to include executing cradle to grave endeavors, utilizing troop labor execution methods.” With 100% expert support on the proposed verbiage, Competency 10 will be included in the model with the current wording.

Also as shown in Table 51, 8 of 11 experts agreed with the development timeline showing competency attainment over years 2-7, as a First Lieutenants and Junior Captains. Expert 1 requested including Senior Captain. Expert 4 requested modification to include all Company Grade Officer Ranks, which was further echoed by Experts 5 and 6. The majority of experts, however, requested no change and therefore First Lieutenant and Junior Captain will be included in the model.

Further shown in Table 51, 7 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of experts believe competency measurement should be pass/fail rather than a mastery scale. With a majority supporting the binary option it will be included in the model for Competency 10.

4.10.11 Question 11

The eleventh component question involved the newly formed umbrella competency titled “Contingency Design.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round’s eleventh question can be seen in Table 52.

Table 52: Round 3: Question 11 Full Responses

Competency 11				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Contingency Design	Design an airfield and beddown for expeditionary/contingency construction and repair. Included in this beddown is simplified facility design, support utility design, and base beddown layout. Prior to design, lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.	First Lieutenant Junior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Scaled	I would add 2dLt to this one to enable more time to achieve the competency whether on deployment/real world, exercises, Silver Flag, etc
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Modify	Scaled	"Based on the size and complexity of the airfield and beddown, I think a hihger level of competency/knowledge/experience may be required and therefore scale the attainment from1st Lt to Capt and beyond"
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Binary	None
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 52, all experts accepted the competency verbiage as “Design an airfield and bed down for expeditionary/contingency construction and repair. Included in this bed down is simplified facility design, support utility design, and base bed down layout. Prior to design, lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.” With 100% expert support on the proposed verbiage, Competency 11 will be included in the model with the current wording.

Also as shown in Table 52, 9 of 11 experts agreed with the development timeline showing competency attainment over years 2-7, as a First Lieutenants and Junior Captains. Expert 4 requested that Second Lieutenant be included under a scaled proficiency level. Expert 6 requested that Senior Captain be included under a scaled proficiency level. With a majority of 81.8%, First Lieutenant and Junior Captain will be included in the model for the development timeline of Competency 11.

Further shown in Table 52, 9 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 11.

4.10.12 Question 12

The twelfth component question involved the newly formed umbrella competency titled “Asset Management of Real Property Assets.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide

opinions on any specific competency. The expert opinions on the third round's twelfth question can be seen in Table 53.

Table 53: Round 3: Question 12 Full Responses

Competency 12				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Asset Management of Real Property Assets	Implement asset management principles to maintain, repair, sustain, and modernize AF real property infrastructure assets to optimize investments at the lowest possible life-cycle costs. These principles include maintaining asset visibility, understanding asset's impact and risk to mission, asset condition and resilience, and asset vulnerabilities. Communicate this information to decision makers and mission owners to ensure the mitigation of unacceptable risk and advocate for courses of action.	Junior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Modify	Scaled	"I would extend to Sr Capt as well. Since we don't know what assignment a 4-7 yr Capt may be at, they may need longer to understand and master this task."
Expert 2	Accept	Accept	Binary	None
Expert 3	Modify	Accept	Binary	"Needs to inlcude something regarding Environmental planning, i.e. NEPA. CE Officers must have some foundational knowledge in Env planning, timeframes, and constraints as they learn to manage "Property and Asset management" Maybe incorporate into row 20 instead?"
Expert 4	Accept	Accept	Binary	"I would add the Sr Capt level to this one since it is a higher level of understanding and processes and would allow more time to get the needed training/OJT to meet the competency level"
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Accept	Binary	None
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Binary	None
Expert 10	Accept	Accept	Scaled	"Suggest a scale on this concept."
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 53, 10 of 11 experts accepted the competency verbiage as "Implement asset management principles to maintain, repair, sustain, and modernize AF real property infrastructure assets to optimize investments at the lowest possible life-cycle costs. These principles include maintaining asset visibility, understanding asset's impact and risk to mission, asset condition and resilience, and asset vulnerabilities. Communicate this information to decision makers and mission owners to ensure the mitigation of unacceptable risk and advocate for courses of action." The sole dissenting opinion came from Expert 3, who requested including environmental planning, timeframes, and constraints. This opinion was not substantiated by the other experts. Specifically calling out environmental requirements, without including other asset management characteristics, can make it appear to be exclusive by comparison. With 90.9% expert support on the proposed verbiage, Competency 12 will be included in the model with the current wording.

Also as shown in Table 53, 10 of 11 experts agreed with the development timeline showing competency attainment over years 4-7, as a Junior Captains. Expert 1 requested that Senior Captain be included under a scaled proficiency level. With a majority of 90.9%, Junior Captain will be included in the model for the development timeline of Competency 12.

Further shown in Table **53**, 9 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 12.

4.10.13 Question 13

The thirteenth component question involved the newly formed umbrella competency titled “Market Research.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round’s thirteenth question can be seen in Table 54.

Table 54: Round 3: Question 13 Full Responses

Competency 13				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Market Research	Investigate local commercial capabilities, advancements of applicable technologies and procedures, risks and opportunities, and incorporate these findings into engineer decision making processes and activities	Junior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Binary	"Add the Lt levels into this one"
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Accept	Binary	None
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Modify	Binary	"Could be 1Lt as well depending on jobs"
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 54, all experts accepted the competency verbiage as "Investigate local commercial capabilities, advancements of applicable technologies and procedures, risks and opportunities, and incorporate these findings into engineer decision making processes and activities." With 100% expert support on the proposed verbiage, Competency 13 will be included in the model with the current wording.

Also as shown in Table 54, 9 of 11 experts agreed with the development timeline showing competency attainment over years 4-7, as a Junior Captains. Experts 4 and 9 advocated for the inclusion of First lieutenant to this competency. With a majority of 81.8%, Junior Captain will be included in the model for the development timeline of Competency 13.

Further shown in Table 54, all experts agreed that this competency should be measured against a binary proficiency measure. That means that 100% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 13.

4.10.14 Question 14

The fourteenth component question involved the newly formed umbrella competency titled "CBRN Preparation and Response." Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round's fourteenth question can be seen in Table 55.

Table 55: Round 3: Question 14 Full Responses

Competency 14				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
CBRN Preparation and Response	Understand published Chemical, Biological, Radiological, and Nuclear (CBRN) response procedures, coordinate with installation personnel in preparation for operation and survival of these events, and validate and interpret CBRN modeling and mapping to senior leaders and decision makers.	Junior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Binary	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Modify	Binary	"1st Lts can do this --only if they have done rows 9, 10, and 15"
Expert 4	Modify	Modify	Binary	Add 1 Lt and Sr Capt level //
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Modify	Scaled	A 1st Lt should have some level of competency as a 1st Lt could potentially be the Flight Commander for this function in the CES.
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Reject	Accept	Binary	"Do we expect this of all of our officers…do we train them all to this level (or only those selected to fill RFO positions)…isn't this skillset similar to an EOD qualified officer."
Expert 10	Modify	Modify	Scaled	"This may only apply to officers who have attended the Readiness course and are Readiness/EM Flight Commanders. (EOD Officers may also attain this level due to their position and schooling.)"
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 55, 8 of 11 experts accepted the competency verbiage as "Understand published Chemical, Biological, Radiological, and Nuclear (CBRN) response procedures, coordinate with installation personnel in preparation for operation and survival of these events, and validate and interpret CBRN modeling and mapping to senior leaders and decision makers." Expert 4 requested verbiage modification but did not propose any specific changes. Expert 9 and 10 Rejected and Modified the competency, respectively, due to concerns that it does not apply to all officers. With 72.7% expert support on the proposed verbiage, Competency 14 will be included in the model with the current wording.

Also as shown in Table 55, 7 of 11 experts agreed with the development timeline showing competency attainment over years 4-7, as a Junior Captains. Expert 3 requested modification to First Lieutenant. Expert 4 requested change to First Lieutenant through Senior Captain. Expert 6 also requested modification to First Lieutenant. Expert 10 chose modify but did not provide any request. Due to a majority of 63.6%, Junior Captain will be included in the model for the development timeline of Competency 14.

Further shown in Table 55, 9 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 14.

4.10.15 Question 15

The fifteenth component question involved the newly formed umbrella competency titled "Engineering Designs". Twelve experts provided opinions on this

question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round's fifteenth question can be seen in Table 56.

Table 56: Round 3: Question 15 Full Responses

Competency 15				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Engineering Designs	Utilize standard designs to meet user requirements, site considerations, and governing design specifications/regulations. Employ references, professional consultation agencies, or other certified/trained personnel to perform design in areas beyond personal knowledge. Ensure design is in accordance with the comprehensive base master plan.	Junior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Modify	Binary	"I would start this with our 2Lts and extend out to Jr Capt"
Expert 2	Accept	Accept	Binary	None
Expert 3	Modify	Modify	Scaled	"This Attainment should change to 2lt. IF they don't learn as a 2Lt, they never will have the opportinutiy because they are too senior in the engineering flight. (ref my comments for row 11 above) This is why most engineers join CE. Let them be engineers. Otherwise they never have the chance. ":
Expert 4	Modify	Modify	Binary	"Add the Lt levels into this one"
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Modify	Binary	"Thia comptentcy should be pushed from Capt to 1st Lt especially wrt standard designs and use of the specified references."
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Modify	Binary	Could be 1Lt as well depending on jobs/experiences"
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 56, 9 of 11 experts accepted the competency verbiage as "Utilize standard designs to meet user requirements, site considerations, and governing design specifications/regulations. Employ references, professional consultation agencies, or other certified/trained personnel to perform design in areas beyond personal knowledge. Ensure design is in accordance with the comprehensive base master plan." Both Experts 3 and 4 requested verbiage modification but did not propose changes. With 81.8% expert support on the proposed verbiage, Competency 15 will be included in the model with the current wording.

Also as shown in Table 56, 6 of 11 experts agreed with the development timeline showing competency attainment over years 4-7, as a Junior Captains. Expert 1 requested modification to include scaling from Second Lieutenant to Junior Captain. Expert 3 requested a direct change to Second Lieutenant. Experts 4, 6, and 9 requested a push back to First Lieutenant. Due to a simple majority of 54.5%, Junior Captain will be included in the model for the development timeline of Competency 15.

Further shown in Table 56, 10 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 90.9% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 15.

4.10.16 Question 16

The sixteenth component question the newly formed umbrella competency titled "Planning and Prioritization." Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth

expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round's sixteenth question can be seen in Table 57.

Table 57: Round 3: Question 16 Full Responses

Competency 16				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Planning and Prioritization	Develop and manage existing civil engineer plans and programs to achieve mission requirements, integrate new and forecasted requirements into these portfolios, and propose prioritization of projects for execution. The recommended prioritization shall be based on information from the mission owners, base master plan, sustainment data, and funding strategies.	Junior Captain Senior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Scaled	"Knowledge should grow from 2 Lt to Sr Capt and increase over time"
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Accept	Binary	None
Expert 5	Accept	Accept	Scaled	"This development is continuous over a period of time"
Expert 6	Accept	Modify	Binary	"Attainment at Junior Capt and eliminate attainment at senior captain."
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Accept	Binary	None
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 57, all experts accepted the competency verbiage as “Develop and manage existing civil engineer plans and programs to achieve mission requirements, integrate new and forecasted requirements into these portfolios, and propose prioritization of projects for execution. The recommended prioritization shall be based on information from the mission owners, base master plan, sustainment data, and funding strategies.” With 100% expert support on the proposed verbiage, Competency 16 will be included in the model with the current wording.

Also as shown in Table 57, 10 of 11 experts agreed with the development timeline showing competency attainment over years 4-10, as a Junior and Senior Captain. Expert 6 requested the elimination of Senior Captain from this competency timeline. Additionally, Experts 1 and 5 listed “accept” for the timeline but provided comments which indicate a development timeline adjustment. Due to a majority of 72.7%, Junior and Senior Captain will be included in the model for the development timeline of Competency 16.

Further shown in Table 57, 9 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 16.

4.10.17 Question 17

The seventeenth component question involved the newly formed umbrella competency titled “Contingency Host Nation Relations.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion

questionnaire. The twelfth expert provided an email opinion on the overall round but did not provide opinions on any specific competency. The expert opinions on the third round's seventeenth question can be seen in Table 58.

Table 58: Round 3: Question 17 Full Responses

Competency 17				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Contingency Host Nation Relations	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability. Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.	Junior Captain Senior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Accept	Accept	Scaled	None
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Accept	Binary	None
Expert 5	Accept	Accept	Scaled	"This development is continuous over a period of time"
Expert 6	Accept	Modify	Binary	What is intended by "host nation stability"? Seems like too much of a strategic impact/expectation for a CE Captain. What does "maximize" installation readiness capabilities" mean? Is this competency in the context of mutual aid, P4, etc.? Secondly recommend binary attainment only at Junior Capt and eliminate Sr Capt so as not to have two gates for attainment."
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Modify	Binary	"This could/should be expected of a 1Lt if required by their job (1Lt OCONUS or deployed)"
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 58, all experts accepted the competency verbiage as “Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability. Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.” With 100% expert support on the proposed verbiage, Competency 17 will be included in the model with the current wording.

Also as shown in Table 58, 9 of 11 experts agreed with the development timeline showing competency attainment over years 4-10, as a Junior and Senior Captain. Expert 6 recommended the removal of Senior Captain and Expert 9 recommended moving it to First Lieutenant. Additionally, Expert 5 chose “accept” but commented that the development should occur over time. Due to a majority of 72.7%, Junior and Senior Captain will be included in the model for the development timeline of Competency 17.

Further shown in Table 58, 9 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary, it will be included in the model for Competency 17.

4.10.18 Question 18

The eighteenth component question involved the newly formed umbrella competency titled “Contingency Bed Down Operations.” Twelve experts provided opinions on this question, although only eleven directly completed the supplied opinion questionnaire. The twelfth expert provided an email opinion on the overall round but did

not provide opinions on any specific competency. The expert opinions on the third round's eighteenth question can be seen in Table 59.

Table 59: Round 3: Question 18 Full Responses

Competency 18				
Title	**Proposed Competency**	**Proposed Timeline for Development**		
Contingency Beddown Operations	Execute a bare base beddown through coordination of acquisition processes, logistic activities, and civil engineer resources in a contingency environment. Develop and continuously update continuity documentation to support rotational turnover. After beddown completion, facilitate the transition to operational contract support.	Junior Captain Senior Captain		
	Competency Verbiage	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	Modify	Accept	Scaled	The competency seems too broad as written…how will you know someone has attained this knowledge, especially if we never transition to a contract"
Expert 2	Accept	Accept	Binary	None
Expert 3	Accept	Accept	Binary	None
Expert 4	Accept	Modify	Binary	"Add Lt into this one. This may not be executed outside of an exercise environment, so providing a bigger development window is logical"
Expert 5	Accept	Accept	Binary	None
Expert 6	Accept	Modify	Binary	"Again, attainment should not be at both Jr Capt and Sr Capt, just specify one--Jr Capt."
Expert 7	Accept	Accept	Binary	None
Expert 8	Accept	Accept	Binary	None
Expert 9	Accept	Modify	Scaled	"Some basic competency is achieved coming out of 101 but a CE officer should strive to become more effective as expectations of their abilities in this area will certainly increase with more rank and experience"
Expert 10	Accept	Accept	Binary	None
Expert 11	Accept	Accept	Binary	None
Expert 12	N/A	N/A	N/A	N/A

As shown in Table 59, 10 of 11 experts accepted the competency verbiage as "Execute a bare base bed down through coordination of acquisition processes, logistical activities, and civil engineer resources in a contingency environment. Develop and continuously update continuity documentation to support rotational turnover. After bed down completion, facilitate the transition to operational contract support." The lone dissenting vote, Expert 1, believed the verbiage was vague and that contract support may not occur within their timeframe. With 90.9% expert support on the proposed verbiage, Competency 18 will be included in the model with the current wording.

Also as shown in Table 59, 8 of 11 experts agreed with the development timeline showing competency attainment over years 4-10, as a Junior and Senior Captain. Due to a majority of 72.7%, Junior and Senior Captain will be included in the model for the development timeline of Competency 18.

Further shown in Table 59, 9 of 11 experts agreed that this competency should be measured against a binary proficiency measure. That means that 81.8% of the panel experts believe the competency should be measured as pass/fail rather than on a scale of mastery from Novice through Master/Expert. With a majority supporting the binary option, it will be included in the model for Competency 18.

4.10.19 Additional Comments from Panel Members

During the Delphi Study's third round, three experts provided additional or supplementary comments providing proposals or discussing the overall model. Expert 12 provided an email in which he agreed that the model appears to be comprehensive and did provide feedback for changing competencies, timeline, or proficiency levels. The

expert did provide input on three topics of concern that they had with the use of the model as a component of the career field.

Expert 12's first concern related to the measurement of each competency by Civil Engineer Officers. They saw a concern with how the Officers would measure the competency level without providing the "same or similar" scenarios. This concern was partially addressed in a previous Round, in which the experts came to majority agreement that Base Civil Engineers should be allowed to make this decision for engineers under their charge.

Expert 12's second concern was about the applicability of the development timeline. The Expert discussed the range of experiences that Civil Engineer Company Grade Officers have and that some may not be able to develop their competencies with experience due to being stationed at different bases. These concerns can pose a legitimate concern; however, competence can be developed through education, training, and/or experience. This means that the officer will have to work with their commanders to mitigate their loss of experience with training or education.

Expert 12's final concern was regarding the tracking the competencies. This concern is outside the scope of the research and cannot be currently addressed during this thesis. The recommendation to pursue this concern in future research will be included in Chapter 5.

In addition to Expert 12's comments, both Expert 1 and Expert 4 of the third round requested additions to the competencies list. Their concerns were not substantiated by the other experts and were not included in the model but are shown in Table 60.

Table 60: Additional Competencies for Follow On.

	Expert Proposed Additional Competencies				
	Proposed Title	**Competency**	**Development Timeline**	**Proficiency Level**	**Comments**
Expert 1	N/A	N/A	N/A	N/A	"add an additional EOD competency (even basic knowledge/understanding similar to CBRN) or combine it with CBRN (CBRN and Explosive, or similar title)"
Expert 4	EOD Preparation and Response	Understand published Explosive Ordnance Disposal (CED) preparation and response procedures, coordinate with installation personnel in preparation for operation and survival of these events, and coordinate with other CE and Security Forces units during response activities from UCC and/or EOC	First Lieutenant Junior Captain	Binary	"As a EOD qualified CE Officer, I absolutely believe we MUST have a competency along the lines of what I drafted up so that our CE ofcrs have a working knowledge of what EOD does and how they integrate into operations"
Expert 4	Firefighting Preparation and Response	Understand published Fire and Emergency Services (CEF) preparation and response procedures, coordinate with installation personnel in preparation for operation and survival of these events, and coordinate with other CE and Security Forces units during response activities from UCC and/or EOC. Additionally, understand and coordinate on fire technical services as it pertains to facility and infrastrucutre planning, programming, design and construction activities.	First Lieutenant Junior Captain	Binary	"If we are going to include CBRN as a competency, then we MUST have Firefighting competency for our CE CGOs. There are a ton of touchpoints where CEF is engaged in not only contingency/ermergency ops but also in real property activities and construction"

V. Conclusions and Recommendations

Chapter 5 concludes this research endeavor by summarizing the study, discussing the research findings through providing solutions to the research questions, detailing the final Civil Engineer Company Grade Officer Competency-Based Education Model, reiterating the study limitations, discussing recommendations for future investigations, and providing the overall conclusion.

5.1 Study Summary

Four research methodologies were used in this investigation, with the final model creation occurring after the Delphi Study. Research started with the 2018 Education Working Group, which acted as a Pilot Study for the other research methods. Working Group participants convened at Wright-Patterson Air Force Base for a one-week open discussion regarding Civil Engineer Company Grade Officer performance requirements. The Working Group results were analyzed and consolidated into a more concise competency list which was validated through the career field survey. The second research methodology was the Air Force Personnel Center data and Air Force publication position analysis. The third research method was a stakeholder analysis conducted through a career field survey. This survey requested that selected participants prioritize competencies by importance and establish a development timeline. The fourth and final research method were Subject Matter Expert interviews in the form of a Delphi Study. This Delphi Study was conducted with open-ended questions in which the participants were allowed to answer questions and validate results from previous steps of the research.

At no point were the experts alerted of the other panel members, such that anonymity was maintained.

5.2 Resolution of Research Questions

5.2.1 What are the required capabilities/competencies for Civil Engineer Company Grade Officers?

Five Delphi Study questions were aimed at resolving this research question. The first round's third question asked experts if the Air Force Literature advertised capabilities accurately portrayed Civil Engineer Company Grade Officer positions requirements and capabilities. Most experts believed that the listed publications were outdated and inaccurate for the current situation. This means that Civil Engineer career field members may not be able to rely upon a literature review to determine the requirements of their position nor the expected performance in discharging their duties. This further strengthens the research purpose, which seeks to identify which competencies these military officers should have.

The first round's fifth question asked experts if Civil Engineer Company Grade Officers are expected to perform combat engineering, if the Air Force definition is different than that of the other services, and if the current education model adequately prepared individuals to perform these roles. Most experts agreed that Civil Engineers perform combat engineering, that the Air Force's definition is not the same as the other branches, and that current training methods are adequate to meet the demand. This means that the Air Force should provide clarification on this specific capability within all published literature to mitigate further confusion on this capability. The use of the phrase

“combat engineering” was intentionally not used in the final model to prevent further confusion; however, it should be added upon Air Force formally publishing a definition.

The second round’s second question had multiple components which asked experts if any Civil Engineer Company Grade Officer requirements may have been overlooked because certain position assignments are rare. These positions included those found outside Civil Engineer Squadrons, within RED HORSE Squadrons, and those found within Staff Directorates. Although most experts championed the skill development found at the base level, a few additional skills had been identified for inclusion. These capabilities included being able to understand how Civil Engineer units support the mission of base organizations, how Civil Engineer units interact with Staff Directorates, how Staff organizations interact with each other, and being able to lead a small Civil Engineer team on cradle to grave projects.

The second round’s fourth question sought expert opinion on the Civil Engineer career field survey results. The survey outcomes provided a stratified list of competencies by importance, and this question asked expert validation of the results. In the response, the experts provided insight toward removing preliminary competencies that were too specific to a position, that were general enough to institutional competencies, and those which were not appropriate for a Lieutenant or Captain. Furthermore, the experts also identified gaps in the enumerated list by identifying EOD, Fire, and Emergency Management as being underrepresented. This shows that the competencies should be general enough to encompass all Civil Engineer Company Grade Officers, but not so general that they would extend beyond the career field. Furthermore, the competencies

should not indicate a higher level of performance than would be expected of a junior officer.

The third rounds questions provided experts with an opportunity to approve, modify, or reject competencies with given titles. The titles were created to advertise the overall concept of the competency. Overall, the following eighteen items have been identified as the required capabilities/competencies for Civil Engineer Company Grade Officers and can be seen in Table 61.

Table 61: Civil Engineer Company Grade Officer Required Capabilities/Competencies

Civil Engineer Company Grade Officer Capabilities/Competencies	
Title	**Competency**
Engineering Judgement and Critical Thinking	Anticipate and adapt engineering approaches in a dynamic operating environment by employing engineering judgement and critical-thinking
Engineer Operations Safety and Real Property Vulnerabilites	Identify safety hazards during Civil Engineer operations/activities and vulnerabilities to base infrastructure and real property assets. Analyze these concerns and provide recommendations to appropriate decision-makers to organize response options
Civil Engineer Support Provision and Staff Interactions	Understand and communicate Civil Engineer Enterprise organic resources and capabilities with other United States Air Force units, such as Wing Staffs, Operations Groups, Maintenance Groups, Medical Groups, other Mission Support Squadrons, or sister services. This enterprise wide understanding includes the interaction between AFCEC, AFIMSC, MAJCOMs, and HAF staffs, as well as between the staffs and bases. The communication abilities should include joint collaboration, status of resources and expected real property risks of actions, and how CE can support various missions.
Civil Engineer Personnel Development and Training	Understand Civil Engineer Officer and Enlisted force development requirements, guidelines, and recommendations to assist in personal, peer, and subordinate proficiency attainment. Additionally, develop and assist others in developing personal and professional goals to assure career-long development. Finally, aid the development of contingency and deployment-related skills through leading or participating in home station training
Stakeholder Engagement	Coordinate with stakeholders to identify and define civil engineer requirements, determine scopes of work, establish approximate cost and schedule, and recommend method of execution. This communication should occur during both the planning and execution of work, and should continue with after-action discussions upon work completion
Contract Management and Support	Develop the specifications/technical work requirements and solicitation package for contracted support of design, construction, and service contracts. Evaluate submittals, proposed drawings, and provided specifications for code, rule, and regulation, and design requirements. During contract execution, assess, monitor, and document contractor performance for contract compliance and recommend actions to contracting officer.
Programming and Program Support	Develop a comprehensive project programming package to request appropriate resources and authorization at both permanent and/or contingency locations.
Organic Civil Engineer Emergency Capabilites	Understand the local organic capabilities Civil Engineers provide during emergency situations and lead Civil Engineer Unit Control Center (UCC) operations or serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).
Preparation and Recovery After Attack	Aid in identifying and executing plans to mitigate mission impact during unplanned disruptive events. In the occurrence of a disruptive event, organize and direct airfield recovery efforts, including validating and communicating minimum operating strips to senior leaders for approval. Ensure the development and maintenance of engineer portion of installation contingency plans.

Table 61: Civil Engineer Company Grade Officer Required Capabilities/Competencies

Civil Engineer Company Grade Officer Capabilities/Competencies	
Title	**Competency**
Troop Leading Procedures	Lead small multi-disciplinary civil engineer units under mission command orders in contingency environments, to include executing cradle to grave endeavors, utilizing troop labor execution methods.
Contingency Design	Design an airfield and bed down for expeditionary/contingency construction and repair. Included in this bed down is simplified facility design, support utility design, and base bed down layout. Prior to design, lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.
Asset Management of Real Property Assets	Implement asset management principles to maintain, repair, sustain, and modernize AF real property infrastructure assets to optimize investments at the lowest possible life-cycle costs. These principles include maintaining asset visibility, understanding asset's impact and risk to mission, asset condition and resilience, and asset vulnerabilities. Communicate this information to decision makers and mission owners to ensure the mitigation of unacceptable risk and advocate for courses of action.
Market Research	Investigate local commercial capabilities, advancements of applicable technologies and procedures, risks and opportunities, and incorporate these findings into engineer decision making processes and activities
CBRN Preparation and Response	Understand published Chemical, Biological, Radiological, and Nuclear (CBRN) response procedures, coordinate with installation personnel in preparation for operation and survival of these events, and validate and interpret CBRN modeling and mapping to senior leaders and decision makers.
Engineering Designs	Utilize standard designs to meet user requirements, site considerations, and governing design specifications/regulations. Employ references, professional consultation agencies, or other certified/trained personnel to perform design in areas beyond personal knowledge. Ensure design is in accordance with the comprehensive base master plan.
Planning and Prioritization	Develop and manage existing civil engineer plans and programs to achieve mission requirements, integrate new and forecasted requirements into these portfolios, and propose prioritization of projects for execution. The recommended prioritization shall be based on information from the mission owners, base master plan, sustainment data, and funding strategies
Contingency Host Nation Relations	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability. Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.
Contingency Bed Down Operations	Execute a bare base bed down through coordination of acquisition processes, logistical activities, and civil engineer resources in a contingency environment. Develop and continuously update continuity documentation to support rotational turnover. After bed down completion, facilitate the transition to operational contract support.

