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Contingency Contracting Officer Proficiency Assessment Test Development for Construction, Architect-Engineer, and Contingency Contracting

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NAVAL POSTGRADUATE SCHOOL

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MBA PROFESSIONAL REPORT

Contingency Contracting Officer Proficiency Assessment Test Development for Construction, Architect-Engineer, and Contingency Contracting

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March 2013

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In September 2011, the U.S. Army Corps of Engineers (USACE) published a proficiency training guide titled, *51C/1102 Proficiency Guide for Construction, Architect-Engineer, & Contingency Contracting*, for military contingency contracting officers (MCCOs) and 1102 interns within USACE. The training guide groups contracting tasks into four subject areas encompassing 45 separate contracting tasks in all. The research team of this report supplemented the USACE training by providing a Proficiency Assessment Test (PAT) based on the *51C/1102 Proficiency Guide* to assist mentors of MCCOs/1102 interns with a tool for standardizing a way for MCCOs/1102s to demonstrate proficiency of individual tasks. Objectives of the project include the development and implementation of a pilot PAT of select contracting tasks followed by a comprehensive written proficiency assessment test used as a tool to measure proficiency for each of the 45 individual tasks. The research team vetted questions through experienced USACE MCCO's and subject matter experts. Further, these experts assisted the team by providing valuable feedback from participating in the pilot PAT. After incorporating feedback from the sponsor, the research team provided USACE a final PAT that encompassed nearly 800 questions to measure proficiency of the 45 individual tasks.

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CONTINGENCY CONTRACTING OFFICER PROFICIENCY ASSESSMENT TEST DEVELOPMENT FOR CONSTRUCTION, ARCHITECT-ENGINEER, AND CONTINGENCY CONTRACTING

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CONTINGENCY CONTRACTING OFFICER PROFICIENCY ASSESSMENT TEST DEVELOPMENT FOR CONSTRUCTION, ARCHITECT-ENGINEER, AND CONTINGENCY CONTRACTING

ABSTRACT

In September 2011, the U.S. Army Corps of Engineers (USACE) published a proficiency training guide titled, *51C/1102 Proficiency Guide for Construction, Architect-Engineer, & Contingency Contracting*, for military contingency contracting officers (MCCOs) and 1102 interns within USACE. The training guide groups contracting tasks into four subject areas encompassing 45 separate contracting tasks in all. The research team of this report supplemented the USACE training by providing a Proficiency Assessment Test (PAT) based on the *51C/1102 Proficiency Guide* to assist mentors of MCCOs/1102 interns with a tool for standardizing a way for MCCOs/1102s to demonstrate proficiency of individual tasks. Objectives of the project include the development and implementation of a pilot PAT of select contracting tasks followed by a comprehensive written proficiency assessment test used as a tool to measure proficiency for each of the 45 individual tasks. The research team vetted questions through experienced USACE MCCO's and subject matter experts. Further, these experts assisted the team by providing valuable feedback from participating in the pilot PAT. After incorporating feedback from the sponsor, the research team provided USACE a final PAT that encompassed nearly 800 questions to measure proficiency of the 45 individual tasks.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACC	Army Contracting Command
A-E	Architect-Engineer
AERA	American Educational Research Association
AR	Army Regulation
APA	American Psychological Association
AT&L	Acquisition, Technology, and Logistics
AT&LDS	Army Training and Leader Development Strategy
CCO	Contingency Contracting Officer
CLP	Continuous Learning Points
CONUS	Continental United States
CTC	Combat Training Center
CWC	Commission on Wartime Contracting
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DoA	Department of the Army
DoD	Department of Defense
DoDIG	Department of Defense Inspector General
DTIC	Defense Technical Information Center
ECC	Expeditionary Contracting Command
FAR	Federal Acquisition Regulation
FM	Field Manual

FY	Fiscal Year
GAO	Government Accountability Office
HRD	Human Resource Development
LVC	Live, Virtual, Constructive
METL	Mission Essential Task List
MCCO	Military Contingency Contracting Officer
MCCT	Military Contingency Contracting Team
MICC	Mission and Installation Contracting Command
MOS	Military Occupational Specialty
NCME	National Council on Measurement in Education
NCO	National Contracting Organization
NPS	Naval Postgraduate School
PARC	Principle Assistance Responsible for Contracting
PARTS	Players, Added Values, Rules, Tactics, and Scope
PAT	Proficiency Assessment Test
PROSPECT	Proponent-Sponsored Engineer Corps Training
SES	Senior Executive Service
SMCT	*Soldier's Manual of Common Tasks*
UCF	Uniform Contract Format
ULC	U.S. Army Corps of Engineer Learning Center
USACE	U.S. Army Corps of Engineers

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE) is a vital component of U.S. national defense that executes necessary construction contracts in civil, military, and contingency scenarios. Near the epicenter of responsibility are contracting officers who ensure the USACE mission happens with the greatest of efficiency. Minimal knowledge of construction contracting is imparted to an Army 51C contracting officer before being assigned to the USACE, where it becomes a primary function of the contracting officer. The complexities involved in contemporary contracting challenge the force to develop contracting officers capable of understanding and managing contracts to efficiently meet modern demands. In 2011, the USACE produced the *51C/1102 Proficiency Guide* (USACE, 2011) in an effort to define training tasks for leaders and mentors in developing neophyte contracting officers unfamiliar with construction contracting.

The next evolutionary step in training was a need to develop a supplemental tool that would assist mentors in assessing competency in performing the 45 tasks in the *51C/1102 Proficiency Guide* (USACE, 2011). The USACE did not have a standardized test to measure construction contracting skills. The use of a proficiency assessment test (PAT) by the USACE would provide its leaders a tool to mentor 51C and 1102 contracting officers through immediate feedback on the proficiency levels of their subordinates, as well as a tangible progress tool to assist them in providing additional guidance. This PAT tool could introduce contracting officers new to the USACE with the scope of USACE operations and standards. The subject matter can be tested to identify tasks that the individual shows proficiency in or that require additional attention. Leaders could then individualize or focus training to more efficiently address the needs of subordinates.

The scope of the research team's project involved developing a proficiency assessment test that covered the 45 Contracting tasks listed in the *51C/1102 Proficiency Guide* (USACE, 2011). Following the example of the Arzu, Castro, & Mack research team (Arzu, 2010) that developed a PAT for the Army Contracting Command (ACC), the research team of this report researched and created a similar PAT to assist the USACE in

assessing and developing the proficiency of its contracting officers. The team conducted a literature review of applicable Army training doctrine and test-item writing to determine methods for developing the PAT and writing effective questions. The team identified appropriate literature to become familiar with construction contracting, Architect-Engineer contracting, and contingency operations. Because of the specialized area of contracting that the USACE conducts, the preponderance of references to understand the subject matter were obtained from the USACE and tied to its published *51C/1102 Proficiency Guide* (USACE, 2011). Utilizing knowledge gained from the literature review, the team developed and implemented a pilot PAT based on a selected number of tasks. Knowledgeable MCCO from the USACE completed this pilot PAT and provided feedback on the developed questions and format that were incorporated into the development of the comprehensive PAT.

The research team's test items were vetted by USACE subject matter experts