5.2.2 When should Civil Engineer Company Grade Officers achieve competence in the identified areas?

Three Delphi Study questions sought resolution of this research question. The first round's seventh question asked experts if establishing a standardized education timeline for Civil Engineer Company Grade Officer development would be beneficial. This question had universal support from the experts; however, half of those in support only did so under certain conditions. Overall, a development timeline was concluded to provide a benefit to the career field and to this educational model.

The second round's fifth question provided experts with the survey results regarding the educational timeline for the preliminary competency list. The experts were asked to provide their input on the results and if any adjustments needed to be made. In some cases, the experts were asked to provide a rank for when this should be developed without survey results, as none were provided.

The third round's first through eighteenth questions had experts either accept, modify, or reject a competency development timeline for the eighteen approved competencies. Overall, Table 62 shows the eighteen development timelines which have been identified as when Civil Engineer Company Grade Officers should achieve competence in the identified areas.

Table 62: Civil Engineer Company Grade Officer Competency Development Timelines

Civil Engineer Company Grade Officer Development Timelines		
Title	**Development Timeline/Rank**	
Engineering Judgement and Critical Thinking	Second Lieutenant	
Engineer Operations Safety and Real Property Vulnerabilites	Second Lieutenant First Lieutenant	
Civil Engineer Support Provision and Staff Interactions	Second Lieutenant First Lieutenant (Wing Level and Below)	Junior Captain Senior Captain (Full Competency)
Civil Engineer Personnel Development and Training	First Lieutenant Junior Captain Senior Captain	
Stakeholder Engagement	First Lieutenant	
Contract Management and Support	First Lieutenant	
Programming and Program Support	First Lieutenant	
Organic Civil Engineer Emergency Capabilites	First Lieutenant Junior Captain	
Preparation and Recovery After Attack	First Lieutenant Junior Captain	
Troop Leading Procedures	First Lieutenant Junior Captain	
Contingency Design	First Lieutenant Junior Captain	
Asset Management of Real Property Assets	Junior Captain	
Market Research	Junior Captain	
CBRN Preparation and Response	Junior Captain	
Engineering Designs	Junior Captain	
Planning and Prioritization	Junior Captain	
Contingency Host Nation Relations	Junior Captain Senior Captain	
Contingency Bed Down Operations	Junior Captain Senior Captain	

5.2.3 What are the temporal influences on the Civil Engineer Company Grade Officer's Career?

Three Delphi Study questions sought resolution to this research question. The first round's first question indirectly touched upon the temporal influences on the Civil Engineer Company Grade Officer's career. The aspect of time being dedicated to education and education planning means that said time cannot be already allocated to other tasks. This question asked the experts if Company Grade Officers are meeting with their supervisors to develop educational plans, are being allowed to attend training, and if the current model is adequate to meet the Air Force's and career field's needs. The experts agreed that not enough time is being given toward educational development but that this may not be due to command climate. Experts were divided on the usefulness of the current model but agreed that the career field values education. This concludes that there are temporal demands placed upon Civil Engineers which currently may restrict development.

The second round's first question was aimed to identify if the current list of competencies would provide a negative temporal influence on the Company Grade Officer. Experts were asked if the number of competencies from the survey, 73, was too cumbersome for development. The experts nearly universally agreed that the number was to high and needed to be reduced to avoid it being to time intensive to be useful for the career field.

The second round's second question aimed to identify the temporal effects on development that position misalignment would have, if it would continue, and if it should affect the model. The experts agreed that the misalignments would have some impact,

that it would likely continue to occur, but that it was not concerning and that it should not affect the model. This means that the temporal impacts of performing in positions which are outside the normal progression path, while taking time away from experience in certain areas, is not influential.

5.2.4 How would a Civil Engineer Company Grade Officer educational model incorporate Civil Engineer competencies?

There were 5 Delphi Study questions aimed at resolving this research question. The first round's second question asked experts if they felt that competencies could be tracked by the career field and if that could be used to impact effectiveness. The majority of experts agreed that it would improve effectiveness, with some experts voicing that the competencies should match professional standards. This means that the career field could use the competencies to adjust training and standardize the development to increase effectiveness.

The first round's fourth question asked the experts if the local units would be capable of assessing the competence and proficiency level of Company Grade Officers. The majority of experts agreed that Squadron Commanders should be the ultimate assessor for their units, that these commanders should receive some formal training, and that there will likely still be deviations between units.

The first round's sixth question asked experts if the career field should tie the progression of badge upgrades to levels of competence. Most experts agreed that linking the badge to competencies may be a good idea, but only a simple majority believed it was a good idea without condition. In conclusion, this area should be investigated further to determine if it is feasible.

The second round's third question asked the experts if they believed that competencies could be used to enforce the rotation of officers to gain experience in each CES flight. Most believed that this was a problem but that it should not be mandatory to make moves; however, a guide may be useful.

The third round's questions asked the experts if the competencies can be incorporated into the model based on either binary or scaled proficiency levels. Each competency had the experts choose a value, which is shown in Table 63.

Table 63: Civil Engineer Company Grade Officer Competency Proficiency Types

Civil Engineer Company Grade Officer Competency Proficiency Types	
Title	**Proficiency Types**
Engineering Judgement and Critical Thinking	Binary
Engineer Operations Safety and Real Property Vulnerabilites	Binary
Civil Engineer Support Provision and Staff Interactions	Scaled
Civil Engineer Personnel Development and Training	Scaled
Stakeholder Engagement	Binary
Contract Management and Support	Binary
Programming and Program Support	Binary
Organic Civil Engineer Emergency Capabilites	Binary
Preparation and Recovery After Attack	Binary
Troop Leading Procedures	Binary
Contingency Design	Binary
Asset Management of Real Property Assets	Binary
Market Research	Binary
CBRN Preparation and Response	Binary
Engineering Designs	Binary
Planning and Prioritization	Binary
Contingency Host Nation Relations	Binary
Contingency Bed Down Operations	Binary

5.3 Proposed Competency-Based Education Model

There final Civil Engineer Company Grade Officer Competency Based Education Model can be seen in Appendix 49**.** The final model consists of 18 enumerated competencies of equal importance and prioritization. Each competency is provided with an approved title, description, proficiency type, and the rank at which it should be attained/achieved.

Within this model there are terms which must be defined through establishing a common lexicon to accompany the educational plan. For the purpose of this research, the following definition are to accompany the final model:

Civil Engineer Emergency Services: The Civil Engineer Organic capabilities to respond to emergency situations. These capabilities are primarily found within the Fire Emergency Services (CEF) Flight, Readiness and Emergency Management Flight (CEX), and Explosive Ordinance Disposal Flights. Additional capabilities within this competency are included as components of other flights, the main duties of which are not for emergency response, which includes: Damage Assessment, Unit Control Center response, and Emergency Operations Center response.

5.4 Study Limitations

There were three research limitation areas encountered in this study endeavor. These limitations include Scope Limitations, Data Limitations, and Analysis Limitations, and are detailed as follows:

5.4.1 Scope Limitations

The research scope was limited to Air Force Civil Engineer Company Grade Officers competencies and development timelines. Investigation into educational

requirements for any other military-branch engineer career fields, other public organizations, any private organizations, Air Force Civil Engineer Field Grade Officers, or Air Force Civil Engineer Enlisted were not included. The Company Grade Officer ranks included Second Lieutenants (O-1), First Lieutenants (O-2), and Captains (O-3). Additionally, this study did not address how the resulting model will be used by either the Civil Engineer School, the Air Force Civil Engineer career field, or any other organization. Finally, this study did not include the creation of, or applicability to, a centralized or decentralized competency tracking system

5.4.2 Data Limitations

The 2018 Education Working Group panel members were not previously designated as experts of the Civil Engineer career field. Although they meet the peer-nomination/superior-nomination requirement for expert designation, many did not possess the recommended 10 years of experience. This results in the data obtained from this initial investigation as being potentially inaccurate, which may have influenced the 2019 career field survey. Additionally, the 2018 Education Working Group panel members were not experts in competency writing, which may have hindered their abilities to convey their opinions on Civil Engineer Company Grade Officer requirements. Furthermore, the Air Force Personnel Center (AFPC) does not maintain historical position data beyond a single year. The position-data received from AFPC, therefore, cannot be used to address position change trends to aid in forecasting future competency requirements. Finally, the Air Force Published Literature, as it pertains to the Civil Engineer (Civil Engineer) career field position requirements, is rarely updated and

the Delphi Study panel members asserted that the provided information does not reflect accurate conditions.

5.4.3 Analysis Limitations

Complete consensus of the Delphi Study Panel members could not be achieved in the three study rounds. This resulted in the final model not completely meeting the Delphi Study objective. Additionally, the first and second Delphi Study rounds only received 8 expert responses for each, which may have influenced the final model proposition of the third round.

5.5 Recommendations for Future Investigation

Competency-Based Education application within the United States Air Force's Civil Engineer Career Field may be limited to Company Grade Officers and lower peer groups. This recommendation, to not develop a Competency Model for Field Grade Officers and higher peer groups, comes from the identified failure of these models in executive development. According to research undertaken over the last decade, executive competencies have failed to become "lingua franca" for executive development due to experience driving greater leadership development than educational modeling (Hollenbeck and McCall 2003). Further validation of this recommendation is needed through additional future research. An additional future investigation area is assessment and tracking of Company Grade Officers over time. The provided information from the Air Education and Training Command indicated the creation of the Airman's Learning Record but did not discuss how or when that would occur. If the model comes into fruition before the creation of the centralized tracking tool, there should be some way of

validating achieved competence. Further research areas could also include a competency-based education model for Space Force Civil Engineers. Finally, further research could be to analyze and synthesize these thesis results with those found by the Civil Engineer School. Both research endeavors were independent and parallel in establishing competency-based education models for Civil Engineer Company Grade Officers, but the results may deviate due to specifics within the research methods.

5.6 Conclusion

The United States Air Force operates in a dynamic environment which sees constant shifting due to the emergence or removal of threats. The Air Force Civil Engineer career field has a unique set of requirements placed upon them to combat these threats and ensure the wellbeing of the United States of America. This study has investigated the requirements placed upon Civil Engineer Company Grade Officers and enumerated a list of 18 competencies and an associated development timeline, to ensure that the Air Force's mission can continue to be accomplished. Although the development of this model can provide numerous benefits to the Civil Engineer career field, it is not an enduring list and must evolve as the Civil Engineer Company Grade Officer career field evolves.

Appendix 1: Education Working Group Topic Schedule

32E Occupational Competency Workshop				
Time (EST)	**Day 1**	**Day 2**	**Day 3**	**Time (EST)**
0800-0830	Kickoff and Motivation	Speed Round: Occupational Capabilities	Refine: Occupational Competencies	0800-0830
0830-0900	Participant Introductions	Baseline: Doctrine and Force Presentation		0830-0900
0900-0930	Speed Round: What Would You Say You Do?			0900-0930
0930-1000	Brainstorm: Workforce Categories		Gap Analysis: Learning Objectives	0930-1000
1000-1030				1000-1030
1030-1100	Brainstorm: Occupational Competencies	Revise: Occupational Competencies	Comprehensive WC/OC Relevance and Bundling	1030-1100
1100-1130				1100-1130
1130-1200	Lunch	Lunch	Lunch	1130-1200
1200-1230				1200-1230
1230-1300				1230-1300
1300-1330	Brainstorm: Occupational Competencies	Revise: Occupational Competencies	Refine: Prioritization	1300-1330
1330-1400				1330-1400
1400-1430	Speed Round: Knowledge and Skills	Revise: Learning Objectives		1400-1430
1430-1500	Brainstorm: Learning Objectives		Discussion: Next Steps and Force Development	1430-1500
1500-1530				1500-1530
1530-1600				1530-1600
1600-1630	Brainstrom: Occupational Competencies	Workforce Category Timing	Outbrief	1600-1630
1630-1700				1630-1700

Appendix 2: Civil Engineer Occupational Competency (OC) Workshop Terminology

32E Occupational Competency (OC) Workshop – Terminology

Occupational Competency (OC)
- A set of competencies required of all Airmen within a specific workforce category; they describe technical/functional skills, knowledge, abilities, behaviors, and other characteristics needed to perform that function's mission successfully [AFPD36-26]
- Each OC should be specific, definite, and outcome-based; mastery must be measurable during Force Development education, training, and/or experience
  - Good OC example: "Design a facility electrical plan for a contingency troop construction"
  - Poor OC example: "Analyze and design electrical systems"
- All Force Development opportunities and curriculum should be deliberately focused on mastering an OC

Workforce Category (WC)
- A group of functions requiring similar work [AFPD36-26]
- May be defined by rank, experience, position, location, or specific duties
- An individual belongs to multiple WCs at any given time (e.g. 32E Captain as the OIC, Portfolio Optimization at Kunsan AB with an additional duty as OIC, Airfield Damage Repair)

Relevance
- A measure of the importance of a specific Occupational Competency to a specific Workforce Category
- Used to determine the appropriate timing, focus, and audiences for Force Development opportunities

> ***Required***
> - Mastering this OC is a prerequisite for the member's duties
> - Time and resources should be deliberately set aside to ensure the member masters this OC
> - For Force Development opportunities, WC is primary audience (mandatory)
>
> ***Expected***
> - Mastering this OC will directly improve the member's performance in their current duties
> - Time and resources should be prioritized to ensure the member masters this OC
> - For Force Development opportunities, WC is primary audience
>
> ***Encouraged***
> - Mastering this OC will indirectly improve the member's performance in their current duties or will prepare the member for expected future duties
> - Time and resources should be considered to ensure the member masters this OC
> - For Force Development opportunities, WC is secondary audience
>
> ***Optional***
> - Mastering this OC will not directly or indirectly improve the member's performance in their current duties nor will it prepare the member for expected future duties
> - Limited time and resources should be expended to ensure the member masters this OC
> - For Force Development opportunities, WC is secondary audience (unfunded)

Learning Objective (LO)
- The knowledge, skills, and abilities needed to achieve an OC
- To achieve mastery of an OC, LOs provide the milestones along the "knowledge pathway"
- LOs are smaller in scope than OCs (e.g. "Translate between bank and loose fill quantities")
- A specific LO may support multiple OCs for multiple WCs; Force Development opportunities and curriculum should be packaged to make efficient use of student and instructor time

Appendix 3: Civil Engineer Occupational Competency (OC) Workshop Documentation Matrix

32E Occupational Competency (OC) Workshop – Documentation Matrix

Notes: Example OCs have not been adjudicated and are provided only to illustrate the relationships between OCs, Workforce Categories (WC) defined by rank, and relevance of the OC for each WC; workshop results will include many more OCs

	2d Lieutenant (0-2 years)	**1st Lieutenant (2-4 years)**	**Captain (4-7 years)**	**Captain (7-10 years)**
Required	OC1: Translate between general facility design considerations, construction drawings, and physical facility components	OC1: Translate between general facility design considerations, construction drawings, and physical facility components	OC1: Translate between general facility design considerations, construction drawings, and physical facility components OC4: Advise mission owners on the impact of airfield pavement condition on operational capability	OC1: Translate between general facility design considerations, construction drawings, and physical facility components OC4: Advise mission owners on the impact of airfield pavement condition on operational capability
Expected	OC2: Evaluate the impact of airfield pavement condition on operational capability	OC2: Evaluate the impact of airfield pavement condition on operational capability OC3: Develop a level 5 cost estimate for a multidisciplinary facility renovation	OC2: Evaluate the impact of airfield pavement condition on operational capability OC3: Develop a level 5 cost estimate for a multidisciplinary facility renovation	OC2: Evaluate the impact of airfield pavement condition on operational capability
Encouraged	OC3: Develop a level 5 cost estimate for a multidisciplinary facility renovation OC4: Advise mission owners on the impact of airfield pavement condition on operational capability	OC4: Advise mission owners on the impact of airfield pavement condition on operational capability		OC3: Develop a level 5 cost estimate for a multidisciplinary facility renovation
Optional	*Occupational Competencies for related Workforce Categories are always Optional; refer to comprehensive WC-OC documentation* *When assigned to a specific position (e.g. Project Programmer or OIC, Operations Support) the member also belongs to that Workforce Category; additional Occupational Competencies will apply and the relevance of specific 32E Occupational Competencies may increase*			

Observations:

OC1: *Required* for all 32Es; this OC is a critical competency across many specific positions; may be ideal for Initial Skills Training

OC2: *Expected* for all 32Es regardless of position; this OC is *Required* when an individual is assigned to specific positions (e.g. APE Team)

OC3: *Expected* for 32Es in many positions between 2-7 years and *Encouraged* at 0-2 years to prepare for those roles; not necessary in the positions typically occupied by 32Es after 7 years; may not be appropriate to include in education for FGO cross-trainees

OC4: *Required* for all 32E Captains; only *Encouraged* for Lieutenants due to expected working relationships with more senior 32Es; although related to OC2, the specificity of each OC and their relevance allows for deliberate, focused Force Development; may be ideal for a 32E Captain course

Appendix 4: Civil Engineer Occupational Competency (OC) Workshop Final Competency and Timeline Fill-Out Sheet

Occupational Competency	2d Lieutenant	1st Lieutenant	Captain (4-7 yrs)	Captain (7-10 yrs)	RIORITY CLASSIFICATION
1. Professional Capabilities and Communication					
1.1. Identify the Occupational Competencies relevant for a specific job, position, or duty upon assignment and pursue appropriate Force Development opportunities					
1.2. Employ references and consultation agencies to determine engineering limitations and opportunities for topics beyond prior personal knowledge					
1.3. Translate between general facility and infrastructure design considerations, construction drawings, and physical facility components					
1.4. Provide force development for junior Civil Engineer Officers to meet their Occupational Competency needs					
1.5. Establish personal and professional goals to ensure career-long development of engineering depth and breadth					
1.6. Anticipate and adapt engineering approaches in a dynamic operating environment with sound engineering judgement					
1.7. Establish and cultivate community relationships					
1.8. Communicate infrastructure requirements, status of Civil Engineer resources, and expected risk to mission owners					
1.9. Communicate the organic resources and capabilities available within a Civil Engineer Squadron					
1.10. Communicate civil engineer enterprise business rules to stakeholders					
1.11. Explain the role of Civil Engineer personnel and resources in supporting applicable O-Plans to Airmen within the unit					
2. Scoping, Planning, and Programming					

Appendix 4: Civil Engineer Occupational Competency (OC) Workshop Final Competency and Timeline Fill-Out Sheet (Cont.)

2.1. Organize comprehensive base master planning					
2.2. Develop prioritized project lists for coordination that incorporate funding strategies, sustainment data, base master planning, and mission requirements					
2.3. Validate a work order request and translate subsequent customer input to determine an appropriate project scope and cost					
2.4. Interpret trends in the construction industry that may impact scope, cost, and capability of contracted construction or material					
2.5. Develop and implement utility development plans to transition an installation from contingency to enduring status					
2.6. Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities					
2.7. Incorporate the impact of host nation culture and customs on the ability to support contracted construction and material					
2.8. Identify trends in technology and commercial products that provide opportunities and threats to infrastructure					
2.9. Evaluate existing utility infrastructure to identify and mitigate vulnerabilities and single points of failure					
3. Design and Troop Construction					
3.1. Adapt standard designs for infrastructure to meet user requirements and site considerations					
3.2. Incorporate hardening and Anti-Terrorism and Force Protection principles into facility and site requirements					
3.3. Lead a multi-disciplinary team executing a troop construction project					
3.4. Design a simplified facility for construction with troop labor					
3.5. Design utility infrastructure systems for an expeditionary location for construction with troop labor					
4. Project Management and Construction Management					
4.1. Coordinate stakeholders during the planning and execution stages of a project					
4.2. Evaluate contractor submittals for technical acceptability, execution feasibility, and completeness					

Appendix 4: Civil Engineer Occupational Competency (OC) Workshop Final Competency and Timeline Fill-Out Sheet (Cont.)

4.3. Assess and monitor contractor construction progress and performance					
4.4. Develop a project package contract solicitation					
4.5. Coordinate project closeout					
4.6. Perform construction site inspections to monitor progress and identify contractor deficiencies					
4.7. Develop a comprehensive project management plan					
4.8. Coordinate design and submittal reviews with relevant project stakeholders					
4.9. Interpret a construction schedule to assess project progress					
4.10. Provide a technical evaluations of contractor bids to the contracting source selection team					
4.11. Identify safety violations during contracted or troop labor construction project execution					
4.12. Assess a project's position in the programming or execution process to validate previous milestone were met and to determine the next required milestone					
4.13. Manage project modification process					
5. Operations					
5.1. Prioritize projects based on installation mission requirements and infrastructure sustainment					
5.2. Lead and coordinate facility condition assessments					
5.3. Serve as Contracting Officer Representative for service contracts					
5.4. Develop and execute plans for mission assurance during utility service interruptions					
5.5. Perform data analysis to identify requirements for facility condition assessments					
5.6. provide a qualitative and quantitative risk assessment on infrastructure					
6. Readiness and Emergency Management					
6.1. Manage a unit's deployment readiness programs					
6.2. Develop and execute a Prime BEEF Home Station Training program					
6.3. Coordinate installation preparations that enable personnel to survive and operate in a CBRN environment					
6.4. Interpret a TPFDD to coordinate squadron support and implementation					
6.5. Generate accurate and timely unit readiness reports for commander review					
6.6. Develop plans for Camouflage, Concealment, and Deception					
6.7. Develop dispersal plans for critical assets					
6.8. Develop and maintain installation emergency and readiness support plans					
6.9. Lead Civil Engineer UCC operations					

Appendix 4: Civil Engineer Occupational Competency (OC) Workshop Final Competency and Timeline Fill-Out Sheet (Cont.)

6.10. Direct Civil Engineer base recovery operations					
6.11. Serve as an ESF Representative in the EOC					
6.12. Facilitate Incident Command and Control training for installation EOC and CAT personnel					
6.13. Organize and employ Civil Engineer resources for base denial					
6.14. Communicate CBRN modeling and mapping for senior leader coordination					
6.15. Direct base sustainment and recovery actions in a communication denied environment					
6.16. Incorporate future threats and new Civil Engineer operational concepts into unit training programs					
6.17. Analyze an existing installation's infrastructure risk when provided with a new, unexpected threat					
6.18. Implement revised Civil Engineer sustainment and recovery operations when provided with a new, unexpected threat					
7. Beddown and Contingency Operations					
7.1. Develop an expeditionary bare base design that meets mission requirements					
7.2. Lead on-site execution of Civil Engineer activities in a bare base beddown					
7.3. Establish Civil Engineer sustainment functions in an bare base environment					
7.4. Coordinate acquisitions and logistics to implement a bare base beddown					
7.5. Provide reach back support for Civil Engineers executing a bare base beddown					
7.6. Adapt US facility and utility infrastructure design principles to incorporate foreign standards, local material availability, and contracted construction capability					
7.7. Lead a pre-deployment site survey to determine limitations and capabilities of existing infrastructure, the natural environment, and local contract support					
7.8. Serve as the lead site Civil Engineer at small installation					
7.9. Implement expedient solutions to infrastructure challenges using organic, locally available, or quickly acquired resources					
7.10. Develop continuity documentation to support Civil Engineer operations across rotational turnover					
7.11. Facilitate transition to operational contract support at a contingency location					
7.12. Analyze and compare potential operating locations to determine suitability based on mission requirements, existing infrastructure, and local resources					

Appendix 4: Civil Engineer Occupational Competency (OC) Workshop Final Competency and Timeline Fill-Out Sheet (Cont.)

7.13. Develop a design for an expeditionary airfield for construction with troop labor					
8. Airfields					
8.1. Develop a complete airfield waiver package and route to the appropriate level for approval					
8.2. Validate and communicate Minimum Operation Strip proposals for coordination and approval					
8.3. Conduct a visual surface inspection of airfield pavement					
8.4. Develop a comprehensive airfield plan that incorporates expected condition, mission requirements, and phased improvements					
8.5. Organize and direct the installation's airfield damage repair activities					
8.6. Advise mission owners on the impact of airfield pavement condition on operational capability					
8.7. Validate existing contingency airfield pavement evaluations for relevance, completeness, and accuracy					
8.8. Complete contingency airfield pavement evaluation					
8.9. Evaluate the capability of existing airfield infrastructure to support mission requirements					
8.10. Develop and manage an airfield maintenance plan					
9. Joint and International					
9.1. Coordinate with host nation representatives regarding roles and responsibilities for infrastructure					
9.2. Organize Civil Engineer efforts when divesting infrastructure to the host nation					
9.3. Collaborate with international partners on how to achieve engineer effects					
9.4. Articulate Air Force Civil Engineer resources and capabilities to the joint community					
9.5. Navigate/integrate staff relationships to acquire resources and authority for Civil Engineer requirements in a joint or coalition organization					
9.6. Generate orders to prepare and deploy engineer forces or support to engineer forces in a joint or coalition organization					
9.7. Assess joint engineer resources and capabilities to complete an engineering task					
9.8. Translate joint terminology and processes for activities supported by Air Force Civil Engineer					
9.9. Generate and evaluate Requests for Support (RFS) for engineer capabilities in a joint environment					
9.10. Lead small unit tactics in a contested environment to enable engineer activities					
9.11. Translate an OPORD into actionable engineering tasks					

Appendix 5: Email to AFCEC Reachback Center

Guerin, Scott R Capt USAF AETC AFIT/ENV

Tue 3/19, 9:33 AM

AFCEC Reachback Center <AFCEC.RBC@us.af.mil>

Good Morning AFCEC Reachback Center,

I hope all is well with whomever reads this email. I am doing research for my AFIT Thesis and had a quick question that I hope you may be able to help with. Are there actual position descriptions for the various CE CGO positions within CESs or Staffs? I have a copy of the PAD P-Plans which goes over the element requirements but doesn't detail each position. Are there more detailed position descriptions out there or is the PAD P-Plans the best published information?

Very Respectfully,

SCOTT R. GUERIN, Capt, USAF

Student, AFIT GEM

Appendix 6: Email from AFCEC Reachback Center

AFCEC Reachback Center <AFCEC.RBC@us.af.mil>

Tue 3/19, 12:10 PM

Guerin, Scott R Capt USAF AETC AFIT/ENV

You forwarded this message on 3/21/2019 12:31 PM

Capt. Guerin,

That's a question best fielded by the 32E FDM, Col. Michael Zuhlsdorf.

michael.zuhlsdorf@us.af.mil

V/r,
Jason
AFCEC Reachback Center (RBC)
Comm: (850) 283-6995
DSN: 523-6995
Toll-Free: (888) 232-3721
Email: afcec.rbc@us.af.mil

Appendix 7: Email to Civil Engineer Career Field Manager

Guerin, Scott R Capt USAF AETC AFIT/ENV

Thu 3/21, 12:31 PM

Zuhlsdorf, Michael J Col USAF AF-A4 (USA) <michael.j.zuhlsdorf.mil@mail.mil>

Sir,

I hope all is well! I sent a question to the AFCEC Reachback center and they gave me your name as a contact that may be able to answer my question. I am an AFIT GEM student who is researching Comptency Based Learning to help establish a CE CGO CBL Model to be used by the CE School and one area of information we are looking into is AF publisized CE CGO position requirements. The question that we have is: are there Air Force Publications which detail the requirements for various CE Officer positions other than the element details within the 12-03 PAD P-Plans? I appreciate your assistance in this matter Sir.

Very Respectfully,

SCOTT R. GUERIN, Capt, USAF

Student, AFIT GEM

Appendix 8: Email from Civil Engineer Career Field Manager

Zuhlsdorf, Michael J Col USAF AF-A4 (USA) <michael.j.zuhlsdorf.mil@mail.mil>
Mon 3/25/2019 11:26 AM
To: Guerin, Scott R Capt USAF AETC AFIT/ENV
Cc: ROSENLOF, ERIC S Lt Col USAF AFPC AFPC/DP2LSE; WILEY, SCOTTIE R Capt USAF AFPC AFPC/DP2LSE

This message has a digital signature, but it wasn't verified because the S/MIME control isn't currently supported fo

Hi Scott -

Thanks for reaching out. I don't have a single document that harbors our CE CGO position requirements but our 32E Officer Assignment Team (OAT) may.

I've cc'd Scottie Wiley who may be able to help.

R -

Col Z

MICHAEL J. ZUHLSDORF, Colonel, USAF
Chief, Civil Engineer Readiness Division
32E Career Field Manager
HQ USAF/A4CX
DCS/Logistics, Engineering & Force Protection
703-695-4666/DSN 225-4666
e-mail: michael.j.zuhlsdorf.mil@mail.mil

Appendix 9: Email from Civil Engineer Company Grade Officer Assignments Officer

WILEY, SCOTTIE R Capt USAF AFPC AFPC/DP2LSE <scottie.wiley@us.af.mil>
Mon 3/25, 11:35 AM

Scott,

The two documents I will steer you to this is 32E CFETP and AF Officer Classification Document (AFOCD). Position descriptions are developed by information provided by those two documents, the PAD, and local needs at each installation.

r/

srw

Appendix 10: Civil Engineer Career Field Survey Participant Request Email

Occupational Review Tasking, for 32E Officer Occupational Competencies (Group #10)

OA Survey Managers Mailbox <surveymanager@us.af.mil>

Thu 4/18/2019 2:21 PM

To:OA Survey Managers Mailbox <surveymanager@us.af.mil>;

VIEW IN HTML.

PLEASE NOTE: Due to changes in security protocols, you cannot open a hyperlink within an email. Ensure MS Outlook is open, then cut and paste link and proceed. Some locations are also having trouble accessing the url. This may be an issue with the new protocols as well. A possible fix may be trying to open within Google Chrome. These issues are beyond our control. If you send us a request for help with an invalid url and we reply our server is operational, please work with your local IT personnel to resolve the issue. Always remember, the survey "MUST" be accessed through a .mil server.

Engineers -

When I arrived last year I outlined three priorities our Civil Engineers must focus on in order to maintain our enduring air dominance and force lethality; these are: Restore Readiness, Revitalize Squadrons, and Innovate and Modernize Capabilities.

I believe a key to achieving these priorities is the deliberate development of our Airmen Engineers. The Civil Engineer School is leading the charge to develop a list of Occupational Competencies for Civil Engineer Officers (32EXX). These competencies highlight the knowledge and skills we expect Officers to develop in their career to ensure their Full Spectrum Readiness.

You are receiving this Occupational Analysis survey because I want honest and accurate feedback from Officers, Enlisted and Civilian members. Before we go final on these critical developmental efforts we must assess the validity and utility of these "core" occupational competencies. Our goal is to align our force development programs to develop these occupational competencies in all our Civil Engineer Officers.

The survey can be accessed at the following link, and will be open for 21 days. I strongly encourage you to complete the survey as soon as possible, but no later than 29 April 2019.
https://surveys.oa.aetc.af.mil/survapp/login.aspx?SN=5047

My POC for the 32E Occupational Analysis is Capt Jason Hernandez, jason.hernandez@afit.edu DSN 785-5654 x3526.

For survey access issues please email the Occupational Analysis Survey Managers at surveymanager@us.af.mil.

Thank you for your participation and feedback!

Brig Gen John J. Allen, Jr.
Director of Civil Engineers

HQ AETC Occupational Analysis Survey Manager

How To Proceed:

You MUST use a ".mil" computer with a CAC reader. CAC information will be used to show you your personalized list of survey taskings, and will track your start and completion dates.

Since a ".mil" computer with a CAC reader is needed for this survey, please ensure you are accessing the survey via Internet Explorer.

If you have problems accessing the site, or have technical issues with the survey itself, email your AFSC and the error message you receive to: surveymanager@us.af.mil

Appendix 11: Delphi Study Participant Request Email

From: Ohlemacher, Donald R Col USAF AETC AFIT/CE
Sent: Thursday, September 5, 2019 4:58 PM
Cc: Guerin, Scott R Capt USAF AETC AFIT/ENV; Johannes, Tay W Civ USAF AETC AFIT/CEC
Subject: Participation in AFIT GEM Research-Delphi Study

Engineer Leaders,

BLUF: Request your support and participation in a Delphi Study being conducted by Capt Scott Guerin (AFIT GEM student) as part of his research in developing a competency-based force development model for 32E Company Grade Officers.

BACKGROUND: The CE School, in cooperation with the 32E Career Field Manager, is working to define the core 32E occupational competences expected of CE officers throughout their career. Defining the competencies will help ensure AFIT's Professional Continuing Education program is focused on teaching students what they need to know to effectively perform in engineer officer roles. During March and April 2019, we presented a comprehensive survey to 32Es (and civilian and enlisted members who work closely with officers) to assess 72 draft competencies for importance, relevance and timing in an officers' career. Capt Guerin participated in the design sprint for the CGO draft competencies and decided to conduct his research to enhance the competency-based force development model. I am serving as his Project Sponsor and Dr Tay Johannes is his Research Advisor.

SITUATION: The intent of the Capt Guerin's Delphi Study is to collect qualitative input from senior Civil Engineer leaders to enhance the proposed competency-based force development model, defined through the 32E Company Grade Officer "core" occupational competencies. We are looking for you to participate in this Delphi Study because of your senior expertise and are counting on your involvement to have a successful study. The study will involve 3 rounds: in each round you will be asked to provide responses in writing to various questions. Subsequent rounds of questions will dive deeper into specific context based on synthesis of the responses from the other participants. Overall, this process should take approximately 6 weeks. This study is entirely voluntary and you may choose to leave at any time by contacting Capt Scott Guerin at Scott.Guerin@afit.edu.

DIRECTIONS FOR STUDY PARTICIPANTS: The Round 1 study questions are presented in the attached Word document. Please add your responses below each question and save as "Delphi Question Set Round 1 - (LAST NAME).docx." Please send your responses to Capt Scott Guerin at Scott.Guerin@afit.edu NLT Wednesday, 18 September.

Thank you for your participation in this study!

v/r,

Colonel Don Ohlemacher, P.E.
Dean
The Civil Engineer School
DSN 785-5654 x3501

Appendix 12: Allocation of Positions Per Flight

Allocation of Positions by Squadron Type														
Company Grade Officers					Lieutenant					Captain				
Flight	Position	Position Number	Flight Number	Percentage	Flight	Position	Position Number	Flight Number	Percentage	Flight	Position	Position Number	Flight Number	Percentage
Squadron Staff	Deputy Commander	1	2	0.49%	Squadron Staff	Deputy Commander	0	0	0.00%	Squadron Staff	Deputy Commander	1	2	0.84%
	Support Director	1				Support Director	0				Support Director	1		
EOD	EOD Director of Operations	1	33	8.07%	EOD	EOD Director of Operations	0	1	0.58%	EOD	EOD Director of Operations	1	32	13.45%
	EOD Flight Commander	25				EOD Flight Commander	0				EOD Flight Commander	25		
	EOD Officer	7				EOD Officer	1				EOD Officer	6		
CEX	Undistinguished	16	39	9.54%	CEX	Undistinguished	2	9	5.26%	CEX	Undistinguished	14	30	12.61%
	Flight Commander	23				Flight Commander	7				Flight Commander	16		
CEO	Flight Commander	10	80	19.56%	CEO	Flight Commander	2	36	21.05%	CEO	Flight Commander	8	44	18.49%
	Deputy Flight Commander	2				Deputy Flight Commander	2				Deputy Flight Commander	0		
	Operations Engineering, Chief	30				Operations Engineering, Chief	9				Operations Engineering, Chief	21		
	Operations Engineer	1				Operations Engineer	0				Operations Engineer	1		
	Operations Officer	1				Operations Officer	0				Operations Officer	1		
	Public Works Officer	2				Public Works Officer	0				Public Works Officer	2		
	R&O Officer	11				R&O Officer	8				R&O Officer	3		
	R&O OIC	18				R&O OIC	12				R&O OIC	6		
	R&O Deputy	1				R&O Deputy	1				R&O Deputy	0		
	Executive Officer	2				Executive Officer	1				Executive Officer	1		
	Service Contracts OIC	1				Service Contracts OIC	1				Service Contracts OIC	0		
	Mission Engineering	1				Mission Engineering	0				Mission Engineering	1		
CEN	Flight Commander	6	215	52.57%	CEN	Flight Commander	1	105	61.40%	CEN	Flight Commander	5	110	46.22%
	Deputy Flight Chief	16				Deputy Flight Chief	3				Deputy Flight Chief	13		
	Project Management, Chief	11				Project Management, Chief	3				Project Management, Chief	8		
	Project Manager	26				Project Manager	18				Project Manager	8		
	OIC, Construction Management	6				OIC, Construction Management	2				OIC, Construction Management	4		
	Construction Manager	3				Construction Manager	3				Construction Manager	0		
	Quality Assurance	1				Quality Assurance	0				Quality Assurance	1		
	SABER Chief	2				SABER Chief	0				SABER Chief	2		
	Portfolio Optimization, Chief	8				Portfolio Optimization, Chief	4				Portfolio Optimization, Chief	4		
	Deputy Portfolio Optimization, OIC	2				Deputy Portfolio Optimization, OIC	0				Deputy Portfolio Optimization, OIC	2		
	Energy Manager	3				Energy Manager	1				Energy Manager	2		
	Programmer	40				Programmer	32				Programmer	8		
	NEXGEN IT Officer	1				NEXGEN IT Officer	0				NEXGEN IT Officer	1		
	Expeditionary Engineering, Chief	1				Expeditionary Engineering, Chief	1				Expeditionary Engineering, Chief	0		
	Undistinguished	89				Undistinguished	37				Undistinguished	52		
CEI	Flight Commander	4	29	7.09%	CEI	Flight Commander	0	12	7.02%	CEI	Flight Commander	4	17	7.14%
	Deputy Flight Commander	5				Deputy Flight Commander	2				Deputy Flight Commander	3		
	Environmental Compliance, Chief	1				Environmental Compliance, Chief	0				Environmental Compliance, Chief	1		
	Environmental Chief	1				Environmental Chief	0				Environmental Chief	1		
	Environmental Officer	8				Environmental Officer	5				Environmental Officer	3		
	Installation Management Officer	5				Installation Management Officer	2				Installation Management Officer	3		
	Military Family Housing	1				Military Family Housing	0				Military Family Housing	1		
	Asset Management	3				Asset Management	3				Asset Management	0		
	Real Property Officer	1				Real Property Officer	0				Real Property Officer	1		
Undistinguished	Undistinguished	11	11	2.69%	Undistinguished	Undistinguished	8	8	4.68%	Undistinguished	Undistinguished	3	3	1.26%
TOTAL		409		100.00%	TOTAL		171		100.00%	TOTAL		238		100.00%

Appendix 13: Allocation of Positions by Unit Level (Top Level)

Allocation of Positions by Unit Level (Top Level)								
Company Grade Officers			Lieutenant			Captain		
Unit Level	Number	Percentage	Unit Level	Number	Percentage	Unit Level	Number	Percentage
STAFF	85	14.78%	STAFF	12	6.03%	STAFF	73	19.41%
WG	9	1.57%	WG	0	0.00%	WG	9	2.39%
GP	5	0.87%	GP	2	1.01%	GP	3	0.80%
SQ	473	82.26%	SQ	185	92.96%	SQ	288	76.60%
MASKED	3	0.52%	MASKED	0	0.00%	MASKED	3	0.80%
TOTAL	**575**	**100.00%**	**TOTAL**	**199**	**100.00%**	**TOTAL**	**376**	**100.00%**

Allocation of Positions by Staff Organizations								
Company Grade Officers			Lieutenant			Captain		
Staff Organization	Number	Percentage	Staff Organization	Number	Percentage	Staff Organization	Number	Percentage
HQAF	3	3.53%	HQAF	0	0.00%	HQAF	3	4.11%
MAJCOM	17	20.00%	MAJCOM	0	0.00%	MAJCOM	17	23.29%
NAF	9	10.59%	NAF	0	0.00%	NAF	9	12.33%
AFIMSC	19	22.35%	AFIMSC	3	25.00%	AFIMSC	16	21.92%
AFCEC	16	18.82%	AFCEC	8	66.67%	AFCEC	8	10.96%
JB STAFF	1	1.18%	JB STAFF	1	8.33%	JB STAFF	0	0.00%
Testing	1	1.18%	Testing	0	0.00%	Testing	1	1.37%
Nuclear Agency	1	1.18%	Nuclear Agency	0	0.00%	Nuclear Agency	1	1.37%
AU	12	14.12%	AU	0	0.00%	AU	12	16.44%
AFA	3	3.53%	AFA	0	0.00%	AFA	3	4.11%
DIA	1	1.18%	DIA	0	0.00%	DIA	1	1.37%
AFSC	1	1.18%	AFSC	0	0.00%	AFPC	1	1.37%
AFPC	1	1.18%	AFPC	0	0.00%	AFSC	1	1.37%
TOTAL	**85**	**100.00%**	**TOTAL**	**12**	**100.00%**	**TOTAL**	**73**	**100.00%**

Allocation of Positions by Squadron Type								
Company Grade Officers			Lieutenant			Captain		
Squadron Type	Number	Percentage	Squadron Type	Number	Percentage	Squadron Type	Number	Percentage
CES	409	86.47%	CES	171	94.05%	CES	238	81.60%
MMS	3	0.63%	MMS	0	0.00%	MMS	3	1.04%
RHS	29	6.13%	RHS	8	4.32%	RHS	21	7.29%
Air Base SQ	4	0.85%	Air Base SQ	1	0.54%	Air Base SQ	3	1.04%
Combat Ops SQ	1	0.21%	Combat Ops SQ	1	0.54%	Combat Ops SQ	0	0.00%
Air Advisor SQ	6	1.27%	Air Advisor SQ	0	0.00%	Air Advisor SQ	6	2.08%
Support SQ	1	0.21%	Support SQ	0	0.00%	Support SQ	1	0.35%
CES+LOG SQ	3	0.63%	CES+LOG SQ	1	0.54%	CES+LOG SQ	2	0.69%
Const+Train SQ	3	0.63%	Const+Train SQ	0	0.00%	Const+Train SQ	3	1.04%
Training SQ	4	0.85%	Training SQ	0	0.00%	Training SQ	4	1.39%
Cont Response SQ	8	1.69%	Cont Response SQ	0	0.00%	Cont Response SQ	8	2.78%
Space Warning SQ	2	0.42%	Space Warning SQ	0	0.00%	Space Warning SQ	2	0.69%
TOTAL	473	100.00%	TOTAL	185	100.00%	TOTAL	288	100.00%

Appendix 14: Civil Engineer Career Field Survey Competency Responses

Survey Responces								
Competency Designator		Response Ranking and Rating						
ID	Name	Ranking	Score/Rating	Not Important (Weight 1)	Slightly Important (Weight 2)	Moderately Important (Weight 3)	Very Important (Weight 4)	Extremely Important (Weight 5)
10.9	Cultivate a positive command climate based on trust, mutual respect, inclusion, safety consciousness, and stewardship of government resources.	1	4563	2	10	108	748	3695
3.1	Communicate the organic resources and capabilities available within a Civil Engineer Squadron.	2	4403	2	8	171	1252	2970
2.3	Anticipate and adapt engineering approaches in a dynamic operating environment with good engineering judgement and critical thinking.	3	4374	1	18	120	1400	2835
4.1	Identify and define requirements, and coordinate with stakeholders to determine appropriate scope, cost, schedule, and method of execution.	4	4371	1	4	171	1380	2815
10.4	Advocate for resources required to execute mission priorities and explain risk to mission for unfunded requirements	5	4342	1	12	198	1376	2755
3.4	Communicate facility and infrastructure requirements, status of Civil Engineer resources, and expected risk to stakeholders.	6	4332	2	2	207	1356	2765
10.3	Direct execution of Civil Engineer resources to meet functional and operational mission requirements.	7	4330	1	14	180	1400	2735
4.2	Prioritize projects for execution that are informed by mission requirements, base master planning, sustainment data, and funding strategies.	8	4313	3	8	150	1632	2520
12.1	Maximize unity of effort with fellow commanders.	9	4246	2	12	261	1456	2515
6.5	Identify safety hazards during civil engineer activities and organize response options	10	4220	1	30	363	1336	2490
7.8	Organize and direct airfield recovery activities.	11	4219	5	44	318	1252	2600
6.1	Coordinate stakeholders during the planning and execution stages of a project.	12	4199	1	12	294	1672	2220
10.2	Ensure highest state of unit readiness by organizing, training, equipping and reporting on assigned UTCs.	13	4170	4	42	282	1572	2270
10.7	Lead EOC operations and coordinate response to contingencies	14	4122	4	34	339	1640	2105
5.2	Lead a multi-disciplinary team executing a troop construction project.	15	4120	2	44	387	1492	2195
7.6	Lead Civil Engineer Unit Control Center (UCC) operations.	16	4089	2	36	432	1584	2035
4.4	Identify vulnerabilities of installation infrastructure, and mitigate risk to mission assurance by developing options to improve resilience.	17	4085	1	32	429	1688	1935
8.2	Assess and evaluate infrastructure capability, condition and capacity of potential operating locations to inform decision makers and mission owners.	18	4069	1	22	414	1832	1800
11.2	Develop and manage civil engineer plans and programs to achieve mission requirements.	19	4057	1	24	378	1824	1830
10.5	Collaborate with support organizations to maximize their support to the installation mission requirements.	20	4053	3	40	420	1700	1890
12.2	Ensure compliance with standards, laws, and regulations through the commander's inspection program.	21	4047	8	62	411	1556	2010
4.9	Develop a comprehensive project programming package for approval.	22	4029	2	52	468	1672	1835
12.4	Communicate and deliver expertise, capabilities, and resources to MAJCOMs and squadrons to support installation mission requirements.	23	4028	5	38	426	1684	1875
3.3	Communicate Civil Engineer enterprise business rules and rationale to stakeholders	24	4021	2	52	462	1700	1805
6.4	Assess, monitor, and document contractor progress and performance against contract scope of work and recommend actions to the contracting officer.	25	4015	2	32	477	1784	1720

Appendix 14: Civil Engineer Career Field Survey Competency Responses (Cont.)

8.1	Lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.	26	4011	2	28	471	1760	1750
8.5	Develop continuity documentation to support Civil Engineer operations across rotational turnover	27	3976	7	76	480	1508	1905
8.3	Develop an expeditionary bare base design.	28	3969	5	58	567	1444	1895
2.2	Employ references and consultation agencies to determine engineering limitations and options for topics beyond prior personal knowledge.	29	3967	2	64	465	1796	1640
1.2	Establish personal and professional goals to ensure career-long Civil Engineer officer development.	30	3966	2	74	447	1808	1635
1.1	Identify the Occupational Competencies relevant for a specific job, position, or duty upon assignment and pursue appropriate Force Development opportunities.	31	3963	3	52	429	1784	1695
1.4	Facilitate the force development for Civil Engineer enlisted personnel to attain the desired proficiency level throughout upgrade training.	32	3962	8	86	498	1500	1870
6.3	Evaluate contractor submittals for technical acceptability, execution feasibility, and completeness.	33	3953	3	48	525	1752	1625
2.1	Interpret construction drawings and specifications to validate that the design complies with codes, rules, and regulations, and verify that construction complies with the design	34	3944	2	130	507	1400	1905
10.1	Translate policy and guidance into prioritized operational and tactical objectives.	35	3942	4	54	537	1672	1675
4.7	Organize resources to gain and maintain accurate asset visibility, condition assessment, and information.	36	3933	2	40	591	1760	1540
5.5	Design an airfield in an expeditionary environment for construction or repair.	37	3929	7	90	534	1488	1810
3.2	Communicate the resources and capabilities available within the Air Force Civil Engineer enterprise.	38	3920	2	54	558	1696	1610
10.6	Anticipate emerging requirements across the installation functions and incorporate into the Civil Engineer work plan.	39	3910	3	44	564	1864	1435
12.5	Lead and participate as an innovative, critical thinker in operational planning teams to continuously improve operational capabilities.	40	3903	9	82	534	1648	1630
7.1	Develop and execute plans to mitigate mission impact during unplanned utility service interruptions	41	3893	2	56	642	1688	1505
9.2	Navigate staff relationships to acquire resources and authority for engineer activities in a joint or coalition organization.	42	3888	4	50	588	1716	1530
7.4	Develop and execute a Prime BEEF home station training program that meets unit readiness goals and tasks	43	3883	6	96	495	1696	1590
4.3	Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.	44	3865	4	62	609	1780	1410
1.3	Facilitate the force development for Civil Engineer officers to attain the desired proficiency level of each Occupational Competency.	45	3864	3	56	489	1896	1420
12.3	Cultivate relationships to build trust and influence by across above-wing-level headquarters organizations.	45	3864	7	86	570	1476	1725
4.11	Develop and manage a comprehensive airfield infrastructure plan that incorporates expected condition, mission requirements, and phased improvements.	46	3845	4	60	591	1820	1370
7.7	Serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).	47	3842	4	70	684	1604	1480
7.10	Validate and communicate Minimum Operation Strip proposals for senior leader approval.	48	3838	6	78	552	1632	1570

Appendix 14: Civil Engineer Career Field Survey Competency Responses (Cont.)

9.1	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability.	49	3831	5	84	657	1560	1525
5.1	Adapt standard designs to meet user requirements and site considerations.	50	3828	7	58	702	1716	1345
6.2	Develop the specifications and technical requirements of a construction contract and service contract solicitation package.	51	3821	4	74	663	1760	1320
11.3	Provide guidance to joint partners to enable the proper employment of AF Civil Engineer capabilities.	52	3806	5	76	642	1708	1375
11.4	Operate within the Congressional cycle by communicating Civil Engineer requirements, resources, and risk to influence the defense appropriation and authorization acts.	53	3797	11	116	591	1484	1595
8.4	Coordinate acquisitions and logistics activities to support an expeditionary base beddown.	54	3779	5	88	735	1616	1335
11.5	Advocate, support, and defend Civil Engineer resource requirements within assigned program of record when developing the AF POM position	55	3773	15	78	576	1524	1580
5.4	Design utility infrastructure systems for an expeditionary location for construction.	56	3759	7	114	684	1664	1290
7.3	Translate mission planning documents and readiness guidance into unit readiness goals and tasks.	57	3751	2	110	657	1832	1150
7.5	Develop and maintain engineer portions of installation contingency plan	58	3723	4	88	771	1760	1100
7.2	Coordinate installation preparations that enable personnel to survive and operate in a Chemical, Biological, Radiological, and Nuclear (CBRN) environment.	59	3704	16	148	774	1216	1550
4.8	Perform data analysis to optimize infrastructure investments at the lowest life-cycle operating cost.	60	3695	7	110	816	1632	1130
4.6	Organize resources to produce a comprehensive base master plan.	61	3657	6	120	858	1628	1045
4.5	Assess commercial construction capabilities, risks and opportunities, and incorporate into engineer decision making processes and activities.	62	3649	4	102	846	1772	925
11.1	Formulate Civil Engineer strategy and policy objectives under the National Defense Strategy and Air Force Strategic Master Plan and translate requirements into published guidance.	63	3647	12	138	696	1576	1225
8.6	Facilitate transition to operational contract support at a contingency location.	64	3376	8	212	1092	1304	760
5.3	Design a simplified facility for construction.	65	3359	24	290	990	1160	895
4.10	Develop a complete airfield waiver package and route to the appropriate level for approval.	66	3342	18	218	1065	1296	745
10.8	Leverage public and private partnerships through community engagement, mutual agreements, and third-party financing that better support the mission.	67	3250	27	268	1107	1128	720
7.9	Validate and interpret CBRN modeling and mapping for senior leaders.	68	3213	40	316	951	1176	730
9.3	Organize Civil Engineer efforts when divesting infrastructure to the host nation.	69	3146	21	360	1164	996	605
4.12	Develop a complete explosive site plans and route to the appropriate level for approval.	70	3124	24	320	1062	1168	550
9.4	Lead small unit engineer activities under mission command orders in a contested environment	71	2837	69	460	1266	712	330
3.5	Articulate history and heritage of AF Civil Engineers in supporting joint readiness and lethality.	72	2759	65	564	1149	676	305

Appendix 15: Civil Engineer Career Field Survey Development Timeline Responses

Survey Responces					
Competency Designator		When the Competency Should Be Developed			
ID	Name	Second Lieutenant (0-2 Years)	First Lieutenant (2-4 Years)	Junior Captain (4-7 years)	Senior Captain (7-10 Years)
1.1	Identify the Occupational Competencies relevant for a specific job, position, or duty upon assignment and pursue appropriate Force Development opportunities.	Not Provided	Not Provided	Not Provided	Not Provided
1.2	Establish personal and professional goals to ensure career-long Civil Engineer officer development.	Not Provided	Not Provided	Not Provided	Not Provided
1.3	Facilitate the force development for Civil Engineer officers to attain the desired proficiency level of each Occupational Competency.	Not Provided	Not Provided	Not Provided	Not Provided
1.4	Facilitate the force development for Civil Engineer enlisted personnel to attain the desired proficiency level throughout upgrade training.	Not Provided	Not Provided	Not Provided	Not Provided
2.1	Interpret construction drawings and specifications to validate that the design complies with codes, rules, and regulations, and verify that construction complies with the design	23.55%	38.42%	28.64%	9.39%
2.2	Employ references and consultation agencies to determine engineering limitations and options for topics beyond prior personal knowledge.	22.88%	36.35%	27.41%	10.02%
2.3	Anticipate and adapt engineering approaches in a dynamic operating environment with good engineering judgement and critical thinking.	Not Provided	Not Provided	Not Provided	Not Provided
3.1	Communicate the organic resources and capabilities available within a Civil Engineer Squadron.	Not Provided	Not Provided	Not Provided	Not Provided
3.2	Communicate the resources and capabilities available within the Air Force Civil Engineer enterprise.	Not Provided	Not Provided	Not Provided	Not Provided
3.3	Communicate Civil Engineer enterprise business rules and rationale to stakeholders	Not Provided	Not Provided	Not Provided	Not Provided
3.4	Communicate facility and infrastructure requirements, status of Civil Engineer resources, and expected risk to stakeholders.	Not Provided	Not Provided	Not Provided	Not Provided
3.5	Articulate history and heritage of AF Civil Engineers in supporting joint readiness and lethality.	19.33%	20.73%	32.34%	27.60%
4.1	Identify and define requirements, and coordinate with stakeholders to determine appropriate scope, cost, schedule, and method of execution.	14.23%	26.96%	34.56%	24.16%
4.10	Develop a complete airfield waiver package and route to the appropriate level for approval.	19.82%	33.33%	29.57%	17.29%
4.11	Develop and manage a comprehensive airfield infrastructure plan that incorporates expected condition, mission requirements, and phased improvements.	3.77%	20.46%	48.17%	27.60%
4.12	Develop a complete explosive site plans and route to the appropriate level for approval.	5.20%	20.32%	55.33%	19.15%

Appendix 15: Civil Engineer Career Field Survey Development Timeline Responses (Cont.)

4.2	Prioritize projects for execution that are informed by mission requirements, base master planning, sustainment data, and funding strategies.	3.72%	22.58%	35.91%	37.79%
4.3	Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.	12.34%	22.24%	44.54%	28.85%
4.4	Identify vulnerabilities of installation infrastructure, and mitigate risk to mission assurance by developing options to improve resilience.	Not Provided	Not Provided	Not Provided	Not Provided
4.5	Assess commercial construction capabilities, risks and opportunities, and incorporate into engineer decision making processes and activities.	2.89%	21.99%	44.83%	30.30%
4.6	Organize resources to produce a comprehensive base master plan.	16.67%	19.26%	45.92%	33.15%
4.7	Organize resources to gain and maintain accurate asset visibility, condition assessment, and information.	10.93%	34.77%	34.16%	20.14%
4.8	Perform data analysis to optimize infrastructure investments at the lowest life-cycle operating cost.	6.43%	34.39%	32.18%	27.00%
4.9	Develop a comprehensive project programming package for approval.	18.20%	29.26%	29.84%	22.70%
5.1	Adapt standard designs to meet user requirements and site considerations.	5.89%	37.36%	42.59%	14.15%
5.2	Lead a multi-disciplinary team executing a troop construction project.	12.44%	36.21%	39.52%	11.82%
5.3	Design a simplified facility for construction.	15.82%	36.94%	38.17%	9.07%
5.4	Design utility infrastructure systems for an expeditionary location for construction.	13.69%	35.72%	34.80%	15.79%
5.5	Design an airfield in an expeditionary environment for construction or repair.	11.32%	24.34%	39.98%	24.36%
6.1	Coordinate stakeholders during the planning and execution stages of a project.	21.23%	34.91%	33.13%	10.73%
6.2	Develop the specifications and technical requirements of a construction contract and service contract solicitation package.	17.57%	36.68%	31.01%	14.73%
6.3	Evaluate contractor submittals for technical acceptability, execution feasibility, and completeness.	15.20%	38.91%	30.61%	15.28%
6.4	Assess, monitor, and document contractor progress and performance against contract scope of work and recommend actions to the contracting officer.	25.94%	40.54%	24.37%	9.16%
6.5	Identify safety hazards during civil engineer activities and organize response options	35.88%	36.14%	21.01%	6.98%
7.1	Develop and execute plans to mitigate mission impact during unplanned utility service interruptions	9.52%	36.91%	39.01%	14.55%
7.10	Validate and communicate Minimum Operation Strip proposals for senior leader approval	14.65%	26.13%	36.96%	22.26%
7.2	Coordinate installation preparations that enable personnel to survive and operate in a Chemical, Biological, Radiological, and Nuclear (CBRN) environment.	10.04%	31.63%	38.61%	19.72%

Appendix 15: Civil Engineer Career Field Survey Development Timeline Responses (Cont.)

7.3	Translate mission planning documents and readiness guidance into unit readiness goals and tasks.	Not Provided	Not Provided	Not Provided	Not Provided
7.4	Develop and execute a Prime BEEF home station training program that meets unit readiness goals and tasks	9.24%	35.27%	41.63%	13.86%
7.5	Develop and maintain engineer portions of installation contingency plan	2.85%	25.07%	51.23%	20.85%
7.6	Lead Civil Engineer Unit Control Center (UCC) operations.	6.37%	31.80%	36.19%	25.65%
7.7	Serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).	12.12%	31.21%	34.47%	22.19%
7.8	Organize and direct airfield recovery activities.	Not Provided	Not Provided	Not Provided	Not Provided
7.9	Validate and interpret CBRN modeling and mapping for senior leaders.	7.30%	26.95%	43.19%	22.56%
8.1	Lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.	3.45%	34.17%	34.32%	28.06%
8.2	Assess and evaluate infrastructure capability, condition and capacity of potential operating locations to inform decision makers and mission owners.	Not Provided	Not Provided	Not Provided	Not Provided
8.3	Develop an expeditionary bare base design.	Not Provided	Not Provided	Not Provided	Not Provided
8.4	Coordinate acquisitions and logistics activities to support an expeditionary base beddown.	Not Provided	Not Provided	Not Provided	Not Provided
8.5	Develop continuity documentation to support Civil Engineer operations across rotational turnover	24.78%	30.01%	29.06%	16.16%
8.6	Facilitate transition to operational contract support at a contingency location.	9.57%	20.16%	41.15%	29.12%
9.1	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability.	Not Provided	Not Provided	Not Provided	Not Provided
9.2	Navigate staff relationships to acquire resources and authority for engineer activities in a joint or coalition organization.	Not Provided	Not Provided	Not Provided	Not Provided
9.3	Organize Civil Engineer efforts when divesting infrastructure to the host nation.	Not Provided	Not Provided	Not Provided	Not Provided
9.4	Lead small unit engineer activities under mission command orders in a contested environment	0.37%	2.21%	34.20%	63.22%
10.1	Translate policy and guidance into prioritized operational and tactical objectives.	3.29%	11.81%	46.38%	38.52%
10.2	Ensure highest state of unit readiness by organizing, training, equipping and reporting on assigned UTCs.	4.32%	24.14%	38.27%	33.27%
10.3	Direct execution of Civil Engineer resources to meet functional and operational mission requirements.	4.37%	18.28%	42.16%	35.19%
10.4	Advocate for resources required to execute mission priorities and explain risk to mission for unfunded requirements	2.33%	22.09%	39.91%	35.68%
10.5	Collaborate with support organizations to maximize their support to the installation mission requirements.	9.13%	17.65%	49.07%	24.14%

Appendix 15: Civil Engineer Career Field Survey Development Timeline Responses (Cont.)

10.6	Anticipate emerging requirements across the installation functions and incorporate into the Civil Engineer work plan.	4.15%	18.44%	43.65%	33.76%
10.7	Lead EOC operations and coordinate response to contingencies	1.69%	12.60%	39.40%	46.32%
10.8	Leverage public and private partnerships through community engagement, mutual agreements, and third-party financing that better support the mission.	1.52%	8.23%	43.17%	47.08%
10.9	Cultivate a positive command climate based on trust, mutual respect, inclusion, safety consciousness, and stewardship of government resources.	27.29%	24.88%	22.73%	25.10%
11.1	Formulate Civil Engineer strategy and policy objectives under the National Defense Strategy and Air Force Strategic Master Plan and translate requirements into published guidance.	Not Provided	Not Provided	Not Provided	Not Provided
11.2	Develop and manage civil engineer plans and programs to achieve mission requirements.	Not Provided	Not Provided	Not Provided	Not Provided
11.3	Provide guidance to joint partners to enable the proper employment of AF Civil Engineer capabilities.	Not Provided	Not Provided	Not Provided	Not Provided
11.4	Operate within the Congressional cycle by communicating Civil Engineer requirements, resources, and risk to influence the defense appropriation and authorization acts.	Not Provided	Not Provided	Not Provided	Not Provided
11.5	Advocate, support, and defend Civil Engineer resource requirements within assigned program of record when developing the AF POM position	Not Provided	Not Provided	Not Provided	Not Provided
12.1	Maximize unity of effort with fellow commanders.	8.05%	8.91%	35.40%	47.64%
12.2	Ensure compliance with standards, laws, and regulations through the commander's inspection program.	16.12%	27.55%	32.00%	24.33%
12.3	Cultivate relationships to build trust and influence by across above-wing-level headquarters organizations.	8.42%	10.75%	41.05%	39.78%
12.4	Communicate and deliver expertise, capabilities, and resources to MAJCOMs and squadrons to support installation mission requirements.	2.60%	8.16%	41.61%	47.62%
12.5	Lead and participate as an innovative, critical thinker in operational planning teams to continuously improve operational capabilities.	6.15%	22.89%	36.52%	34.44%

Appendix 16: Proposed Civil Engineer Company Grade Officer Competency-Based Educational Model

Proposed Civil Engineer Company Grade Officer Competency-Based Educational Model									
Competency Designator				Ranking	Timeline for Development				
ID	Competency #	Concept	Modified Competency	Previous	Second Lieutenant	First Lieutenant	Junior Captain	Senior Captain	
2.3	1	Engineering Judgement and Critical Thinking	Anticipate and adapt engineering approaches in a dynamic operating environment with good engineering judgement and critical thinking.	3	Attainment				
6.5	2	Engineer Operations Safety and Real Property Vulnerabilities	Identify safety hazards during civil engineer operations/activities and vulnerabilities to base infrastructure and real property assets. Analyze these concerns and provide recommendations to appropriate decision-makers to organize response options.	10	Attainment	Attainment			
3.1, 3.6, 12.4, 3.3, 9.2, 3.2, 11.3	3	Civil Engineer Support Provision and Staff Interactions	Understand and communicate Civil Engineer Enterprise organic resources and capabilities with other United States Air Force units, such as Wing Staffs, Operations Groups, Maintenance Groups, Medical Groups, other Mission Support Squadrons, or sister services. This enterprise wide understanding includes the interaction between AFCEC, AFIMSC, MAJCOMs, and HAF staffs, as well as between the staffs and bases. The communication abilities should include joint collaboration, status of resources and expected real property risks of actions, and how CE can support various missions.	2,6, 23, 24, 42, 38, 53	Attainment	Attainment			
1.2, 1.3, 1.4, 7.4	4	Civil Engineer Personnel Development and Training	Understand Civil Engineer Officer and Enlisted force development requirements, guidelines, and recommendations to assist in personal, peer, and subordinate proficiency attainment. Additionally, develop and assist others in developing personal and professional goals to assure career-long development. Finally, aid the development of contingency and deployment-related skills through leading or participating in home station training.	30, 45, 32, 43		Attainment			
4.1, 6.1, 10.6	5	Stakeholder Engagement	Coordinate with stakeholders to identify and define civil engineer requirements, determine scopes of work, establish approximate cost and schedule, and recommend method of execution. This communication should occur during both the planning and execution of work, and should continue with after-action discussions upon work completion.	4, 12, 39		Attainment			

Appendix 16: Proposed Civil Engineer Company Grade Officer Competency-Based Educational Model (Cont.)

2.1, 6.2, 6.3, 6.4	6	Contract Management and Support	**Develop the specifications/technical work requirements and solicitation package for contracted support of design, construction, and service contracts. Evaluate submittals, proposed drawings, and provided specifications for code, rule, and regulation, and design requirements. During contract execution, assess, monitor, and document contractor performance for contract compliance and recommend actions to contracting officer.**	34, 52, 33, 25		**Attainment**		
4.9	7	Programming and Program Support	**Develop a comprehensive project programming package to request appropriate resources and authorization at both permanent and contingency locations.**	22		**Attainment**		
7.6, 7.7, 10.7	8	Organic Civil Engineer Emergency Capabilites	**Understand the local organic capabilities Civil Engineers provide during emergency situations and lead Civil Engineer Unit Control Center (UCC) operations or serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).**	14, 16, 48,		**Attainment**	**Attainment**	
7.1, 7.8, 7.10, 7.5	9	Preparation and Recovery After Attack	**Aid in identifying and executing plans to mitigate mission impact during unplanned disruptive events. In the occurrence of a disruptive event, organize and direct airfield recovery efforts, including validating and communicating minimum operating strips to senior leaders for approval. Ensure the development and maintenance of engineer portion of installation contingency plans.**	41, 11, 49, 59		**Attainment**	**Attainment**	
5.2, 9.4	10	Troop Leading Procedures	**Lead small multi-disciplinary civil engineer units under mission command orders in contingency environments, to include executing cradle to grave endeavors, utilizing troop labor execution methods.**	15, 72		**Attainment**	**Attainment**	
8.3, 8.1, 5.5, 5.4, 5.3	11	Contingency Design	**Design an airfield and beddown for expeditionary/contingency construction and repair. Included in this beddown is simplified facility design, support utility design, and base beddown layout. Prior to design, lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.**	28, 26, 37, 57, 66		**Attainment**	**Attainment**	

Appendix 16: Proposed Civil Engineer Company Grade Officer Competency-Based Educational Model (Cont.)

8.2, 4.4, 4.7, 4.11, 4.8, 10.4	12	Asset Management of Real Property Assets	**Implement asset management principles to maintain, repair, sustain, and modernize AF real property infrastructure assets to optimize investments at the lowest possible life-cycle costs. These principles include maintaining asset visibility, understanding asset's impact and risk to mission, asset condition and resilience, and asset vulnerabilities. Communicate this information to decision makers and mission owners to ensure the mitigation of unacceptable risk and advocate for courses of action.**	18, 17, 36, 47, 61, 5		**Attainment**	
4.5	13	Market Research	**Investigate local commercial capabilities, advancements of applicable technologies and procedures, risks and opportunities, and incorporate these findings into engineer decision making processes and activities**	63		**Attainment**	
7.2, 7.9	14	CBRN Preparation and Response	**Understand published Chemical, Biological, Radiological, and Nuclear (CBRN) response procedures, coordinate with installation personnel in preparation for operation and survival of these events, and validate and interpret CBRN modeling and mapping to senior leaders and decision makers.**	60, 69		**Attainment**	
2.2, 5.1, 4.6	15	Engineering Designs	**Utilize standard designs to meet user requirements, site considerations, and governing design specifications/regulations. Employ references, professional consultation agencies, or other certified/trained personnel to perform design in areas beyond personal knowledge. Ensure design is in accordance with the comprehensive base master plan.**	29, 51, 62		**Attainment**	
11.2, 4.2	16	Planning and Prioritization	**Develop and manage existing civil engineer plans and programs to achieve mission requirements, integrate new and forecasted requirements into these portfolios, and propose prioritization of projects for execution. The recommended prioritization shall be based on information from the mission owners, base master plan, sustainment data, and funding strategies.**	19, 8		**Attainment**	**Attainment**
4.3, 9.1	17	Contingency Host Nation Relations	**Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability. Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.**	44, 50		**Attainment**	**Attainment**
10.3, 8.4, 8.5, 8.6	18	Contingency Beddown Operations	**Execute a bare base beddown through coordination of acquisition processes, logistic activities, and civil engineer resources in a contingency environment. Develop and continuously update continuity documentation to support rotational turnover. After beddown completion, facilitate the transition to operational contract support.**	7, 55, 27, 65		**Attainment**	**Attainment**

Appendix 17: Summary of Results from Civil Engineer Occupational Competency Workshop 26-28 June 2018

Summary of Results from 32E Occupational Competency Workshop 26-28 June 2018

Occupational Competency (OC) Definition

- A set of competencies required of all Airmen within a specific workforce category; they describe technical/functional skills, knowledge, abilities, behaviors, and other characteristics needed to perform that function's mission successfully [AFPD36-26]
- Each OC should be specific, definite, and outcome-based; mastery must be measurable during Force Development education, training, and/or experience

Core Occupational Competencies were defined as those that are common, foundational, critical, or cultural for the wide variety of 32E positions and situations

Relevance Definition

- A measure of the importance of a specific Occupational Competency to a specific Workforce Category
- Used to determine the appropriate timing, focus, and audiences for Force Development opportunities

Required [Participant Scoring: 4]
Mastering this OC is A prerequisite for the member's duties
Time and resources should be deliberately set aside to ensure the member masters this OC

Expected [Participant Scoring: 3]
Mastering this OC will directly improve the member's performance in their current duties
Time and resources should be prioritized to ensure the member masters this OC

Encouraged [Participant Scoring: 2]
Mastering this OC will indirectly improve the member's performance in their current duties or will prepare the member for expected future duties
Time and resources should be considered to ensure the member masters this OC

Optional [Participant Scoring: 1]
Mastering this OC will not directly or indirectly improve the member's performance in their current duties
Limited time and resources should be expended to ensure the member masters this OC

Aggregate Scoring Key	
Required	4.00
	3.75
	3.50
Expected	3.25
	3.00
	2.75
Encouraged	2.50
	2.25
	2.00
Optional	1.75
	1.50
	1.25

Core 32E CGO Occupational Competencies

with average *Relevance* at each rank from individual participant responses

Competency	2d Lieutenant	1st Lieutenant	Captain (4-7 yrs)	Captain (7-10 yrs)
1. Professional Capabilities and Communication				
1.1. Identify the Occupational Competencies relevant for a specific job, position, or duty upon assignment and pursue appropriate Force Development opportunities	2.3	2.9	3.5	3.6
1.2. Employ references and consultation agencies to determine engineering limitations and opportunities for topics beyond prior personal knowledge	2.3	2.9	3.2	3.3
1.3. Translate between general facility and infrastructure design considerations, construction drawings, and physical facility components	2.5	3.0	3.4	3.3
1.4. Provide force development for junior Civil Engineer Officers to meet their Occupational Competency needs	1.3	2.2	3.0	3.6
1.5. Establish personal and professional goals to ensure career-long development of engineering depth and breadth	2.7	3.0	3.2	3.2
1.6. Anticipate and adapt engineering approaches in a dynamic operating environment with sound engineering judgement	2.2	2.8	3.4	3.5
1.7. Establish and cultivate community relationships	1.6	2.0	2.7	3.1
1.8. Communicate infrastructure requirements, status of Civil Engineer resources, and expected risk to mission owners	1.8	2.5	3.3	3.7
1.9. Communicate the organic resources and capabilities available within a Civil Engineer Squadron	2.2	3.0	3.5	3.8
1.10. Communicate civil engineer enterprise business rules to stakeholders	1.8	2.7	3.4	3.7
1.11. Explain the role of Civil Engineer personnel and resources in supporting applicable O-Plans to Airmen within the unit	1.5	2.5	3.2	3.4
2. Scoping, Planning, and Programming				
2.1. Organize comprehensive base master planning	1.4	2.0	3.0	3.2
2.2. Develop prioritized project lists for coordination that incorporate funding strategies, sustainment data, base master planning, and mission requirements	1.8	2.7	3.4	3.6
2.3. Validate a work order request and translate subsequent customer input to determine an appropriate project scope and cost	2.5	3.2	3.5	3.4
2.4. Interpret trends in the construction industry that may impact scope, cost, and capability of contracted construction or material	1.7	2.4	2.9	2.9
2.5. Develop and implement utility development plans to transition an installation from contingency to enduring status	1.6	2.2	3.0	3.3
2.6. Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities	1.8	2.3	2.9	3.1
2.7. Incorporate the impact of host nation culture and customs on the ability to support contracted construction and material	2.0	2.6	3.1	3.3
2.8. Identify trends in technology and commercial products that provide opportunities and threats to infrastructure	1.7	2.2	2.7	2.7
2.9. Evaluate existing utility infrastructure to identify and mitigate vulnerabilities and single points of failure	2.2	2.7	3.4	3.5
3. Design and Troop Construction				
3.1. Adapt standard designs for infrastructure to meet user requirements and site considerations	2.3	2.8	3.3	3.3
3.2. Incorporate hardening and Anti-Terrorism and Force Protection principles into facility and site requirements	2.2	3.0	3.3	3.2
3.3. Lead a multi-disciplinary team executing a troop construction project	2.3	3.1	3.5	3.5
3.4. Design a simplified facility for construction with troop labor	2.4	3.1	3.3	3.0
3.5. Design utility infrastructure systems for an expeditionary location for construction with troop labor	2.3	3.1	3.4	3.2
3.6. Adapt US facility and utility infrastructure design principles to incorporate foreign standards, local material availability, and contracted construction capability	2.0	2.7	3.2	3.3
4. Project Management and Construction Management				
4.1. Coordinate stakeholders during the planning and execution stages of a project	2.6	3.4	3.7	3.7
4.2. Evaluate contractor submittals for technical acceptability, execution feasibility, and completeness	2.5	3.3	3.4	3.2
4.3. Assess and monitor contractor construction progress and performance	2.7	3.3	3.3	3.1
4.4. Develop a project package contract solicitation	2.3	3.0	3.4	3.3
4.5. Coordinate project closeout	2.3	3.1	3.3	3.2
4.6. Perform construction site inspections to monitor progress and identify contractor deficiencies	2.8	3.2	3.3	3.1
4.7. Develop a comprehensive project management plan	2.3	2.8	3.2	3.0
4.8. Coordinate design and submittal reviews with relevant project stakeholders	2.7	3.2	3.4	3.1
4.9. Interpret a construction schedule to assess project progress	2.9	3.3	3.5	3.3
4.10. Provide a technical evaluations of contractor bids to the contracting source selection team	2.2	3.0	3.4	3.3
4.11. Identify safety violations during contracted or troop labor construction project execution	2.8	3.4	3.7	3.7
4.12 Assess a project's position in the programming or execution process to validate previous milestone were met and to determine the next required milestone	2.4	3.1	3.5	3.5
4.13. Manage the project modification process	2.1	2.9	3.3	3.1
5. Operations				
5.1. Prioritize projects based on installation mission requirements and infrastructure sustainment	2.0	2.7	3.4	3.7
5.2. Lead and coordinate facility condition assessments	2.3	3.2	3.3	2.7
5.3. Serve as Contracting Officer Representative for service contracts	2.2	2.8	3.0	2.7

Appendix 17: Summary of Results from Civil Engineer Occupational Competency Workshop 26-28 June 2018 (Cont.)

5.4. Develop and execute plans for mission assurance during utility service interruptions	1.8	2.6	3.2	3.3
5.5. Perform data analysis to identify requirements from facility condition assessments	2.1	2.7	3.0	2.8
5.6. Provide a qualitative and quantitative risk assessment on infrastructure	2.0	2.9	3.3	3.3
6. Readiness and Emergency Management				
6.1. Manage a unit's deployment readiness programs	1.6	2.5	3.2	3.1
6.2. Develop and execute a Prime BEEF Home Station Training program	2.0	3.0	3.3	3.1
6.3. Coordinate installation preparations that enable personnel to survive and operate in a CBRN environment	1.9	2.5	2.9	2.9
6.4. Interpret a TPFDD to coordinate squadron support and implementation	1.5	2.1	2.8	3.1
6.5. Generate accurate and timely unit readiness reports for commander review	1.6	2.5	3.1	3.2
6.6. Develop plans for Camouflage, Concealment, and Deception	2.1	2.8	2.8	2.7
6.7. Develop dispersal plans for critical assets	2.1	2.7	2.8	2.8
6.8. Develop and maintain installation emergency and readiness support plans	1.7	2.4	3.2	3.3
6.9. Lead Civil Engineer UCC operations	2.0	3.0	3.6	3.8
6.10. Direct Civil Engineer base recovery operations	1.5	2.4	3.3	3.7
6.11. Serve as an ESF Representative in the EOC	2.0	2.8	3.1	3.4
6.12. Facilitate Incident Command and Control training for installation EOC and CAT personnel	1.4	2.0	2.8	2.8
6.13. Organize and employ Civil Engineer resources for base denial	1.6	2.4	2.8	2.8
6.14. Communicate CBRN modeling and mapping for senior leader coordination	1.7	2.4	2.8	2.8
6.15. Direct base sustainment and recovery actions in a communication denied environment	1.9	2.4	2.8	3.2
6.16. Incorporate future threats and new Civil Engineer operational concepts into unit training programs	1.7	2.2	2.8	3.2
6.17. Analyze an existing installation's infrastructure risk when provided with a new, unexpected threat	1.7	2.5	3.1	3.2
6.18. Implement revised Civil Engineer sustainment and recovery operations when provided with a new, unexpected threat	1.8	2.5	3.0	3.3
7. Beddown and Contingency Operations				
7.1. Develop an expeditionary bare base design that meets mission requirements	2.5	3.2	3.7	3.7
7.2. Lead on-site execution of Civil Engineer activities in a bare base beddown	2.5	3.2	3.8	3.8
7.3. Establish Civil Engineer sustainment functions in an bare base environment	2.5	3.3	3.7	3.8
7.4. Coordinate acquisitions and logistics to implement a bare base beddown	2.3	3.0	3.5	3.5
7.5. Provide reach back support for Civil Engineers executing a bare base beddown	1.8	2.5	3.1	3.3
7.6. Lead a pre-deployment site survey to determine limitations and capabilities of existing infrastructure, the natural environment, and local contract support	2.0	2.8	3.6	3.5
7.7. Serve as the lead site Civil Engineer at small installation	1.3	2.0	3.3	3.6
7.8. Implement expedient solutions to infrastructure challenges using organic, locally available, or quickly acquired resources	2.3	2.8	3.5	3.5
7.9. Develop continuity documentation to support Civil Engineer operations across rotational turnover	2.6	3.2	3.5	3.6
7.10. Facilitate transition to operational contract support at a contingency location	1.8	2.5	3.2	3.3
7.11. Analyze and compare potential operating locations to determine suitability based on mission requirements, existing infrastructure, and local resources	1.8	2.5	3.3	3.7
8. Airfields				
8.1. Develop a complete airfield waiver package and route to the appropriate level for approval	2.0	2.8	3.2	3.0
8.2. Validate and communicate Minimum Operation Strip proposals for coordination and approval	2.5	3.2	3.4	3.3
8.3. Conduct a visual surface inspection of airfield pavement	2.7	3.3	3.5	3.4
8.4. Develop a comprehensive airfield plan that incorporates expected condition, mission requirements, and phased improvements	2.2	2.9	3.4	3.5
8.5. Organize and direct the installation's airfield damage repair activities	2.3	3.2	3.5	3.2
8.6. Advise mission owners on the impact of airfield pavement condition on operational capability	2.1	2.7	3.5	3.7
8.7. Validate existing contingency airfield pavement evaluations for relevance, completeness, and accuracy	2.1	2.7	3.2	3.3
8.8. Complete contingency airfield pavement evaluation	1.6	2.3	2.9	2.9
8.9. Evaluate the capability of existing airfield infrastructure to support mission requirements	2.2	2.9	3.5	3.6
8.10. Develop and manage an airfield maintenance plan	1.8	2.8	3.3	3.2
8.11. Develop a design for an expeditionary airfield for construction with troop labor	1.7	2.4	3.2	3.5
9. Joint and International				
9.1. Coordinate with host nation representatives regarding roles and responsibilities for infrastructure	1.7	2.4	3.2	3.5
9.2. Organize Civil Engineer efforts when divesting infrastructure to the host nation	1.6	2.2	2.9	3.3
9.3. Collaborate with international partners on how to achieve engineer effects	1.8	2.5	3.1	3.5
9.4. Articulate Air Force Civil Engineer resources and capabilities to the joint community	1.8	2.7	3.4	3.8
9.5. Navigate staff relationships to acquire resources and authority for Civil Engineer requirements in a joint or coalition organization	1.5	2.2	3.2	3.6
9.6. Generate orders to prepare and deploy engineer forces or support to engineer forces in a joint or coalition organization	1.3	1.9	2.5	2.8
9.7. Assess joint engineer resources and capabilities to complete an engineering task	1.7	2.3	3.0	3.3
9.8. Translate joint terminology and processes for activities supported by Air Force Civil Engineer	1.8	2.4	3.2	3.5
9.9. Generate and evaluate Requests for Support (RFS) for engineer capabilities in a joint environment	1.6	2.0	2.9	3.3
9.10. Lead small unit tactics in a contested environment to enable engineer activities	2.1	2.6	3.3	3.3
9.11. Translate an OPORD into actionable engineering tasks	1.9	2.4	3.2	3.4

Appendix 18: Civil Engineer Career Field Survey Results Competencies by Rank.

Civil Engineer Career Field Survey Results: Competencies by Rank		
Proficiency Level	**Competency Number**	**Competency**
Second Lieutenant		
Basic	3.1	Communicate the organic resources and capabilities available within a Civil Engineer Squadron
Basic	3.2	Communicate the resources and capabilities available within the Air Force Civil Engineer enterprise
Basic	3.3	Communicate Civil Engineer enterprise business rules and rationale to stakeholders.
Basic	3.4	Communicate facility and infrastructure requirements, status of Civil Engineer resources, and expected risk to stakeholders
Basic	4.4	Identify vulnerabilities of installation infrastructure, and mitigate risk to mission assurance by developing options to improve resilience
Basic	7.3	Translate mission planning documents and readiness guidance into unit readiness goals and tasks
Basic	7.8	Organize and direct airfield recovery activities
Basic	8.2	Assess and evaluate infrastructure capability, condition and capacity of potential operating locations to inform decision makers and mission owners
Basic	8.3	Develop an expeditionary bare base design
Basic	8.4	Coordinate acquisitions and logistics activities to support an expeditionary base beddown
Basic	9.1	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability
Basic	9.2	Navigate staff relationships to acquire resources and authority for engineer activities in a joint or coalition organization
Basic	11.1	Develop and manage civil engineer plans and programs to achieve mission requirements

Appendix 18: Civil Engineer Career Field Survey Results Competencies by Rank (Cont.)

Civil Engineer Career Field Survey Results: Competencies by Rank		
Proficiency Level	**Competency Number**	**Competency**
First Lieutenant		
Not Provided	1.1	Identify the Occupational Competencies relevant for a specific job, position, or duty upon assignment and pursue appropriate Force Development opportunities
Not Provided	1.2	Establish personal and professional goals to ensure career-long Civil Engineer officer development
Not Provided	2.1	Interpret construction drawings and specifications to validate that the design complies with codes, rules, and regulations, and verify that construction complies with the design.
Not Provided	2.2	Employ references and consultation agencies to determine engineering limitations and options for topics beyond prior personal knowledge
Not Provided	4.1	Identify and define requirements, and coordinate with stakeholders to determine appropriate scope, cost, schedule and method of execution
Not Provided	4.9	Develop a comprehensive project programming package for approval
Not Provided	5.2	Lead a multi-disciplinary team executing a troop construction project
Not Provided	5.3	Design a simplified facility for construction
Not Provided	5.4	Design utility infrastructure systems for an expeditionary location for construction
Not Provided	6.1	Coordinate stakeholders during the planning and execution stages of a project
Not Provided	6.2	Develop the specifications and technical requirements of a construction contract and service contract solicitation package
Not Provided	6.3	Evaluate contractor submittals for technical acceptability, execution feasibility, and completeness
Not Provided	6.4	Assess, monitor, and document contractor progress and performance against contract scope of work and recommend actions to the contracting officer
Not Provided	6.5	Identify safety hazards during civil engineer activities and organize response options
Not Provided	7.1	Develop and execute plans to mitigate mission impact during unplanned utility service interruptions
Not Provided	8.5	Develop continuity documentation to support Civil Engineer operations across rotational turnover
Basic	9.3	Organize Civil Engineer efforts when divesting infrastructure to the host nation
Basic	11.3	Provide guidance to joint partners to enable the proper employment of AF Civil Engineer capabilities
Basic	11.4	Operate within the Congressional cycle by communicating Civil Engineer requirements, resources, and risk to influence the defense appropriation and authorization acts
Basic	11.5	Advocate, support and defend Civil Engineer resource requirements within assigned program of record when developing the AF POM position

Appendix 18: Civil Engineer Career Field Survey Results Competencies by Rank (Cont.)

Civil Engineer Career Field Survey Results: Competencies by Rank		
Proficiency Level	**Competency Number**	**Competency**
Junior Captain (4-7 Years)		
Not Provided	1.4	Facilitate the force development for Civil Engineer enlisted personnel to attain the desired proficiency level throughout upgrade training
Not Provided	2.3	Anticipate and adapt engineering approaches in a dynamic operating environment with good engineering judgement and critical thinking
Experienced	3.1	Communicate the organic resources and capabilities available within a Civil Engineer Squadron
Experienced	3.2	Communicate the resources and capabilities available within the Air Force Civil Engineer enterprise
Experienced	3.3	Communicate Civil Engineer enterprise business rules and rationale to stakeholders.
Experienced	3.4	Communicate facility and infrastructure requirements, status of Civil Engineer resources, and expected risk to stakeholders
Not Provided	3.5	Articulate history and heritage of AF Civil Engineers in supporting joint readiness and lethality
Not Provided	4.1	Identify and define requirements, and coordinate with stakeholders to determine appropriate scope, cost, schedule and method of execution
Not Provided	4.2	Prioritize projects for execution that are informed by mission requirements, base master planning, sustainment data, and funding strategies.
Not Provided	4.3	Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities
Experienced	4.4	Identify vulnerabilities of installation infrastructure, and mitigate risk to mission assurance by developing options to improve resilience
Not Provided	4.5	Assess commercial construction capabilities, risks and opportunities, and incorporate into engineer decision making processes and activities
Not Provided	4.7	Organize resources to gain and maintain accurate asset visibility, condition assessment, and information
Not Provided	4.8	Perform data analysis to optimize infrastructure investments at the lowest life-cycle operating cost
Not Provided	4.11	Develop and manage a comprehensive airfield infrastructure plan that incorporates expected condition, mission requirements, and phased improvements
Not Provided	4.12	Develop a complete explosive site plans and route to the appropriate level for approval
Not Provided	5.1	Adapt standard designs to meet user requirements and site considerations
Not Provided	5.5	5.5. Design an airfield in an expeditionary environment for construction or repair
Not Provided	7.1	Develop and execute plans to mitigate mission impact during unplanned utility service interruptions
Not Provided	7.2	Coordinate installation preparations that enable personnel to survive and operate in a Chemical, Biological, Radiological and Nuclear (CBRN) environment
Experienced	7.3	Translate mission planning documents and readiness guidance into unit readiness goals and tasks
Not Provided	7.4	Develop and execute a Prime BEEF home station training program that meets unit readiness goals and tasks
Not Provided	7.5	Develop and maintain engineer portions of installation contingency plans
Not Provided	7.6	Lead Civil Engineer Unit Control Center (UCC) operations
Not Provided	7.7	Serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC)
Experienced	7.8	Organize and direct airfield recovery activities
Not Provided	7.9	Validate and interpret CBRN modeling and mapping for senior leaders
Not Provided	8.1	Lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability
Experienced	8.2	Assess and evaluate infrastructure capability, condition and capacity of potential operating locations to inform decision makers and mission owners
Experienced	8.3	Develop an expeditionary bare base design
Experienced	8.4	Coordinate acquisitions and logistics activities to support an expeditionary base beddown
Not Provided	8.6	Facilitate transition to operational contract support at a contingency location
Experienced	9.1	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability
Not Provided	9.4	Lead small unit engineer activities under mission command orders in a contested environment
Not Provided	10.5	Collaborate with support organizations to maximize their support to the installation mission requirements
Not Provided	10.9	Cultivate a positive command climate based on trust, mutual respect, inclusion, safety consciousness, and stewardship of government resources
Basic	11.1	Formulate Civil Engineer strategy and policy objectives under the National Defense Strategy and Air Force Strategic Master Plan and translate requirements into published guidance
Not Provided	12.2	Ensure compliance with standards, laws and regulations through the commander's inspection program

Appendix 18: Civil Engineer Career Field Survey Results Competencies by Rank (Cont.)

Civil Engineer Career Field Survey Results: Competencies by Rank		
Proficiency Level	**Competency Number**	**Competency**
Senior Captain (7-10 years)		
Not Provided	1.3	Facilitate the force development for Civil Engineer officers to attain the desired proficiency level of each Occupational Competency
Not Provided	4.6	Organize resources to produce a comprehensive base master plan
Experienced	9.2	Navigate staff relationships to acquire resources and authority for engineer activities in a joint or coalition organization
Experienced	9.3	Organize Civil Engineer efforts when divesting infrastructure to the host nation
Not Provided	10.1	Translate policy and guidance into prioritized operational and tactical objectives
Not Provided	10.2	Ensure highest state of unit readiness by organizing, training, equipping and reporting on assigned UTCs
Not Provided	10.3	Direct execution of Civil Engineer resources to meet functional and operational mission requirements
Not Provided	10.4	Advocate for resources required to execute mission priorities and explain risk to mission for unfunded requirements
Not Provided	10.6	Anticipate emerging requirements across the installation functions and incorporate into the Civil Engineer work plan
Not Provided	10.7	Lead EOC operations and coordinate response to contingencies
Experienced	11.2	Develop and manage civil engineer plans and programs to achieve mission requirements
Experienced	11.3	Provide guidance to joint partners to enable the proper employment of AF Civil Engineer capabilities
Experienced	11.4	Operate within the Congressional cycle by communicating Civil Engineer requirements, resources, and risk to influence the defense appropriation and authorization acts
Experienced	11.5	Advocate, support and defend Civil Engineer resource requirements within assigned program of record when developing the AF POM position
Not Provided	12.4	Communicate and deliver expertise, capabilities, and resources to MAJCOMs and squadrons to support installation mission requirements
Not Provided	12.5	Lead and participate as an innovative, critical thinker in operational planning teams to continuously improve operational capabilities

Appendix 19: Delphi Study Round 1: Question 1: Component 1 Full Responses

CE CGOs are developing educational plans with their superiors

1. Based on my empirical assessment of hundreds of CGOs I have been in touch with in the AFCENT AOR I would guess that fewer than 5% of CGOs are developing education and training plans with supervisors.
2. I believe that some CE CGOs may be developing educational plans with their superiors but unfortunately, I believe it is inconsistent based on the personality of the CE CGO and his/her superiors, and whether the officer is active, guard or reserve. Additionally, I suspect not all CE CGOs are aware of, let alone have reviewed, the CFETP or available courses in adequate detail to plan their education and engage their superiors.
3. IMO, this depends on the commander/supervisor and their experience and their willingness to make and take the time to mentor their officers. It also depends on officer's personal desire to continue their formal (Master's/PME) and career field education (AFIT, Satellite) or other courses to included certifications such as PMP or PE which are encouraged but not mandatory. I think career milestone plans, with key educational goals included along the timeline, are created, but specific career field education plans are not the norm. This may be stronger in other career fields such as Maintenance where certifications are key to advancement from a competency perspective…for example, the Aircraft or Missile Maintenance processes are more deliberate and AF CE should do the same.
4. I don't think that is happening at too many squadrons. It will take a culture change to be successful. Squadron CC's have not grown up like that and, since they have not grown up with plans, they may not think they are necessary. I believe they are necessary. I believe the CFETP should provide an outline to that affect to help the Sq/CCs develop that plan for their respective CGOs. It'll largely be template but there should be room for branches and sequels to one's career.)
5. I suspect it runs the entire spectrum from no involvement to high involvement. My best guess is that it doesn't happen as much as we'd like. If it's not a requirement and it isn't checked, it usually doesn't get done due to the day-to-day activities that tend to consume our schedules.
6. If at all, I think this is loosely part of mentoring but not as highly prioritized when populating the career field timeline. Mandatory drivers such as PME, AAD, and Command window often drive the conversation—especially on the Reserve side with limited time during UTA and Annual Tour. On the plus side, technical competence and professional registration are highly valued for many Reservist employers, where I imagine this educational planning is mainly accomplished.
7. – probably not very well. It should be discussed during feedback sessions, but detailed timing of plans is probably not completed consistently across the force.
8. I do not believe CGOs are developing educational plans with their superiors.

Appendix 20: Delphi Study Round 1: Question 1: Component 2 Full Responses

CE CGOs are being allowed to attend courses that develop them for their current positions and/or develop them for other positions

1. Furthermore, I also do not believe that more than 25% of CGOs/FGOs are attending courses at the CE School to develop them for current or future positions.
2. Pending mission requirements, conflicts with their civilian jobs for our guard and reserve CE CGOs, and resource constraints, I believe that most of the superiors of CE CGOs would allow, if not encourage, CGO attendance of courses that are appropriately timed for their development. By appropriate timing, I would not expect a superior to support a LT's attendance of a FGO-level course or an Industrial Engineering college major attending a graduate level electrical engineering course, while supporting the attendance of a course for which the LT fulfilled the prerequisites.
3. Generally, I think the courses are available and officers are being allowed to attend, but again, there needs to be active leadership and/or an officer interested in career field education to make that happen. There is no forcing mechanism to ensure this happens. As an aside, since there is no forcing mechanism, it can affect the long term competency of those who don't follow the traditional career path. This is one of the areas where this would better prepare our CE officers who leave the career field for a number of years and later come back into CE (a technical career field) and are put in leadership situations not having sufficient career field educational competency. They make do and most do fine, but we could do better.
4. I don't think that is the case. I believe it should be the case. It should be linked to the developmental plan. I attended a Programming Course when I was assigned to be a programmer. I attended a Construction Management Course when I was doing construction management. I attended the Readiness Flight Commander course at Ft. McLellan, AL and then went to the course at AFIT. Each of those courses, while taking me away from my primary duty station, ultimately made me a better, more prepared, officer and leader in those respective arenas. We need to ensure our Squadron Commanders recognize that and provide our officers opportunities to develop/grow/get educated/network.)
5. I believe there is very significant support for CGOs to attend training courses, provided it doesn't conflict with deployments, mandatory exercises, other higher priority items.
6. This is a very "leadership specific" question, which relies on a number of variables to include ops tempo, unit funding, and timing.
7. – I think AFIT and other professional development courses are still valued by AF Civil Engineers and our CGOs are encouraged to attend.
8. CGOs are not planning to attend courses thus it is not a matter of being allowed or not.

Appendix 21: Delphi Study Round 1: Question 1: Component 3 Full Responses

Do you believe that the current educational development is adequate to meet the needs of the career field and the Air Force?

1. Finally, I do not believe the current system of NON-Mandatory attendance to CE School courses is adequately meeting the needs of the career field, and has had detrimental effects in deployed environments where we do not have civilian employees with years of experience to provide the continuity / training to CGOs
2. I believe that only requiring CGO attendance of WMGT 101 is woefully inadequate. As a functional community, we should be able to program and require attendance in courses needed for the CGO to excel in a newly assigned position or one that the officer is forecasted to fill in his/her next assignment or deployment (e.g., if a CGO is projected to deploy into an environmental element position, he or she should be required to attend the corresponding AFIT environmental course in addition to 40-hour HAZWOPER as a minimum. The CFETP Part II. Section B paragraph 2 listed courses should be mandated based on the time and/or position specified in the various sub-paragraphs. Finally, we do a disservice to our young engineers when we fail to provide them the training and/or experience to enable their achievement of a professional engineer's license or other commensurate certification. When we deploy a 32EXC civil/32EXE electrical/32EXF mechanical engineer, I expect him or her to be a full-up round in technical terms—note I specifically denote the shred out AFSC and not 32EXG. Specifically, a CGO with an 32EXE electrical engineering major should attend AFIT's electrical engineering course; likewise 32EXF mechanical engineers while 32EXC civil engineers should successfully complete the Pavements Class.
3. No, more deliberate career field development is needed. We could use the development of the CE 5 and 7 level enlisted force as a template to be more deliberate.
4. No. We need to provide a few more courses…designed at the right time in officer careers…for growth and skillset development. Additionally, this basic foundational theory then is turned into Policy at the officer's 15 to 25 year point.)
5. I believe the current educational development is adequate
6. I believe that the opportunities are available to pursue education and training in specific areas such as pavements evaluation and design. However, it is unrealistic to mandate a field of study that encompasses technical competencies across a wide-ranging spectrum. Our career field degree requirements serve as an initial screen to ensure foundational expertise in one of several engineering disciplines.
7. – due to the changing nature of technology and the Joint Force, our current educational development is adequate but not where we need it to be.
8. The education development opportunities are adequate with the exception of educating our officers to lead a Readiness and Emergency Management Flight.

Appendix 22: Delphi Study Round 1: Question 2 Full Responses

The Competency-Based Educational Model has been mandated for Airman development. This educational model would revolve around establishing a set list off competencies, proficiency levels for each competency, a development timeline, and the tracking of CGO capabilities against these competencies. This educational model can be seen as a large deviation from the status quo. In your opinion, how will tracking specific competencies and proficiencies impact the effectiveness of CE CGOs?

1. In my opinion, this sort of CFETP STS driven training and educational requirements is VITAL to helping our CGOs and their supervisors and Sq/CCs deliberately ensure they are ready to support their garrison squadron/base but more importantly that they are fully prepared to LEAD in deployed environments our enduring bases and contingency locations that replicate our CES organizations. This is consistently identified as a chronic problem for our ECES' in the CENTCOM AOR.
2. I don't believe that tracking specific competencies beyond looking at a CE CGO's major and the positions and amount of time in the position is necessary. My assumption is if a CGO is a mechanical engineer and has been doing design work in RED HORSE or a CES for a year, then superiors should be able to make a decision on appropriate work or a job for that CGO based on his or her performance, his college engineering major, prior experience and training/certifications. In my opinion, tracking a set of specific competencies is helpful in guiding an officer's development but we tend to do this already when CE Senior Leaders meet once/twice a year to vector officers and leverage the "bubble" chart to see what key jobs an officer has done and what are the gaps. Moreover, in many cases, I think a CE officer who has broader experience across several squadron flights versus one who has achieved experience in a singular flight like Engineering, is better prepared to command a squadron.
3. It IS a deviation from the AF CE status quo, but it's the right way to develop Civil Engineer officers with targeted competencies. However, food for thought…with the breadth of CE missions, it may be difficult for all officers to complete the entire breadth of CE competencies unless it is either very deliberate development (fully funded mandatory courses) or possibly specialization in competency areas (the latter not recommended as a more senior CE officer is expected to know the full extent of CE responsibilities).
4. IMO, I believe this would enhance their growth and development. However, it should be targeted to only those top 10 to 20 skills we need them to have to: fight, build, sustain, develop, program, recover, etc. We cannot put 72 occupational competencies on the street and expect our officers to pursue all 72. Should be prioritized.)
5. I think it could have significant impact and is very intriguing, but I wonder to what extent would CGOs actively pursue these proficiency levels? Would completing these be tied to anything significant (IDE consideration, occupational master/expert badge, other?) As a hiring authority, I think seeing what proficiency levels officers have achieved (in addition to seeing previous assignments job positions held) could be helpful. I think it would be a very manpower intensive undertaking to track, monitor, and update members' records to reflect achieved proficiency levels in certain competencies.
6. Just as the recent changes in 10-210 levied a large training burden (i.e.-requiring 100% of UTC to accomplish tasks such as tractor trailer certification that previously only needed a 30%) without capacity to conduct training; I would caution repeating this scenario by creating "checklists" that aren't backed by a requirement. As a member of a profession, why not leverage existing/recognized professional licensures or certifications rather than generate potentially hollow competency lists. Recognizing that there are a number of specialties within the career field, there could be a list of options to pursue prior to FGO (PE, AIA, LEED, PMP, etc.).
7. – While I think it is very important to measure/assess competencies, at this time, I think it will be too cumbersome for individuals and supervisors/commanders to track both competencies and proficiencies.
8. I cannot envision how this would work. We would need a standardization & evaluation function along with a list of skills and associated performance standards. Why not use the already established professional engineer licensing process and continuing education credits to ensure competency?

Appendix 23: Delphi Study Round 1: Question 3: Component 1 Full Responses

Do you believe that these capability descriptions accurately portray actual requirements?

1. In my opinion, and having not fully reviewed the P-Plan for PAD 12-03 vol 1-3 (since it wasn't provided for this questionnaire), I believe that the word descriptions of what each CES Flight, Element does is helpful to determine the education and training required for our CE officers. The officer classification directory is pretty open ended but provides macro level info on the career field.
2. Yes I generally believe that the CFETP and AFOCD do a decent job in capability descriptions, except in the area of specifying training requirements for cross trainees from other career fields (e.g., 62XX). Do we expect a senior captain or possibly even FGOs cross trainees with a bachelor's degree in engineering to complete WMGT 101…if so, recommend specifically stating the requirement (see the 31P language on cross-trainees)—I've seen both senior captains and FGOs get assigned to CE squadron's especially in the Reserve Component get assigned to CE Units. Finally, although I reviewed and commented on PAD 12-03, I cannot claim proficiency of knowledge in the associated P-Plan and don't have ready access to the P-Plan.
3. Unfortunately, I am not familiar with the updated CFETP. Would like to see a current copy. Asking several officers, there was a mixed bag with most last seeing the CFETP when they were a Lt being told about it at AFIT 101 or shortly thereafter. The older CFETP was too general in nature with the CE career officer pyramid being the biggest take away. A few thoughts…it should more closely align to what is in CE enlisted CFETPs, which I believe are appropriately detailed and updated on a regular basis by experts in their AFSCs with AFCEC FDMs (in conjunction with the CFMs at HAF) leading the way compiling inputs from many sources in the field at all enlisted levels and tech schools. Assume the intent is for AF CE is following a similar model with CE officers to describe needed competencies, and in the future, continue to update on a regular basis. The AFOCD provides minimal input for this task. PAD 12-03 is not current, so it is not an accurate. And it does not address all CE core competencies in sufficient detail or based on current ways of doing business. You could argue that organization should not affect what CE core competencies are…but I would say it can influence the tools necessary to achieve those competencies. As an aside, although AFI 32-1001 has attempted to incorporate some of the details in 12-03, the current purpose of AFIs to be short and less prescriptive has caused gaps, some significant. And updating AFIs can be a slow and cumbersome process to keep up with career field duty and process changes.
4. No. I think officers may be familiar with the first two…but not the P-Plan. Perhaps these are all touched on in WMGT 101 but I don't hear officers talking about these often. Which goes back my culture comments.)
5. Can't say… not familiar with any of these documents.
6. Honestly, I serve as the Reserve 32E CFM (yes, I recognize this terminology is used more loosely in AFRC) and I have never heard of the last document. I do use the CFETP regularly and look forward to the updated version that is in the works. I have looked up the AFOCD and used it several times to advise on degree waivers for the career field or to see if the non-engineer EOD shred is still an option in the recognized source document—but this document is not something that would guide a young officer.
7. – No. The AFOCD for CE hasn't been updated since 31 Oct 10 (introduction) and 2015 for context. I think it probably does an ok job with AF CE in "general" but nothing gets close to the new idea of technical competencies.
8. Can't provide an informed answer. Its been awhile since I read PAD 12-03 and I need to find a copy of the CFETP.

Appendix 24: Delphi Study Round 1: Question 3: Component 2 Full Responses

Are there any additional capabilities which should be listed?

1. As CE officers we need to be knowledgeable across the various missions sets the typical CES provides to the wing, base, joint team. There are things officers should KNOW for each element/flight and things each officer should be able to DO / PERFORM across the spectrum of capability requirements. Additionally, there are warfighter skills that CE officers must also know and perform. Many are outlined in or are required in AFI 10-209/210 RH / Prime BEEF Programs. Finally, These various capaiblities/tasks should be arranged into a Specialized Training Standard (STS) just like our enlisted CE AFSCs are so there is a roadmap for the officer, supervisor and Sq/CC to ensure they get trained/educated on tasks/skills/knowledge at certain levels throughout their LT / Capt / Maj / Lt Col levels of development.
2. I believe we should re-consider and implement a requirement for CE officers to achieve before pinning on O-4 either an Architect's or Professional Engineer (PE) license, Project Management Professional (PMP), Certified Construction Manager (CCM), or possibly an environmentally related certification (BCEE, BCEEM, CEP, NREP, etc). This will drive a more deliberate educational, training and experiential development program for CE officers.
3. I think we got the majority of them. My only recommendation would be to bounce this off of our Sister Service competencies and ensure we are not duplicating effort or crossing where we shouldn't be crossing.)
4. Can't say… not familiar with any of these documents.
5. – I would like new perspective on registration (FE, PE, etc), and if we still care that EOD-Q officers are engineers (there are still some prior-enlisted EOD techs that would like to be CE officers but don't have engineering degrees that qualify).
6. Can't provide an informed answer. Its been awhile since I read PAD 12-03 and I need to find a copy of the CFETP.

Appendix 25: Delphi Study Round 1: Question 3: Component 3 Full Responses

Are there any capabilities which are not needed?

1. I think housing management, including dormitory management, should be fully divested to a privatized entity, or possibly reassigned to FSS. Most CONUS MFH is already privatized, while dormitories should likewise be able to be privatized similar to how the Army privatized its lodging operations to IHG (i.e., Holiday Inns).
2. Perhaps. Perhaps not. See above. I think AF Engineering is pretty clear….we open, establish, build, defend, sustain, operate, maintain, divest bases. If our capabilities are not tied to those basic warfighting requirements then we can probably divest ourselves from them.)
3. Can't say… not familiar with any of these documents.
4. – Probably all/most are still needed, but will have to be prioritized in some way to allow you to get after competencies.
5. Can't provide an informed answer. Its been awhile since I read PAD 12-03 and I need to find a copy of the CFETP.

Appendix 26: Delphi Study Round 1: Question 4: Component 1 Full Responses

How competencies and Proficiencies are evaluated?

1. I fully believe that we have successfully developed Enlisted CFETP STS Upgrade Training requirements, tasks, conditions and standards. This allows for the force to be consistently trained, evaluated and certified on their knowledge or skill/performance of tasks. Officers can and should be handled in a similar manner.
2. I believe that local adaptations, especially for CE CGOs in guard, reserve or non-traditional CES or RED HORSE squadrons—e.g., a lone CE CGO assigned to a CRG, TRS, or other unit where he or she may be supervised by a non-CE officer—will mean a standard proficiency baseline will experience creep or dilution.
3. Given the difference in local training environments and what tools, equipment, scenarios and other methods are available could affect how evaluations are conducted or if they can even be fully successful in meeting a desired objective. Although Civil Engineers are very adaptable to their situations and surroundings and will succeed (a core competency?), there should still be a minimum achievable proficiency that can be measured in a repeatable way. This necessitates core courses taught in residence or distance learning to achieve a common understanding and proficiency level that can be effectively evaluated.
4. They will happen. State regulations are different. Country requirements are different. Especially in environmental arenas. I think if we focus our competencies on generalized requirements we, as engineers, will figure out the local adaptations as necessary.)
5. It would likely cause additional work to how proficiencies are evaluated. If "county options" are allowed, then the proficiency evaluator would have to first be familiar with all Air Force accepted practices and then determine how each of those practices would be evaluated.
6. The Civil engineer career field is comprised of a diverse array of disciplines; thus my earlier comments that we should focus on developing professionals that achieve recognized industry standards rather than increased emphasis on proficiency across a wide range of competencies is the most realistic and sustainable way ahead.
7. – Local adaptions will play a large role in evaluation; they have to. The danger is everyone will do them independently if allowed and you won't be able to compare "CGO A" to "CGO B."
8. Local adaptations should be additive to the basic competency. The standard competency should have a standard proficiency evaluation. Additives are up to the local squadron commander to define.

Appendix 27: Delphi Study Round 1: Question 4: Component 2 Full Responses

Do you believe that current squadron commanders are capable of performing standardized evaluations of competencies and proficiencies?

1. However, they will be required to complete training and education to get "signed-off" on tasks by experts across various flights in a CES. Ex. Fire Department education and training tasks that a CE officer should be completing will require the officer to work with the Fire Dept training section and Chief to complete those items to the standard laid out in the CFETP STS. Likewise, a officer may get trained and signed off by a GS-09 in R&O section on any tasks listed in the STS for the officer to know / perform at the appropriate rank level.
2. Yes I believe current active duty CE and Reserve and Guard AGR squadron commanders are capable of performing standardized evaluations or know which resources (e.g., other CE military and civilian peers and superiors) to tap to assist them with their evaluations. I'm not convinced that all traditional reserve squadron commanders have the same foundation when in some cases; they fill a squadron commander billet the minimum one year consisting of 24 days IDT and an annual tour before they get "promoted" to a Colonel billet.
3. This would be a mixed bag…with many interpretations of how to measure proficiency...or how important it is to measure proficiency against a standard…consistently. However, we should trust our leaders who are selected to lead our Airmen, so with descriptive guidance this could be achievable. To be quite honest, there also needs to be an understanding that this is not a competition, but a tool used to ensure our CE officers are ready to accomplish the mission and perform competently in core tasks. Also, much thought would need to be given for the non-traditional jobs or even jobs outside the CE squadron, how and by whom would those officers be evaluated?
4. Not quite yet. I think it may require a AFIT education push to fully explain what we are trying to get to with standardized evaluations of competencies. That is, everyone must understand the intent of the competencies and proficiencies. Which, again, leads to keeping it relatively simple and more focused on warfighting skills. The basic building blocks of Combat Engineers; across the Full Spectrum of Readiness.)
5. Yes, but only if the evaluations are significantly standardized.
6. While Sq/CCs are capable, I don't believe they have time to serve in this oversight capacity. Considering that our Reserve CES/CCs, as well as most officers, are almost all TRs, they only have 2 days during monthly drill to run the unit and ensure readiness training is accomplished. Officer technical competency must be assumed, because any available time for mentoring will likely need to focus on military necessity. Adding additional requirements is not sustainable within the current Reserve construct.
7. – Only if provided tools to do so; otherwise, evals will not be standardized across the force. This will be a disservice to our CGOs that have theoretically worked hard to be evaluated.
8. No. Squadron commanders need either 1) a standardization and evaluation position or 2) a centralized board to nominate officers to when ready for eval

Appendix 28: Delphi Study Round 1: Question 5: Component 1 Full Responses

What is the definition of "Combat Engineering" from the AF CE perspective?

1. AF CE is designed to perform General Engineering and Geo-Spatial Engineering under combat conditions.
2. Combat Engineering encompasses contingency/expeditionary construction and beddown and operations (including hardening and splinter protection), disaster preparedness (including preparations and operations in a CBRN contaminated environment), base recovery after attack operations (including UXO and/or IED clearance) and base denial.
3. Difficult question. Same as to how do we explain how AF CE should be termed 'warfighters.' We provide both combat support and combat operations (as detailed below.) Currently, I agree AF is thought of as more 'combat engineering support' at MOBs/COBs whether the AFCENT or PACAF AORs. We also hat JET and IA taskings in the recent past which put Airmen that would not normally be in direct fire situations. In any case, AF CE should always be prepared to be directly involved in 'Combat Engineering' roles. BL, we wear the uniform to be able to respond when and where needed.
4. To me, "Combat Engineering" is how Air Force Civil Engineers enable the Air Force and Joint warfighting missions. It is everything required to enable a stationary power projection platform. This is COMPLETELY DIFFERENT then how an Army Engineer or a Navy Engineer looks at a problem set.)
5. I view combat engineering as something Army engineers conduct whether it deals with route clearance or supporting maneuver. I do not believe Airmen engineers conduct combat engineering with the exception of EOD. I believe we are combat support engineers. Refering to the joint engineering doctrine, there's a difference. When I was assigned to the CE School, I helped facilitate the WMGT 590 Joint Engineer Operations Course, so I'm a big believer in the joint engineer definitions.
6. We must evolve our thinking about "combat engineering" from the Army centric model employed in Iraq and Afghanistan (removal of objects for maneuver) to more accurately reflect the reality of modern warfare. We operate and recover the installation as a weapon system from which we launch combat sorties to sustained cyber effects. Additionally, the installation support mission also delivers indirect support from hardened aircraft shelters and infrastructure defense in the current permissive CONUS environment.
7. – I still think we align with the Army and JP 3-34 definitions of combat engineering…mobility, countermobility and survivability.
8. Engineers provide maneuver space for combatant commanders. "Combat Engineering" is the action of creating maneuver space in the battlefield environment.

Appendix 29: Delphi Study Round 1: Question 5: Component 2 Full Responses

Does AF CE perform Combat Engineering?

1. They typically do not support ground combat elements in direct contact with enemy direct fire weapons. That would typically be a Sapper or Route Clearance Company mission. (That's essentially the Joint Engineer Pub definition/caveats). However, AF CE does directly support air maneuver forces which are our aircraft weapon systems that must project power from airbase weapon systems (think Aircraft Carrier on land) in permissive, semi-permissive and non-permissive/contested joint operational areas. AF CE provides planning, programming, design for horizontal and vertical maintenance, repair and construction troop labor and contract work. We also provide installation management of real property, environmental, housing and resources, as well as emergency services functions including firefighting, emergency mgt/CBRN and Explosive Ordnance Disposal. Our engineer forces are also trained to respond to enemy attack to recover our airbases/bases in general by performing expedient troop construction/repair/recovery often in UXO/Explosive hazards/CBRN environments. We are also performing engineer missions at forward contingency locations where in-direct fire, IEDs, and yes direct fire enemy attacks can occur on the base or during a convoy operation or off-base construction site.
2. Definitely.
3. Yes, there are examples where AF DOES perform combat engineering. The reconstruction of the runway at Q-West was Air Force Combat Engineering in a combat zone. Syria is another possible example. As well, we have current beddown which although could be explained as combat support…the ability of AF planes to deliver bombs on target or timely ISR to our warfighters on the ground in austere locations or close to or past front lines, don't exist without a suitable airfield. Saudi Arabia and Africa provide other current examples. Obviously performing these types of missions is not the daily norm for AF CE in combat operations, but it should be in the mindset of the officers being educated/trained that Air Force has civil engineers capable of 'Combat Engineering.'
4. Generally, yes. We have been. Some of our Base Recovery After Attack (BRAAT) skillsets have absolutely eroded and atrophied but, generally, yes. It is and should be our bread and butter.)
5. Please refer to last response.
6. Absolutely. If we didn't perform combat engineering, there would not be a military necessity to keep uniformed engineers. See above answer—we need to be more active in how we define "combat" as a Service—perhaps start with criteria for combat action badge?
7. – No, not as defined by JP 3-34.
8. Yes

Appendix 30: Delphi Study Round 1: Question 5: Component 3 Full Responses

Do we appropriately prepare CE CGOs to perform Combat Engineering?

1. Although there's always opportunity for improvement, I think the combination of AFIT's 485 course and the Joint Engineer Operations Course (JEOC) do a good job at providing foundational training and are enhanced with home station training, exercises, and non-combat deployments.
2. Overall, we do not fully prepare Air Force CE CGOs for "true" Combat Engineering roles. Operations such as Al Udeid or Al Dharfra color what AF Civil Engineers think about when performing engineer roles in a deployed environment. Given some of these locations are no longer coded as combat zones adds to this paradigm. Our exercise programs also do not prepare our officers to perform in combat environments…'recover the base' or 'fight the base' is more of the paradigm followed today.
3. I'd say we could do better.)
4. No and I don't think we necessarily should be… would suggest keeping this training in the "just-in-time" training bin
5. There is definitely room for improvement. Current emphasis on "return to readiness" is timely and necessary for our junior officers to understand, articulate and even advocate for the military necessity of maintaining a uniformed engineer force. Part of that advocacy is better defining our contributions as combat engineers to opening, operating, and recovering Airbases.
6. Not fully, but AF engineers are still the preferred engineer force in the deployed environment. May not be until we get back into C-IED and similar environments that it will really matter.
7. Yes; but, not the full spectrum potential actions. CGOs need the skills to read an OPLAN, determine how to best build maneuver space for the plans success, then provide foundational engineering skills to include design, construction, and project management.

Appendix 31: Delphi Study Round 1: Question 6 Full Responses

According the Air Force Publications, Civil Engineer Officer Badge upgrades occur purely based on time within the career field, rather than due to specific capabilities or skills. Do you believe that competency-based education could and/or should be used to evaluate when a Civil Engineer Officer is prepared for upgrade to Master and Expert Badge Levels?

1. In my opinion, YES. I think there should be some sort of incentive to complete your education and training requirements in line with how the enlisted force achieves their Senior and Master badge. Requiring a Sq/CC to certify that a CE officer has earned their Senior and Master badge in AFTR / in their CFETP / STS would be the enterprise wide proof of competency at key milestones in a career. It could also be used by a Sq/CC regarding who are their strongest / top performing / best CGOs / FGOs when OPR time comes…ie are they proceeding well in training/education/development or not.
2. First, I believe we have a Senior and Master Badge but no "CE Expert Badge." Although it may at first sound good at having specific capabilities/skills/ experiences, I think we over complicate things and unnecessarily add to the administrative burden. I would expect that someone with net (not counting time in another specialty for those who may have cross-trained) seven and 15 years in the career field should be adequate for active duty CE officers. However, I think Guard and Reserve CE officers may require more time in service, especially when a traditional guard or reserve officer may have only 24 days IDT and their annual tour. As an added comment, although I agree that all CE officers should take the Facility Systems Design Course as specified in paragraph 2.2.3, I don't believe that CE officers without a civil engineer degree should automatically take the pavements courses specified in 2.2.1 and 2.2.2. Rather these two courses as well as 2.3.2, 2.3.3 and 2.3.4 should not be treated as "general engineering courses" that an architect or industrial engineer can take. Why do we undervalue civil engineering education in contrast to electrical and mechanical engineering degreed officers? Pavements design and construction should require a technical education competency encompassing a more detailed understanding of soil mechanics, hydrology, etc that those with civil engineering degrees possess. These five courses (2.2.1, 2.2.2, 2.3.2, 2.3.3 and 2.3.4) should be taken in the first 2-6 years but based instead on the college degree of the individual officer. The remaining courses in paragraph 2.3 should remain position-based and open to all CE officers based on the specified timeline.
3. In the past the Master badge was tied (at least loosely) to attendance at WMGT 585 at AFIT. I believe the award of the badge should be connected to a milestone educational event that signifies a major accomplishment. This would help solidify the importance of career field education. Perhaps you should ask this question to Dr (Maj Gen, ret.) Todd Stewart who wrote the heraldic significance and was instrumental in the CE badge creation. Just a thought…
4. I think the basic badge should remain as is….that is, earned AFTER successful accomplishment of BOTH WMGT 101 and the accompanying field trip to Silver Flag. That shows both theoretical accomplishment and practical achievement.) For both the Master and Expert Badges, I think they should be tied to both achievement in an educational training program and time. That is, we could leave it at 7 years and 15 years respectively BUT the officer should achieve a set number

Appendix 31: Delphi Study Round 1: Question 6 Full Responses (Cont.)

of competencies that are accomplished through and OJT AF Form 623-like training plan.)

5. This has been considered before… challenge lies in having the resources to implement something like this. I think it would take a lot of work to connect competencies to wearing the master and/or expert badge. But I do think the career field would value something like this particularly when it deals with hiring a new officer to an organization.
6. Curious, have any other career fields leveled competency based upgrades for their badges? If we ensure meaningful training and experience during assignments to engineer units, then I believe the current system is working. The Master and Expert badge is a signal to time/experience in the career field. IN the Reserve, we have a number of cross-trainees from 62E or other AFSCs—as many Reserve officers serve in more than 1 careerfield. I do note the badge for an understanding of the amount of time served within CE.
7. – Not unless there is a consistent/deliberate/defined evaluation criteria. We tend to make things too hard on ourselves and say that we don't have enough time to grow our CGOs, but if we are now evaluating CGOs on top of everything else, we may have gone too far. I'm just ecstatic that our CE officers actually want to wear their badges and are proud of them (unlike a lot of AF AFSCs that DO NOT wear badges)…we shouldn't do anything that would detract from this or make it too difficult to be proud to be an engineer.
8. Yes. How and who assesses skill level will be a challenge.

Appendix 32: Delphi Study Round 1: Question 7 Full Responses

The CFETP presents a series of recommended courses and a timeline of attendance for CE Officer development. To what extend do you believe that CE CGO capabilities should be standardized by mandating competency attainment dates, as in an educational timeline?

1. In my opinion, the less we leave it up to the member and over tasked supervisor/Commander to figure things out the better. Plus it helps drive the "why do you need this…we really can't afford you to be gone for XX weeks" excuses.
2. As previously stated, I believe that the Formal Education courses listed in the CFETP Part II, Section B, paragraph 2 should be mandated as specified for active duty and Reserve and Guard AGR positions—some of which are timeline driven as in paragraph 2.1, 2.2 (exception as stated in 2.f.ii above) and 2.7; while others are position driven as in 2.3-2.6, etc. The timeline driven requirements will likely have to be modified for Traditional Reserve and Guard CE officers to account for their limited availability of 24 days IDT and their annual tour.
3. There should be some guidelines for attaining competency. There are many different situations, but standardizing without being overly prescriptive would fulfill the intent that all 32E primary AFSC CE officers attain competency by a specified time in their careers. As in item f above, this could be tied to achieving Master and Expert CE Badge levels.
4. See above. They should be linked. However, there will always be exceptions and I'm not sure how we deconflict those exceptions.)
5. I think it would be helpful and interested to see what it would look like. We expect so much out of our CGOs and it really depends on the assignment. The competencies I expect my officers to have on the staff are somewhat different from a CGO at base level or RED HORSE assignment. From a practical standpoint, it makes sense to create something like this and I can see how it could benefit both the CGO in terms of what they should be able to do by the end of a given assignment and the supervisor in terms of what their subordinate should be able to do and what they as supervisors are responsible for in terms of providing training.
6. In order to better analyze this need, I would suggest evaluating what jobs (i.e.-programming) that we expect all officers to understand and then look at what capabilities are required (basic project scheduling and cost estimating). But this would require a coordination effort. For example, Reserve engineers rarely have an opportunity to serve as project programmers because we do not retain a home station installation support mission. Thus, reference my earlier point that there must be a careful balance in demanding breadth and expecting depth within the diverse disciplines within 32E.
7. - Only if it is tied to a badge upgrade (see comment above).
8. Competency based Civil Engineer Officer Badge upgrades should drive the educational timeline. Squadron Commanders should prepare their officers to upgrade to Master within "X" years and Expert within "Y" years.

Appendix 33: Delphi Study Round 2: Question 1 Full Responses

Number of Competencies: There were 96 original competency-based tasks generated from the Pilot Study, which were reduced to 73 prior to the survey. Based upon responses within the previous round of the Delphi Study, panel experts indicated that the number of competencies, no matter how essential they are, may be too many to address in an educational development model. In your opinion, how many competencies do you believe are realistic?

a. I believe that competency-based tasks for CE CGOs could be boiled down to 15 or less tasks. For the one listed, the following resonated with me: 2.3, 4.1, 7.6, 8.2, 11.2, 8.1, 8.3, 2.1, 5.5, 7.7, 7.5, and if modified 9.4 after replacing "contested" with "contingency". Rather than competency-based tasks unique to CE CGOs, a number of tasks were too specific to a particular job in a particular organization (e.g.., 3.3, 3.5, 4.3, 4.10, 4.12, 7.1, 7.4, 9.3, 10.9, 12.4, etc.,) or they were general skills most CGOs—not just CE CGOs—should have (e.g., 1.1, 6.4, 7.3, 10.1, 10.2, 10.4, 10.5, 12.2, 12.3, 12.5, , or were not grade appropriate for a CGO (e.g., 10.8, 11.1, 12.1, versus competency-based tasks.

b. We have six flights in a typical CE Squadron. There are competencies required for 32Es to run those functions in garrison (with lots of civilian help) and deployed where it is all on them to run a ECES. Also, if you just took a look at the Enlisted CE AFSCs CFETP STS you would probably find the right sorts of 32E Competencies. Some of the CE Civilians Series also have CFETPs and maybe that could also be used for things. Additionally, there are competencies for 32Es to have when working on a HHQ staff job. However, most of that knowledge, skills and abilities should be focused on programmatic management knowledge of the various CE mission areas executed at base level. The whole idea that a specific number is too many/not enough is not relevant to the development of a CFETP STS section. What do we need officers to Know and Do in order to run a CE Squadron and then to serve as a Engineer Staff Officer on various AF and Joint Engineer Staffs.

c. This is a difficult question to answer as Civil Engineers are responsible for a myriad of competencies required for the AF mission. However, many are not necessarily core competencies for officers…and the first time an officer may be truly exposed to many of these competencies (aside from the odd job an officer may take on due to opportunity or mission needs) is as a CE Commander. And when one attains Commander, there are other experts within the squadron/unit that a Commandeer can reach to for input to use alongside their experience when a decision is required. In any case, 73 is definitely too many … I would suggest comparing to how many competencies are required for most CE enlisted career fields or, if data is available, other officer career fields. This could give a rule of thumb. With the joining of AFSCs such as Personnel and Services, this is probably not just a CE issue. Possible they can also provide insight into a correct number. My off-the-cuff suggestion is no more than 30-40 (though still seems high) or so with an emphasis on military unique or specific competencies that as military officers we should focus more heavily on.

d. I think we should work hard to consolidate and then provide our officers with 20 or so broader competencies that they can remember

Appendix 33: Delphi Study Round 2: Question 1 Full Responses (Cont.)

e. This is an interesting question that caused me to think much longer than I thought I'd need to in order to answer. I don't think you can give all 73 defined competencies the same level of attention as I don't think the CE School/Grad School/USAFA have the resources to develop single courses for each of these competencies. But they could be prioritized or perhaps binned into overarching competencies or bodies of knowledge. We have the PMBOK – Project Management Body of Knowledge. Why not have an AF Civil Engineering Body of Knowledge? I didn't put additional thought into it, but I'd like to believe the 73 identified competencies could be grouped into 4-6 overarching competencies that can easily be used to answer "What do Air Force Civil Engineers do?" When developing courses at the CE School and convening Education Working Groups, we'd conduct "clustering" activities from the working group's identified topics that would lead to identified "bodies of knowledge" for the continuing education course… maybe this could be similar? But returning to the original question, I do think all of the identified competencies can be addressed in an educational development model. It's a matter of what level of attention it receives. For example, a particular competency may warrant an entire 1-week course; it could be a single block of instruction; or it could be a simple activity or in-class exercise. Using a book analogy, a competency could warrant an entire book, a chapter, or a single section. I think the school needs to determine the level of effort needed for each competency and then adjust based on student and career field feedback.

f. I think 50-75 competencies, before a CGO pins on Major, is realistic

g. 15 (Pareto principle)

h. I think 30-40…maybe up to 50 but I 73 is too many…if everything is important…and I don't know that there is enough time to get every CE officer competence (let alone exposure) to every one of the listed competencies. It also appears the competencies are targeted at different grade levels, perhaps some could be combined and generalized more.

Appendix 34: Delphi Study Round 2: Question 2: Component 1 Full Responses

The Air Force Personnel Center maintains current CE CGO & FGO position allocations but does not record allocation levels over time. A condensed version of the AFPC allocations are attached. The data supports that the vast majority of CGO positions, 82.26%, are allocated for the squadron level. Do you believe that there are crucial non-squadron skills that CE CGOs should develop early in their career?

i. No. The squadron experience provides the opportunity for CGOs to hone their engineering technical competencies, leadership skills, management abilities and staff work/coordination proficiency.

ii. I full understanding on how to get help and who to talk with at the MAJCOM, AFIMSC, AFCEC and HAF staffs. They should be developed to understand Joint Engineer operations, capabilities, doctrine, operational planning process (JP-5 stuff), they need to be exposed to and work to learn all about the MSG sister units for sure and familiar with Wg Staff functions, OG and MDG and MXG mission and how CE supports that stuff.

iii. I believe the vast majority of CGOs should remain at the squadron level. There should be an emphasis by commanders to ensure officers get exposed to the several flights/duties and competencies that only exist at the squadron level. This should be done through initial squadron immersions for newly assigned Lts and assignment to multiple positions during time assigned. This is the only time we can ensure officers get the breadth they need at the ground level. We need to develop the technical and action officer competencies early in a career prior to positions of FGO leadership. With 2 or more years less as a Captain than in the past (9 years versus 11 years time in service), this time at the squadron becomes even more crucial to be used to grow CE competencies. I'm not aware of any crucial non-squadron skills to be developed early. One comment…an officer should learn to work and team outside their squadron with other AFSCs at an installation early in one's career.

iv. Not particularly; but, if we do, we should focus them within the AFIMSC and AFCEC arenas

v. No. The early years spent in the CE squadron are very important for our CGOs and will pay significant dividends for them when they return as an Ops Chief or CE Commander.

vi. I do find value in CGOs developing Executive, CAG or similar skills early. We do need to help AFPC clear up all the "Undistinguished" positions on the books. Duty titles mean a lot across the AF and we need to make sure we aren't inadvertently "penalizing" our CGOs to non-engineers that are reading their records.

vii. Yes, those non-squadron competencies that fall within the "vital few" (top 15) should be developed at the earliest opportunity

viii. I would first need to understand what "non-squadron skills" are. Some skills that I think are vital that may not be a focus in a squadron-level include communication skills like executive writing/briefing and critical, time-compressed thinking. These skills could also be gained in broadening assignments like Wg Exec jobs or ROTC instructor positions.

Appendix 35: Delphi Study Round 2: Question 2: Component 2 Full Responses

From those CE CGOs that are assigned to staff, 41% are assigned to AFCEC or AFIMSC. Are any special skills which should be developed in young CGOs which relate to these highly technical staff positions?

a. First, the question presents the disputable bias that the AFIMSC (including AFCEC) positions are highly technical. I disagree as many are simply program/project management and staff work. If you look at promotion rates, many may be surprised to find that CE officers in AFCEC and AFIMSC positions are behind their peers in O-5/O-6 promotion rates. This may possibly be due to the lack of exposure to the operational mission and to non-engineering stakeholders. Unfortunately, with the advent of AFIMSC, civil engineers are aligning more closely to their NAVFAC non-line Navy Civil Engineer Corps (CEC) Officers who are now struggling with their own relevancy to the Navy operational mission.

b. They need to attend the CE School technical courses which should be mandatory for all 32Es as CGOs (Figure out which ones everyone should have done while a CGO, FGO, etc). they need to understand the PPBS process, Joint Planning, Doctrine, improve writing and briefing skills…work on leadership and management of civilians/contractors…

c. Apart from Airfield Pavement Evaluation positions, most of which are young Captains that have had one base level position and then taken the appropriate Geotech Masters through AFIT's CI program, most AFCEC and AFIMSC officers are senior Captains that will be considered for promotion to Major prior to or just after departure from AFCEC or AFIMSC. Given that there are many less staff positions available for CGOs after the reduction at MAJCOMs, this is many times the first staff experience for our CE CGOs. Speaking on behalf of AFCEC, It is generally AFCEC's intention that all who come on staff (with few exceptions) can contribute immediately to the AFCEC mission in at least one area of expertise. Positions are assigned based on experience at previous assignments. This becomes more difficult when officers come to staff without being previously exposed to staff work. This affects their ability to be a "full up round" when they arrive having to understand the intricacies of staff work, not just the focus on their area of technical expertise or experience.

d. While at AFCEC or AFIMSC, they should still learn their primary warfighting skills…which may mean working closely with the supporting squadron at that location or going TDY to a base to take part in learning those skills; Planning, Programming, Budgeting, Execution (PPBE) skills should also be learned

e. Understanding the importance of the other staff functions and how they contribute to the mission. Many times, it is not just the bases the staff works with but also horizontally across the staff. In fact, there are quite often other staff agencies that have to be coordinated with in order to develop comprehensive solutions that will gain approval at higher senior levels.

f. Time management, Executive/staffing, and some type of technical (civil, electrical, etc) engineering skills.

g. NoT technical depth gained within the CES should prepare the CGO for a staff position; staff skills should be developed OJT.

h. Masters student answer…it depends. Not all AFCEC/IMSC positions are "highly technical," many are project and program management positions similar to what we had CGOs doing on MAJCOM staffs not too long ago. However, there are more technical positions (i.e. APE team) that absolutely need special skills.

Appendix 36: Delphi Study Round 2: Question 2: Component 3 Full Responses

RED HORSE positions make up approximately 6% of positions. In your opinion what RED HORSE capabilities should be developed in all CE CGOs?

i. Leadership of a small CE detachment/unit and cradle to grave management (including scope, budget, schedule, quality management along with related logistics) of a FSRM or non-MILCON project should be developed in all CE CGOs.

ii. Ideally we would have ALL 32Es do a tour in RED HORSE. Frankly we don't have enough RH units on active duty. Should have at lease one full RH Sq for each Geographic Combat Command and probably one for SOCOM. PACOM, EUCOM, CENTCOM, AFRICOM, SOUTHCOM. NORTHCOM has ANG RH and AFRC to cover it.

iii. The ability to use engineering skills (or other technical skills depending on degree) in their discipline to develop requirements, design and construct projects. This includes leading a team to construct such a project which can be done in most squadrons via the SORTS-reportable required annual Prime BEEF project (or more than one). This is integral to AF Civil Engineers skills in beddown and some level of construction capability whether Prime BEEF or RED HORSE.

iv. Leadership; warfighting; and all the capabilities that a typical RED HORSE has and already teaches the enlisted. However, the focus should be learning the capabilities across the breadth of RED HORSE and then learning to lead and problem-solve in a warfighting scenario across the Full Spectrum of Readiness

v. Ability to take a relatively simple O&M project from start to finish. This includes project definition; conducting a planning charrette that identifies and integrates stakeholder input into cohesive design intent; leading a cross-functional team of engineers to complete detailed design drawings; creating an accurate cost estimate; creating an accurate schedule that identifies activities needing significant lead times (and being able to continually update the schedule throughout the project); communicating project status to multiple audiences with engineer and non-engineer backgrounds using methods from industry; ensuring construction activities are conducted in a safe manner; understanding how to handle change orders; understand how to resource and conduct quality assurance; understand and develop criteria for determining when rework is necessary; and understand supply chain management since getting vehicles and materials to a deployed work site is one of the most challenging activities we do.

vi. Planning, programming, design, construction management.

vii. Competency 5.2

viii. Small unit troop leading skills, construction management, limited/expedient design, resource management.

Appendix 37: Delphi Study Round 2: Question 2: Component 4: Subcomponent 1 Full Responses

Currently, 24.35% of CE CGO assignment billets are rank misaligned, meaning that the position rank and the assigned individual rank do not match. The mismatchs between Captain and Lieutenant positions and actuals is about 52%. What level of concern do you have with the CGO rank mismatch of positions and individuals assigned?

i. I am not overly concerned, but no flight chief position should be an O-1, while certain flights should be O-3 minimum (CEN and CEO). Otherwise, assignment at grade or one below is permissible and should not be frowned upon.

ii. With MyVector and Talent Marketplace for job hiring / vacancy ads / etc I think we must get this cleaned up

iii. Generally, not a high level of concern. It's a leadership issue. With the few exceptions I am sure exist, it is a squadron commander and leadership responsibility to ensure the appropriate level of position (based on potential, experience and/or capability) is assigned to each officer. It would not take long to figure out if an officer does not have the experience and/or capability for a position. Though most rise to the occasion, changes can and should be made by leadership to correct as necessary.

iv. Not much

v. Not much, but I'd probably care more if I was the CE Commander who owned those billets.

vi. Very little.

vii. Very little

viii. Medium concern…some positions may be misclassified and for many positions the requirement is very dependent on the circumstances of the position (strength of supervisor, complexity of posn, visibility of posn) and the person (prior enlisted, prior experience, aptitude). A 1Lt in a Capt posn may not be concerning but when 2Lt start filling senior Capt billets you are likely hurting the unit and setting the individual up for failure…a perfect example was putting 2Lt's in PRTs in Afghanistan; they were typically one deep engineers on the team but they didn't have the skills to do job they were sent to do.

Appendix 38: Delphi Study Round 2: Question 2: Component 4: Subcomponent 2 Full Responses

Do you believe that this will continue, and that competency timelines should be indifferent?

1. Yes it will continue in the near future as the pipeline of incoming Lts will continue to outpace lower graded billets due to retention challenges. Therefore, competency timelines should be indifferent as we strive to have the faces match the authorized graded billets.
2. With MyVector and Talent Marketplace for job hiring / vacancy ads / etc I think we must get this cleaned up
3. This is an age old issue…not a new problem to have mismatch of ranks and positions. I would suggest competency timelines that apply to the career field should remain unchanged.
4. No. Shouldn't be different…should view the competency "timeline" as a "window."
5. I believe it will continue. Our CE Commanders are very busy and if it's not important to the MSG/CCs, it likely won't be their priority to update. From that perspective, I could see that the competency timelines may be indifferent, but I still look at a Lieutenant differently from a Captain meaning the Captain should have significantly more competencies.
6. Yes.
7. N/A
8. I do believe it will continue, but competency timelines aren't necessarily indifferent, there should still be general levels of competency expected at certain "gates" in a career.

Appendix 39: Delphi Study Round 2: Question 2: Component 4: Subcomponent 3 Full Responses

The data indicates that 24% of misaligned position are Captains holding FGO billets. Due to the nature of the data, it was not possible to determine if these positions were Senior Captains/Major Selects. In that regard how does this misalignment affect a CGO competency timeline?

i. Per previous response, the retention challenge is why we have O-3s in FGO billets. As long as a commander assesses that a Senior Captain (7-10 years) is capable for a FGO position, we should support. The CGO timeline is a "plan" and thus departures from the plan to adjust for local capabilities/conditions are allowed.

ii. With MyVector and Talent Marketplace for job hiring / vacancy ads / etc I think we must get this cleaned up

iii. This is not new…during my entire career, myself and others have filled positions with rank mismatches. I filled a Maj position as a 1Lt and was able to effectively perform with the right mentorship. As well, there are many instances where CE fills Major Ops Chief billets with Captains either due to necessity or more often, due the Captain's capabilities. I actually believe that this accelerates a CGOs competency to take on FGO duties, but do believe it is more beneficial for Senior Captains…not mid to junior Captains to take on these roles. It may affect the timeline as it should be considered that the vast majority of CE Officers should achieve full competency by the time they are being considered for Major (prior to pin-on) versus as a pinned-on Major.

iv. See above; need to work the competencies into a "window" for development; e.g. – years 1 – 8 to work all competencies…or as many as possible.)

v. The officer will be forced into a position where they may not have all the desired competencies needed in order to be successful in that position.

vi. In that case, I am more concerned if the Capts are filling FGO positions. While I think achieving CGO competencies is doable, even if assigned to a FGO position, supervisors/others outside CE may believe the CGO already knows everything to fill a FGO position.

vii. I do not think the 24% is particularly useful data; there are positions coded for O-4s that the right O-3s can excel in.

viii. Not significantly, leaders will always have to assess the capabilities of an individual to fill a position…misalignment shouldn't drive us to try and force more "experiences" in a shorter amount of time.

Appendix 40: Delphi Study Round 2: Question 3: Component 1 Full Responses

Pilot Study discussions with limited validation during the AFPC data analysis, indicated a large number of CE CGOs within engineering flight. Some members of the Pilot Study had mentioned serving for 6 years exclusively in the CEN flight. The AFPC data revealed that approximately half of all CE CGOs assigned to CE Squadrons are within CEN. What concern (if any) do you have with exclusive CEN experience? Do you believe that these officers (when eventually rotated to the other flights) have appropriate breadth of experience?

i. Some CE CGOs need to be on the technical track to ensure they get the qualifying experience to allow them to pursue their professional engineering or architectural license, but 6 years seems long. I think the amount of time in CEN or other similar qualifying position (e.g., environmental) should be limited to what's needed for professional licensing. And recognize that a CGO may get a second assignment in CEN as a Deputy Flight CC or Flight CC.

ii. No I don't think we can have them spending more than 4-6 years in that CEN related jobs. There must be opportunities to LEAD AIRMEN ENGINEERS…and figure out who has the ldrshp abilitiy to be successful in Flt/CC, Sq/CC, beyond…BUT, we must have 32Es that can Plan, Program, Design, Construct things in garrison and deployed (when most of that falls to them to do). They must know how to run Operations Flt (at least by time they are Capt). They must know enough about Installation mgt activities to provide that in a deployed location. Funding/Resources, Environmental, and Real Property. And they need to at least have time spent learning / doing Fire, EOD and EM/CBRN flights to effectively lead/support/operate with those flights.

iii. Even if CEN is where the Officer positions are on the books, that is a foul. Half may be assigned to CEN at any one time, but should not be for long periods of time. As well, I would hope that we've broken the paradigm that all CE officers need to start in Engineering. Bottom line, we have Commanders (and other leaders) that are not doing their jobs ensuring our CE officers receive appropriate experience in the many facets of CE through rotation of jobs within the squadrons. Of course, in some cases, with the never ending project cycle, more pressure to obligate funds earlier in the FY and ensure project execution along with many bases having problems hiring and keeping civilian engineers, commanders may resort to filling those gaps with officers for extended periods. However, with that said, with the creation of opportunities in Ops Maintenance and R&O, ongoing Readiness and EOD Officer jobs as well as other opps, there is really no reason for job stagnation or spending up to 6 years in CEN. Most may have good CE experience, but no they will not have appropriate or sufficient breadth aside from the officers who take it upon themselves to find opportunities to interface, volunteer and work with other flights.

iv. I have some concern as ideally an officer would rotate more often within a squadron. However, sometimes it simply doesn't work out that way and, frankly, I've seen plenty of CE officers be successful who grew up primarily within the engineering flight. No. But, see above. If the CE Enterprise adopted the "A-Staff" model those officers who have multiple years in the Engineering Flight could still learn CE Warfighting through Prime BEEF days within the A-Staff.)

v. Lack of breadth would be largest concern. They need to understand how different flights operate in order to be more effective as a future CE Squadron Commander.

vi. Classic breadth vs depth concern…the issue should be considered the same way we look at EOD experience. Sq/CCs have to own this as well.

vii. None, Yes

viii. I have some concern, mostly with troop leading/interaction opportunities and exposure (or lack of) to the often more dynamic atmosphere that CEX or CEO opportunities might offer. I think engineering positions can provide breadth and experience that is applicable to the entire squadron such as project management, resource management, customer interaction and requirement definition.

Appendix 41: Delphi Study Round 2: Question 3: Component 2 Full Responses

In context of a CGO competency timeline, should the careerfield mandate flight rotations on a given time interval?

1. Yes. Rotate through at least two positions in a 3 or 4 year assignment to provide for more breadth of experience and exposure to other parts of the squadron. I rotated through 4 positions in my 4 years at my first duty station (CEN contract planner/programmer, Readiness Flight Chief, CEO Facilities Maintenance Chief and Heavy Repair Chief, and Environmental Flight Chief)
2. We should set some basic standards / guidelines for officers to be in the various flights and more importantly to get training on those key tasks, skills, knowledge expected in each flight…
3. If it is necessary due to commanders not taking their own initiative to grow our officers with varied jobs and experience, then YES. To this end, we should also keep officers at a first base for 3-4 years to ensure they are able to rotate with 2-3 jobs (in various flights) at a minimum.
4. NO. Squadron Commanders need to have the flexibility within their units to either move officers around OR leave them (and their expertise) in an Engineering Flight that needs appropriate (i.e. – experienced) resources
5. I think the career field could suggest recommended time intervals for professional development purposes, but would keep the authorities with Commanders to provide them needed flexibility to run their squadrons the way they see fit
6. Not mandate, but use as a guide.
7. No, my opinion is that is CES/CC business
8. I don't think rotations should be mandated, BCEs have enough demands to juggle with vacancies and deployments and org constructs…but we should continue to mentor our CE leaders on the goodness of breadth, especially as a CGO.

Appendix 42: Delphi Study Round 2: Question 4: Component 1 Full Responses

Attached are the survey results for the careerfield competency survey. Each of the questions had five categories of importance, which the respondent could choose to show the importance of the competency. For the sake of analysis, each of the importance levels was then given a weight of 1 (Not Important) to 5 (Extremely Important). The number of respondents who selected a level were then multiplied by a weight and added together. The higher score indicated that the cumulative responses determined a higher level of importance. Do you agree with the ranking of the competencies from the careerfield survey? Or should be moved

i. No. See response to 1.a. above. I believe that competency-based tasks for CE CGOs could be boiled down to 15 or less tasks. For the one listed, the following resonated with me: 2.3, 4.1, 7.6, 8.2, 11.2, 8.1, 8.3, 2.1, 5.5, 7.7, 7.5, and if modified 9.4 after replacing "contested" with "contingency". Rather than competency-based tasks unique to CE CGOs, a number of tasks were too specific to a particular job in a particular organization (e.g.., 3.3, 3.5, 4.3, 4.10, 4.12, 7.1, 7.4, 9.3, 10.9, 12.4, etc.,) or they were general skills most CGOs—not just CE CGOs—should have (e.g., 1.1, 6.4, 7.3, 10.1, 10.2, 10.4, 10.5, 12.2, 12.3, 12.5, , or were not grade appropriate for a CGO (e.g., 10.8, 11.1, 12.1, versus competency-based tasks.

ii. We have to get something into our CFETP STS section that 32Es and their supervisor/commanders can use to shape their development more deliberately. I know there isn't enough specific competencies for emergency mgt, EOD and Fire (ie. Emergency Services functions) but we all need to know and do some things as CGOs and FGOs related to those functions.

iii. I believe some contingency-related requirements in some cases should be higher. For example, ones that stick out are 4.9 and 8.3 should be around 21 (8.3) and 22 (4.9) and above the inspection program. 10.2 should be in the Top 10. 1.2 should be in the Top 15. 1.4 in the Top 25. 4.7 in the Top 30 if CE asset management is a top priority in how we plan to identify requirements, advocate for resources and execute projects (I2S). 3.2 in the Top 30. 1.3 should not be significantly below 1.4. Not sure where it should be and at a minimum, I am pleased to see our AF CE history is on the list, but it is a "sad" statement that knowing our CE history ranked the lowest as a core competency…we can learn so much if we just paid attention and knew our history… If the intent is to include these competencies in the CGO educational development model, 11.1, 11.4 and 11.5 may be more appropriate for FGOs.

iv. Generally yes

v. Concur with methodology used, but I tend to disagree with some of the rankings. In general, I think more of our expeditionary competencies should be ranked higher. I suspect the weighted importance of these competencies change over time. As an example, I see that Competency 5.3 "Design a simplified facility for construction" ranks as #65. Back in 2008-09 time frame, this was one of the top priorities as deployed engineer commanders lamented that their young officers didn't have any design capabilities. The simplified facility design course (now called Contingency Facility Design) was created to fill this gap based on input from the career field. That's why I share the concept of an AF Civil Engineering Body of Knowledge that these competencies can populate. Once matured, the body of knowledge really doesn't change. What changes is what we prioritize based on current environment.

vi. Not if they are applied to CGOs in the careerfield – a lot of the competencies are beyond CGOs (e.g.: 10.3, 12.1, 10.2, 10.7, 10.5, 12.2, 10.1, 10.6, 11.4, 11.5, 11.1, etc.) 8.1, 3.2 should move higher

vii. Yes

viii. Yes, in general I agree with the ranking but I don't think the individual ranking is important. I think it is more important to identify the top "group" and I think the top 50ish capture the big ticket competencies…although I would still propose that some could/should be combined. One could argue that if you have a broader competency (i.e Collaborate with support organizations to maximize their support to the installation mission requirements), then they should be able to do others like: Leverage public and private partnerships through community engagement, mutual agreements, and third-party financing that better support the mission.

Appendix 43: Delphi Study Round 2: Question 4: Component 1 Response Matrix

Survey Responces										
Competency Designator		Response Ranking and Rating								
ID	Name	Survey Ranking	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Expert 8
10.9	Cultivate a positive command climate based on trust, mutual respect, inclusion, safety consciousness, and stewardship of government resources.	1	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
3.1	Communicate the organic resources and capabilities available within a Civil Engineer Squadron.	2		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
2.3	Anticipate and adapt engineering approaches in a dynamic operating environment with good engineering judgement and critical thinking.	3	#1	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
4.1	Identify and define requirements, and coordinate with stakeholders to determine appropriate scope, cost, schedule, and method of execution.	4	#2	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
10.4	Advocate for resources required to execute mission priorities and explain risk to mission for unfunded requirements	5	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
3.4	Communicate facility and infrastructure requirements, status of Civil Engineer resources, and expected risk to stakeholders.	6		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
10.3	Direct execution of Civil Engineer resources to meet functional and operational mission requirements.	7		N/A		Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	Agreed, Combine Top 50
4.2	Prioritize projects for execution that are informed by mission requirements, base master planning, sustainment data, and funding strategies.	8		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
12.1	Maximize unity of effort with fellow commanders.	9	Not CGO	N/A		Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	Agreed, Combine Top
6.5	Identify safety hazards during civil engineer activities and organize response options	10		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
7.8	Organize and direct airfield recovery activities.	11		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
6.1	Coordinate stakeholders during the planning and execution stages of a project.	12		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
10.2	Ensure highest state of unit readiness by organizing, training, equipping and reporting on assigned UTCs.	13	Not Just CE CGOs	N/A	Top 10	Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	Agreed, Combine Top 50

Appendix 43: Delphi Study Round 2: Question 4: Component 1 Response Matrix (Cont.)

10.7	Lead EOC operations and coordinate response to contingencies	14		N/A		Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	Agreed, Combine Top
5.2	Lead a multi-disciplinary team executing a troop construction project.	15		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
7.6	Lead Civil Engineer Unit Control Center (UCC) operations.	16	#3	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
4.4	Identify vulnerabilities of installation infrastructure, and mitigate risk to mission assurance by developing options to improve resilience.	17		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
8.2	Assess and evaluate infrastructure capability, condition and capacity of potential operating locations to inform decision makers and mission owners.	18	#4	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
11.2	Develop and manage civil engineer plans and programs to achieve mission requirements.	19	#5	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
10.5	Collaborate with support organizations to maximize their support to the installation mission requirements.	20	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	Agreed, Combine Top 50
12.2	Ensure compliance with standards, laws, and regulations through the commander's inspection program.	21	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	Agreed, Combine Top 50
4.9	Develop a comprehensive project programming package for approval.	22		N/A	#22	Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
12.4	Communicate and deliver expertise, capabilities, and resources to MAJCOMs and squadrons to support installation mission requirements.	23	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
3.3	Communicate Civil Engineer enterprise business rules and rationale to stakeholders	24	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
6.4	Assess, monitor, and document contractor progress and performance against contract scope of work and recommend actions to the contracting officer.	25	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
8.1	Lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.	26	#6	N/A		Agreed As Ranked	Disagree, Move Contingency Higher	Move Higher	Agreed As Ranked	Agreed, Combine Top 50

Appendix 43: Delphi Study Round 2: Question 4: Component 1 Response Matrix (Cont.)

8.5	Develop continuity documentation to support Civil Engineer operations across rotational turnover	27		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
8.3	Develop an expeditionary bare base design.	28	#7	N/A	#21	Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
2.2	Employ references and consultation agencies to determine engineering limitations and options for topics beyond prior personal knowledge.	29		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
1.2	Establish personal and professional goals to ensure career-long Civil Engineer officer development.	30		N/A	Top 15	Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
1.1	Identify the Occupational Competencies relevant for a specific job, position, or duty upon assignment and pursue appropriate Force Development opportunities.	31	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
1.4	Facilitate the force development for Civil Engineer enlisted personnel to attain the desired proficiency level throughout upgrade training.	32		N/A	Top 25	Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
6.3	Evaluate contractor submittals for technical acceptability, execution feasibility, and completeness.	33		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
2.1	Interpret construction drawings and specifications to validate that the design complies with codes, rules, and regulations, and verify that construction complies with the design	34	#8	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
10.1	Translate policy and guidance into prioritized operational and tactical objectives.	35	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	Agreed, Combine Top 50
4.7	Organize resources to gain and maintain accurate asset visibility, condition assessment, and information.	36		N/A	Top 30	Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
5.5	Design an airfield in an expeditionary environment for construction or repair.	37	#9	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top
3.2	Communicate the resources and capabilities available within the Air Force Civil Engineer enterprise.	38		N/A	Top 30	Agreed As Ranked	Disagree, Move Contingency Higher	Move Higher	Agreed As Ranked	Agreed, Combine Top 50
10.6	Anticipate emerging requirements across the installation functions and incorporate into the Civil Engineer work plan.	39		N/A		Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	Agreed, Combine Top 50

Appendix 43: Delphi Study Round 2: Question 4: Component 1 Response Matrix (Cont.)

12.5	Lead and participate as an innovative, critical thinker in operational planning teams to continuously improve operational capabilities.	40	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
7.1	Develop and execute plans to mitigate mission impact during unplanned utility service interruptions	41	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
9.2	Navigate staff relationships to acquire resources and authority for engineer activities in a joint or coalition organization.	42		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
7.4	Develop and execute a Prime BEEF home station training program that meets unit readiness goals and tasks	43	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
4.3	Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.	44	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
1.3	Facilitate the force development for Civil Engineer officers to attain the desired proficiency level of each Occupational Competency.	45		N/A	Not Significantly Below 1.4 (Maybe Top 30)	Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
12.3	Cultivate relationships to build trust and influence by across above-wing-level headquarters organizations.	46	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
4.11	Develop and manage a comprehensive airfield infrastructure plan that incorporates expected condition, mission requirements, and phased improvements.	47		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
7.7	Serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).	48	#10	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
7.10	Validate and communicate Minimum Operation Strip proposals for senior leader approval.	49		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
9.1	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability.	50		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	Agreed, Combine Top 50
5.1	Adapt standard designs to meet user requirements and site considerations.	51		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
6.2	Develop the specifications and technical requirements of a construction contract and service contract solicitation package.	52		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	

Appendix 43: Delphi Study Round 2: Question 4: Component 1 Response Matrix (Cont.)

11.3	Provide guidance to joint partners to enable the proper employment of AF Civil Engineer capabilities.	53		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
11.4	Operate within the Congressional cycle by communicating Civil Engineer requirements, resources, and risk to influence the defense appropriation and authorization acts.	54		N/A	FGO	Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	
8.4	Coordinate acquisitions and logistics activities to support an expeditionary base beddown.	55		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
11.5	Advocate, support, and defend Civil Engineer resource requirements within assigned program of record when developing the AF POM position	56		N/A	FGO	Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	
5.4	Design utility infrastructure systems for an expeditionary location for construction.	57		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
7.3	Translate mission planning documents and readiness guidance into unit readiness goals and tasks.	58	Not Just CE CGOs	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
7.5	Develop and maintain engineer portions of installation contingency plan	59	#11	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
7.2	Coordinate installation preparations that enable personnel to survive and operate in a Chemical, Biological, Radiological, and Nuclear (CBRN) environment.	60		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
4.8	Perform data analysis to optimize infrastructure investments at the lowest life-cycle operating cost.	61		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
4.6	Organize resources to produce a comprehensive base master plan.	62		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
4.5	Assess commercial construction capabilities, risks and opportunities, and incorporate into engineer decision making processes and activities.	63		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
11.1	Formulate Civil Engineer strategy and policy objectives under the National Defense Strategy and Air Force Strategic Master Plan and translate requirements into published guidance.	64	Not CGO	N/A	FGO	Agreed As Ranked	Disagree, Move Contingency Higher	Not CGO	Agreed As Ranked	
8.6	Facilitate transition to operational contract support at a contingency location.	65		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
5.3	Design a simplified facility for construction.	66		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
4.10	Develop a complete airfield waiver package and route to the appropriate level for approval.	67	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
10.8	Leverage public and private partnerships through community engagement, mutual agreements, and third-party financing that better support the mission.	68	Not CGO	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
7.9	Validate and interpret CBRN modeling and mapping for senior leaders.	69		N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
9.3	Organize Civil Engineer efforts when divesting infrastructure to the host nation.	70	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
4.12	Develop a complete explosive site plans and route to the appropriate level for approval.	71	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
9.4	Lead small unit engineer activities under mission command orders in a **contingency** environment	72	#12	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	
3.5	Articulate history and heritage of AF Civil Engineers in supporting joint readiness and lethality.	73	Too Specific	N/A		Agreed As Ranked	Disagree, Move Contingency Higher		Agreed As Ranked	

Appendix 44: Delphi Study Round 2: Question 4: Component 2 Full Responses

Do you believe that some of the listed competencies are not relevant (which ones)?

1. No. See response to 1.a. above. Eliminate those tasks that are too specific to a particular job in a particular organization (e.g.., 3.3, 3.5, 4.3, 4.10, 4.12, 7.1, 7.4, 9.3, 10.9, 12.4, etc.,) or involve general skills most CGOs—not just CE CGOs—should have (e.g., 1.1, 6.4, 7.3, 10.1, 10.2, 10.4, 10.5, 12.2, 12.3, 12.5, , or were not grade appropriate for a CGO (e.g., 10.8, 11.1, 12.1, etc.,)
2. We have to get something into our CFETP STS section that 32Es and their supervisor/commanders can use to shape their development more deliberately. I know there isn't enough specific competencies for emergency mgt, EOD and Fire (ie. Emergency Services functions) but we all need to know and do some things as CGOs and FGOs related to those functions.
3. I believe some contingency-related requirements in some cases should be higher. For example, ones that stick out are 4.9 and 8.3 should be around 21 (8.3) and 22 (4.9) and above the inspection program. 10.2 should be in the Top 10. 1.2 should be in the Top 15. 1.4 in the Top 25. 4.7 in the Top 30 if CE asset management is a top priority in how we plan to identify requirements, advocate for resources and execute projects (I2S). 3.2 in the Top 30. 1.3 should not be significantly below 1.4. Not sure where it should be and at a minimum, I am pleased to see our AF CE history is on the list, but it is a "sad" statement that knowing our CE history ranked the lowest as a core competency…we can learn so much if we just paid attention and knew our history… If the intent is to include these competencies in the CGO educational development model, 11.1, 11.4 and 11.5 may be more appropriate for FGOs.
4. Yes. Some should be consolidated. Recommend a focus team to put them together
5. No
6. It seems 1.1, 1.4, 1.3 are relevant only to CCs/Chiefs. (seems to match the timeline data provided)
7. No
8. I think they are all relevant…but it depends on the "track" an individual goes, every engineer isn't going to gain every competency…and I don't think they need to…but they need to be proficient at the "core".

Appendix 45: Delphi Study Round 2: Question 4: Component 2 Response Matrix

Survey Responces										
Competency Designator		Response Ranking and Rating								
ID	Name	Survey Ranking	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Expert 8
10.9	Cultivate a positive command climate based on trust, mutual respect, inclusion, safety consciousness, and stewardship of government resources.	1	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
3.1	Communicate the organic resources and capabilities available within a Civil Engineer Squadron.	2		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
2.3	Anticipate and adapt engineering approaches in a dynamic operating environment with good engineering judgement and critical thinking.	3		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.1	Identify and define requirements, and coordinate with stakeholders to determine appropriate scope, cost, schedule, and method of execution.	4		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
10.4	Advocate for resources required to execute mission priorities and explain risk to mission for unfunded requirements	5	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
3.4	Communicate facility and infrastructure requirements, status of Civil Engineer resources, and expected risk to stakeholders.	6		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
10.3	Direct execution of Civil Engineer resources to meet functional and operational mission requirements.	7		N/A		Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
4.2	Prioritize projects for execution that are informed by mission requirements, base master planning, sustainment data, and funding strategies.	8		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
12.1	Maximize unity of effort with fellow commanders.	9	Not CGO	N/A		Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
6.5	Identify safety hazards during civil engineer activities and organize response options	10		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.8	Organize and direct airfield recovery activities.	11		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
6.1	Coordinate stakeholders during the planning and execution stages of a project.	12		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant

Appendix 45: Delphi Study Round 2: Question 4: Component 2 Response Matrix (Cont.)

10.2	Ensure highest state of unit readiness by organizing, training, equipping and reporting on assigned UTCs.	13	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
10.7	Lead EOC operations and coordinate response to contingencies	14		N/A		Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
5.2	Lead a multi-disciplinary team executing a troop construction project.	15		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.6	Lead Civil Engineer Unit Control Center (UCC) operations.	16		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.4	Identify vulnerabilities of installation infrastructure, and mitigate risk to mission assurance by developing options to improve resilience.	17		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
8.2	Assess and evaluate infrastructure capability, condition and capacity of potential operating locations to inform decision makers and mission owners.	18		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
11.2	Develop and manage civil engineer plans and programs to achieve mission requirements.	19		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
10.5	Collaborate with support organizations to maximize their support to the installation mission requirements.	20	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
12.2	Ensure compliance with standards, laws, and regulations through the commander's inspection program.	21	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
4.9	Develop a comprehensive project programming package for approval.	22		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
12.4	Communicate and deliver expertise, capabilities, and resources to MAJCOMs and squadrons to support installation mission requirements.	23	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
3.3	Communicate Civil Engineer enterprise business rules and rationale to stakeholders	24	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
6.4	Assess, monitor, and document contractor progress and performance against contract scope of work and recommend actions to the contracting officer.	25	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant

Appendix 45: Delphi Study Round 2: Question 4: Component 2 Response Matrix (Cont.)

8.1	Lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.	26		N/A		Yes, Focus Group	None Irrelevant	Move Higher	None Irrelevant	None Irrelevant
8.5	Develop continuity documentation to support Civil Engineer operations across rotational turnover	27		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
8.3	Develop an expeditionary bare base design.	28		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
2.2	Employ references and consultation agencies to determine engineering limitations and options for topics beyond prior personal knowledge.	29		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
1.2	Establish personal and professional goals to ensure career-long Civil Engineer officer development.	30		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
1.1	Identify the Occupational Competencies relevant for a specific job, position, or duty upon assignment and pursue appropriate Force Development opportunities.	31	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant	Only CC/Chief	None Irrelevant	None Irrelevant
1.4	Facilitate the force development for Civil Engineer enlisted personnel to attain the desired proficiency level throughout upgrade training.	32		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
6.3	Evaluate contractor submittals for technical acceptability, execution feasibility, and completeness.	33		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
2.1	Interpret construction drawings and specifications to validate that the design complies with codes, rules, and regulations, and verify that construction complies with the design	34		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
10.1	Translate policy and guidance into prioritized operational and tactical objectives.	35	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
4.7	Organize resources to gain and maintain accurate asset visibility, condition assessment, and information.	36		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
5.5	Design an airfield in an expeditionary environment for construction or repair.	37		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
3.2	Communicate the resources and capabilities available within the Air Force Civil Engineer enterprise.	38		N/A		Yes, Focus Group	None Irrelevant	Move Higher	None Irrelevant	None Irrelevant

Appendix 45: Delphi Study Round 2: Question 4: Component 2 Response Matrix (Cont.)

10.6	Anticipate emerging requirements across the installation functions and incorporate into the Civil Engineer work plan.	39		N/A		Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
12.5	Lead and participate as an innovative, critical thinker in operational planning teams to continuously improve operational capabilities.	40	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.1	Develop and execute plans to mitigate mission impact during unplanned utility service interruptions	41	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
9.2	Navigate staff relationships to acquire resources and authority for engineer activities in a joint or coalition organization.	42		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.4	Develop and execute a Prime BEEF home station training program that meets unit readiness goals and tasks	43	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.3	Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.	44	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
1.3	Facilitate the force development for Civil Engineer officers to attain the desired proficiency level of each Occupational Competency.	45		N/A		Yes, Focus Group	None Irrelevant	Only CC/Chief	None Irrelevant	None Irrelevant
12.3	Cultivate relationships to build trust and influence by across above-wing-level headquarters organizations.	46	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.11	Develop and manage a comprehensive airfield infrastructure plan that incorporates expected condition, mission requirements, and phased improvements.	47		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.7	Serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).	48		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.10	Validate and communicate Minimum Operation Strip proposals for senior leader approval.	49		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
9.1	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability.	50		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
5.1	Adapt standard designs to meet user requirements and site considerations.	51		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant

Appendix 45: Delphi Study Round 2: Question 4: Component 2 Response Matrix (Cont.)

6.2	Develop the specifications and technical requirements of a construction contract and service contract solicitation package.	52		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
11.3	Provide guidance to joint partners to enable the proper employment of AF Civil Engineer capabilities.	53		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
11.4	Operate within the Congressional cycle by communicating Civil Engineer requirements, resources, and risk to influence the defense appropriation and authorization acts.	54		N/A	FGO	Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
8.4	Coordinate acquisitions and logistics activities to support an expeditionary base beddown.	55		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
11.5	Advocate, support, and defend Civil Engineer resource requirements within assigned program of record when developing the AF POM position	56		N/A	FGO	Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant
5.4	Design utility infrastructure systems for an expeditionary location for construction.	57		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.3	Translate mission planning documents and readiness guidance into unit readiness goals and tasks.	58	Not Just CE CGOs	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.5	Develop and maintain engineer portions of installation contingency plan	59		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.2	Coordinate installation preparations that enable personnel to survive and operate in a Chemical, Biological, Radiological, and Nuclear (CBRN) environment.	60		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.8	Perform data analysis to optimize infrastructure investments at the lowest life-cycle operating cost.	61		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.6	Organize resources to produce a comprehensive base master plan.	62		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.5	Assess commercial construction capabilities, risks and opportunities, and incorporate into engineer decision making processes and activities.	63		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
11.1	Formulate Civil Engineer strategy and policy objectives under the National Defense Strategy and Air Force Strategic Master Plan and translate requirements into published guidance.	64	Not CGO	N/A	FGO	Yes, Focus Group	None Irrelevant	Not CGO	None Irrelevant	None Irrelevant

Appendix 45: Delphi Study Round 2: Question 4: Component 2 Response Matrix (Cont.)

8.6	Facilitate transition to operational contract support at a contingency location.	65		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
5.3	Design a simplified facility for construction.	66		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.10	Develop a complete airfield waiver package and route to the appropriate level for approval.	67	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
10.8	Leverage public and private partnerships through community engagement, mutual agreements, and third-party financing that better support the mission.	68	Not CGO	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
7.9	Validate and interpret CBRN modeling and mapping for senior leaders.	69		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
9.3	Organize Civil Engineer efforts when divesting infrastructure to the host nation.	70	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
4.12	Develop a complete explosive site plans and route to the appropriate level for approval.	71	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
9.4	Lead small unit engineer activities under mission command orders in a **contingency** environment	72		N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant
3.5	Articulate history and heritage of AF Civil Engineers in supporting joint readiness and lethality.	73	Too Specific	N/A		Yes, Focus Group	None Irrelevant		None Irrelevant	None Irrelevant

Appendix 46: Delphi Study Round 2: Question 4: Component 3 Full Responses

Do you believe that a competency may have been missed (please identify)?

1. No, but I think some of the competencies could have been grouped under broader "umbrella" competencies such as contingency engineering design, construction and management, cradle-to-grave facilities project management, emergency response operations, etc.
2. We have to get something into our CFETP STS section that 32Es and their supervisor/commanders can use to shape their development more deliberately. I know there isn't enough specific competencies for emergency mgt, EOD and Fire (ie. Emergency Services functions) but we all need to know and do some things as CGOs and FGOs related to those functions.
3. I didn't see any competencies that directly call-out asset management though one could argue that some of the competencies contain asset management principles.
4. There is no mention of EOD competencies (similar to CBRN competencies). I have heard Brig Gen Allen say he would send all CGOs to EOD school if he could to understand basic EOD competencies.
5. No
6. I don't see many/any that pertain to environmental management, energy resiliency/management, housing management…these may not be "core" but are certainly important to gain some exposure to for a well-rounded CE leader.

Appendix 47: Delphi Study Round 2: Question 5 Full Responses

Attached are the survey results related to a competency timeline. Some of the survey questions did not have available responses for timelines of competence attainment and are labeled as "Not Provided". The percentages are based upon the number of responses related to each of the categories. The highlighted cell in each row represents the maximum vote for the row and would serve as the time at which the CE CGO would require competence in the category. Do you agree with the results or do you feel the timeline should be adjusted?

i. Here's my thoughts on specific adjustments:4.1 & 4.9—should be moved to First Lieutenant as contract planners/project programming/development of 1391s is needed sooner rather than later. Thus my first year on active duty was a contract planner in which I developed the requirement and programming documents with the mission owner. 5.4—expeditionary locations can be fairly basic for which a 2d Lt should be able to design utility infrastructure systems…move this to the left. 6.5—it doesn't take an expert to recognize a safety hazard and raise the alarm; definitely move this to the left to 2d Lt. 7.4—move left to 1st Lt 9.4—shift to the left to Junior Captain; small unit is not defined. If Army and Marine Lts can lead platoons, it's reasonable for a CE Junior Captain to likewise lead a "small" unit. 10.3—shift right to Senior Captain as the described competency almost sounds like what a CEO or CES/CC would do 12.3—shift to Senior Captain as "above wing-level" means MAJCOM or higher HQ staff.

ii. We need CGOs to be able to do Planning, Programming, Design, Construction Mgt/Troop Labor Execution, Perform Ops Engineering tasks/mgt, know about all the Installation Mgt, Run a CE UCC, Sit on the EOC ESF position, lead Airmen in the field/combat conditions to execute troop labor tasks/security/convoys, know Troop Leading Procedures, expeditionary tasks, experience and do some things in EOD, Fire, CEX (as a Flt/CC or getting signed off on certain competency idtems/tasks.) They need to know about Contracting, Financne, Comm, Security/AT/FP, FSS stuff, LRS stuff etc. FGOs proably need to know more / do more of the above but focused on leading formations of people doing all of it…Ops Flt/CC and CES/CC…FGOs need to be able to take Operational Level orders/plans and turn them into tactical orders/plans for execution.

iii. Items listed as 7.3, 9.X and 11.X should be Senior Captain or even later as FGO (reference above). 8.X should be Junior Captain. 3.3, 3.4, 4.4, 7.8 Junior Captain 1.3, 1.4, 3.2, 4.9, 5.2, 7.7 1Lt 1.1, 1.2, 2.3, 3.1 2Lt

iv. I agree

v. Agree With Results (Thanks for the opportunity to participate in this study!)

vi. 2.2 seems too early, 3.1 & 3.2 should be included for CGOs (probably by Sr Lt/Early Capt), 4.4 should be added for Sr Capt.

vii. My take is that the top 15 competencies should be developed at the earliest opportunity

viii. In general I think the timelines are pretty accurate. Some of the percentages are pretty close and could be interpreted either, many of which I would defer to the lower/more junior level vice the straight percentage (e.g. 4.2,5.2,5.3, 8.1) and some are dependent on what jobs you have (e.g. 4.9, 4.6, 7.2, 7.9) 7.1 is miss-marked but could go either way as well.

Appendix 48: Delphi Study Round 2: Question 5 Timeline Attachment

Delphi Study Modifications Survey Responces					
Competency Designator		**When the Competency Should Be Developed**			
ID	**Name**	**Second Lieutenant (0-2 Years)**	**First Lieutenant (2-4 Years)**	**Junior Captain (4-7 years)**	**Senior Captain (7-10 Years)**
1.1	Identify the Occupational Competencies relevant for a specific job, position, or duty upon assignment and pursue appropriate Force Development opportunities.	**Delphi Study (1)**			
1.2	Establish personal and professional goals to ensure career-long Civil Engineer officer development.	**Delphi Study (1)**			
1.3	Facilitate the force development for Civil Engineer officers to attain the desired proficiency level of each Occupational Competency.		**Delphi Study (1)**		
1.4	Facilitate the force development for Civil Engineer enlisted personnel to attain the desired proficiency level throughout upgrade training.		**Delphi Study (1)**		
2.1	Interpret construction drawings and specifications to validate that the design complies with codes, rules, and regulations, and verify that construction complies with the design		**Delphi Study (No Change Recommended)**		
2.2	Employ references and consultation agencies to determine engineering limitations and options for topics beyond prior personal knowledge.		**Survey Majority (36.35%)**	**Delphi Study (1)**	
2.3	Anticipate and adapt engineering approaches in a dynamic operating environment with good engineering judgement and critical thinking.	**Delphi Study (1)**			
3.1	Communicate the organic resources and capabilities available within a Civil Engineer Squadron.	**Delphi Study (1)**	**Delphi Study (1)**		
3.2	Communicate the resources and capabilities available within the Air Force Civil Engineer enterprise.		**Delphi Study (2)**		
3.3	Communicate Civil Engineer enterprise business rules and rationale to stakeholders			**Delphi Study (1)**	
3.4	Communicate facility and infrastructure requirements, status of Civil Engineer resources, and expected risk to stakeholders.			**Delphi Study (1)**	
3.5	Articulate history and heritage of AF Civil Engineers in supporting joint readiness and lethality.			**Delphi Study (No Change Recommended)**	
4.1	Identify and define requirements, and coordinate with stakeholders to determine appropriate scope, cost, schedule, and method of execution.		**Delphi Study (1)**	**Survey Majority (34.56%)**	

Appendix 48: Delphi Study Round 2: Question 5 Timeline Attachment (Cont.)

4.10	Develop a complete airfield waiver package and route to the appropriate level for approval.		**Delphi Study (No Change Recommended)**		
4.11	Develop and manage a comprehensive airfield infrastructure plan that incorporates expected condition, mission requirements, and phased improvements.			**Delphi Study (No Change Recommended)**	
4.12	Develop a complete explosive site plans and route to the appropriate level for approval.			**Delphi Study (No Change Recommended)**	
4.2	Prioritize projects for execution that are informed by mission requirements, base master planning, sustainment data, and funding strategies.			**Delphi Study (1)**	**Survey Majority (37.79%)**
4.3	Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.			**Delphi Study (No Change Recommended)**	
4.4	Identify vulnerabilities of installation infrastructure, and mitigate risk to mission assurance by developing options to improve resilience.			**Delphi Study (1)**	**Delphi Study (1)**
4.5	Assess commercial construction capabilities, risks and opportunities, and incorporate into engineer decision making processes and activities.			**Delphi Study (No Change Recommended)**	
4.6	Organize resources to produce a comprehensive base master plan.			**Delphi Study (No Change Recommended)**	
4.7	Organize resources to gain and maintain accurate asset visibility, condition assessment, and information.		**Delphi Study (No Change Recommended)**		
4.8	Perform data analysis to optimize infrastructure investments at the lowest life-cycle operating cost.		**Delphi Study (No Change Recommended)**		
4.9	Develop a comprehensive project programming package for approval.		**Delphi Study (2)**	**Survey Majority (29.84%)**	
5.1	Adapt standard designs to meet user requirements and site considerations.			**Delphi Study (No Change Recommended)**	
5.2	Lead a multi-disciplinary team executing a troop construction project.		**Delphi Study (2)**	**Survey Majority (39.52%)**	

Appendix 48: Delphi Study Round 2: Question 5 Timeline Attachment (Cont.)

5.3	Design a simplified facility for construction.		**Delphi Study (1)**	**Survey Majority (38.17%)**	
5.4	Design utility infrastructure systems for an expeditionary location for construction.	**Delphi Study (1)**	**Survey Majority (35.72%)**		
5.5	Design an airfield in an expeditionary environment for construction or repair.			**Delphi Study (No Change Recommended)**	
6.1	Coordinate stakeholders during the planning and execution stages of a project.		**Delphi Study (No Change Recommended)**		
6.2	Develop the specifications and technical requirements of a construction contract and service contract solicitation package.		**Delphi Study (No Change Recommended)**		
6.3	Evaluate contractor submittals for technical acceptability, execution feasibility, and completeness.		**Delphi Study (No Change Recommended)**		
6.4	Assess, monitor, and document contractor progress and performance against contract scope of work and recommend actions to the contracting officer.		**Delphi Study (No Change Recommended)**		
6.5	Identify safety hazards during civil engineer activities and organize response options	**Delphi Study (1)**	**Survey Majority (36.14%)**		
7.1	Develop and execute plans to mitigate mission impact during unplanned utility service interruptions		**Delphi Study (No Change Recommended)**		
7.10	Validate and communicate Minimum Operation Strip proposals for senior leader approval.			**Delphi Study (No Change Recommended)**	
7.2	Coordinate installation preparations that enable personnel to survive and operate in a Chemical, Biological, Radiological, and Nuclear (CBRN) environment.			**Delphi Study (No Change Recommended)**	
7.3	Translate mission planning documents and readiness guidance into unit readiness goals and tasks.				**Delphi Study (1)**
7.4	Develop and execute a Prime BEEF home station training program that meets unit readiness goals and tasks		**Delphi Study (1)**	**Survey Majority (41.63%)**	

Appendix 48: Delphi Study Round 2: Question 5 Timeline Attachment (Cont.)

7.5	Develop and maintain engineer portions of installation contingency plan			**Delphi Study (No Change Recommended)**	
7.6	Lead Civil Engineer Unit Control Center (UCC) operations.			**Delphi Study (No Change Recommended)**	
7.7	Serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).		**Delphi Study (1)**	**Survey Majority (34.47%)**	
7.8	Organize and direct airfield recovery activities.			**Delphi Study (1)**	
7.9	Validate and interpret CBRN modeling and mapping for senior leaders.			**Delphi Study (No Change Recommended)**	
8.1	Lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.		**Delphi Study (1)**	**Survey Majority (34.32%)**	
8.2	Assess and evaluate infrastructure capability, condition and capacity of potential operating locations to inform decision makers and mission owners.			**Delphi Study (1)**	
8.3	Develop an expeditionary bare base design.			**Delphi Study (1)**	
8.4	Coordinate acquisitions and logistics activities to support an expeditionary base beddown.			**Delphi Study (1)**	
8.5	Develop continuity documentation to support Civil Engineer operations across rotational turnover		**Survey Majority (30.02%)**	**Delphi Study (1)**	
8.6	Facilitate transition to operational contract support at a contingency location.			**Delphi Study (No Change Recommended)**	
9.1	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability.				**Delphi Study (1)**
9.2	Navigate staff relationships to acquire resources and authority for engineer activities in a joint or coalition organization.				**Delphi Study (1)**

Appendix 48: Delphi Study Round 2: Question 5 Timeline Attachment (Cont.)

9.3	Organize Civil Engineer efforts when divesting infrastructure to the host nation.				**Delphi Study (1)**
9.4	Lead small unit engineer activities under mission command orders in a **contingency** environment			**Delphi Study (1)**	**Survey Majority (63.22%) and Delphi Study (1)**
10.1	Translate policy and guidance into prioritized operational and tactical objectives.			**Delphi Study (No Change Recommended)**	
10.2	Ensure highest state of unit readiness by organizing, training, equipping and reporting on assigned UTCs.			**Delphi Study (No Change Recommended)**	
10.3	Direct execution of Civil Engineer resources to meet functional and operational mission requirements.			**Survey Majority (42.16%)**	**Delphi Study (1)**
10.4	Advocate for resources required to execute mission priorities and explain risk to mission for unfunded requirements			**Delphi Study (No Change Recommended)**	
10.5	Collaborate with support organizations to maximize their support to the installation mission requirements.			**Delphi Study (No Change Recommended)**	
10.6	Anticipate emerging requirements across the installation functions and incorporate into the Civil Engineer work plan.			**Delphi Study (No Change Recommended)**	
10.7	Lead EOC operations and coordinate response to contingencies				**Delphi Study (No Change Recommended)**
10.8	Leverage public and private partnerships through community engagement, mutual agreements, and third-party financing that better support the mission.				**Delphi Study (No Change Recommended)**
10.9	Cultivate a positive command climate based on trust, mutual respect, inclusion, safety consciousness, and stewardship of government resources.	**Delphi Study (No Change Recommended)**			
11.1	Formulate Civil Engineer strategy and policy objectives under the National Defense Strategy and Air Force Strategic Master Plan and translate requirements into published guidance.				**Delphi Study (1)**
11.2	Develop and manage civil engineer plans and programs to achieve mission requirements.				**Delphi Study (1)**

Appendix 48: Delphi Study Round 2: Question 5 Timeline Attachment (Cont.)

11.3	Provide guidance to joint partners to enable the proper employment of AF Civil Engineer capabilities.				**Delphi Study (1)**
11.4	Operate within the Congressional cycle by communicating Civil Engineer requirements, resources, and risk to influence the defense appropriation and authorization acts.				**Delphi Study (1)**
11.5	Advocate, support, and defend Civil Engineer resource requirements within assigned program of record when developing the AF POM position				**Delphi Study (1)**
12.1	Maximize unity of effort with fellow commanders.				**Delphi Study (No Change Recommended)**
12.2	Ensure compliance with standards, laws, and regulations through the commander's inspection program.			**Delphi Study (No Change Recommended)**	
12.3	Cultivate relationships to build trust and influence by across above-wing-level headquarters organizations.			**Survey Majority (41.05%)**	**Delphi Study (1)**
12.4	Communicate and deliver expertise, capabilities, and resources to MAJCOMs and squadrons to support installation mission requirements.				**Delphi Study (No Change Recommended)**
12.5	Lead and participate as an innovative, critical thinker in operational planning teams to continuously improve operational capabilities.			**Delphi Study (No Change Recommended)**	

Appendix 49: Final Civil Engineer Company Grade Officer Competency-Based Education Model

Civil Engineer Company Grade Officer Competency-Based Education Model				
Number	**Title**	**Competency**	**Proficiency Type**	**Rank**
1	Engineering Judgement and Critical Thinking	Anticipate and adapt engineering approaches in a dynamic operating environment by employing engineering judgement and critical-thinking	Binary	Second Lieutenant
2	Engineer Operations Safety and Real Property Vulnerabilites	Identify safety hazards during Civil Engineer operations/activities and vulnerabilities to base infrastructure and real property assets. Analyze these concerns and provide recommendations to appropriate decision-makers to organize response options	Binary	Second Lieutenant First Lieutenant
3	Civil Engineer Support Provision and Staff Interactions	Understand and communicate Civil Engineer Enterprise organic resources and capabilities with other United States Air Force units, such as Wing Staffs, Operations Groups, Maintenance Groups, Medical Groups, other Mission Support Squadrons, or sister services. This enterprise wide understanding includes the interaction between AFCEC, AFIMSC, MAJCOMs, and HAF staffs, as well as between the staffs and bases. The communication abilities should include joint collaboration, status of resources and expected real property risks of actions, and how CE can support various missions.	Scaled	Second Lieutenant First Lieutenant (Wing Level and Below) Junior Captain Senior Captain (Full Competency)
4	Civil Engineer Personnel Development and Training	Understand Civil Engineer Officer and Enlisted force development requirements, guidelines, and recommendations to assist in personal, peer, and subordinate proficiency attainment. Additionally, develop and assist others in developing personal and professional goals to assure career-long development. Finally, aid the development of contingency and deployment-related skills through leading or participating in home station training	Scaled	First Lieutenant Junior Captain Senior Captain
5	Stakeholder Engagement	Coordinate with stakeholders to identify and define civil engineer requirements, determine scopes of work, establish approximate cost and schedule, and recommend method of execution. This communication should occur during both the planning and execution of work, and should continue with after-action discussions upon work completion	Binary	First Lieutenant
6	Contract Management and Support	Develop the specifications/technical work requirements and solicitation package for contracted support of design, construction, and service contracts. Evaluate submittals, proposed drawings, and provided specifications for code, rule, and regulation, and design requirements. During contract execution, assess, monitor, and document contractor performance for contract compliance and recommend actions to contracting officer.	Binary	First Lieutenant
7	Programming and Program Support	Develop a comprehensive project programming package to request appropriate resources and authorization at both permanent and/or contingency locations.	Binary	First Lieutenant
8	Organic Civil Engineer Emergency Capabilites	Understand the local organic capabilities Civil Engineers provide during emergency situations and lead Civil Engineer Unit Control Center (UCC) operations or serve as an Emergency Support Function (ESF) Representative in the Emergency Operations Center (EOC).	Binary	First Lieutenant Junior Captain
9	Preparation and Recovery After Attack	Aid in identifying and executing plans to mitigate mission impact during unplanned disruptive events. In the occurrence of a disruptive event, organize and direct airfield recovery efforts, including validating and communicating minimum operating strips to senior leaders for approval. Ensure the development and maintenance of engineer portion of installation contingency plans.	Binary	First Lieutenant Junior Captain
10	Troop Leading Procedures	Lead small multi-disciplinary civil engineer units under mission command orders in contingency environments, to include executing cradle to grave endeavors, utilizing troop labor execution methods.	Binary	First Lieutenant Junior Captain

Appendix 49: Final Civil Engineer Company Grade Officer Competency-Based Education Model (Cont.)

11	Contingency Design	Design an airfield and bed down for expeditionary/contingency construction and repair. Included in this bed down is simplified facility design, support utility design, and base bed down layout. Prior to design, lead a pre-deployment site survey to determine limitations and capabilities of existing built and natural infrastructure; allied, partner and host nation support; and local contract capability.	Binary	First Lieutenant Junior Captain
12	Asset Management of Real Property Assets	Implement asset management principles to maintain, repair, sustain, and modernize AF real property infrastructure assets to optimize investments at the lowest possible life-cycle costs. These principles include maintaining asset visibility, understanding asset's impact and risk to mission, asset condition and resilience, and asset vulnerabilities. Communicate this information to decision makers and mission owners to ensure the mitigation of unacceptable risk and advocate for courses of action.	Binary	Junior Captain
13	Market Research	Investigate local commercial capabilities, advancements of applicable technologies and procedures, risks and opportunities, and incorporate these findings into engineer decision making processes and activities	Binary	Junior Captain
14	CBRN Preparation and Response	Understand published Chemical, Biological, Radiological, and Nuclear (CBRN) response procedures, coordinate with installation personnel in preparation for operation and survival of these events, and validate and interpret CBRN modeling and mapping to senior leaders and decision makers.	Binary	Junior Captain
15	Engineering Designs	Utilize standard designs to meet user requirements, site considerations, and governing design specifications/regulations. Employ references, professional consultation agencies, or other certified/trained personnel to perform design in areas beyond personal knowledge. Ensure design is in accordance with the comprehensive base master plan.	Binary	Junior Captain
16	Planning and Prioritization	Develop and manage existing civil engineer plans and programs to achieve mission requirements, integrate new and forecasted requirements into these portfolios, and propose prioritization of projects for execution. The recommended prioritization shall be based on information from the mission owners, base master plan, sustainment data, and funding strategies	Binary	Junior Captain Senior Captain
17	Contingency Host Nation Relations	Establish and cultivate relationships with community and host nation partners to maximize installation readiness capabilities and host nation stability. Incorporate applicable environmental agreements, laws, and host nation requirements into Civil Engineer activities.	Binary	Junior Captain Senior Captain
18	Contingency Bed Down Operations	Execute a bare base bed down through coordination of acquisition processes, logistical activities, and civil engineer resources in a contingency environment. Develop and continuously update continuity documentation to support rotational turnover. After bed down completion, facilitate the transition to operational contract support.	Binary	Junior Captain Senior Captain

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The Air Force Force Development Commander directed Air University schools to transition current developmental education programs to competency-based education. In compliance with this direction, The Civil Engineer School formalized performance requirements, proficiency types, and a standard development timeline for Civil Engineer Company Grade Officers. This research used structured brainstorming session, position analysis, career field survey, and expert elicitation (Delphi) study and established an educational model with a characterization of 18 Civil Engineer Company Grade Officer competencies, proficiency types, and developmental sequencing for this group.

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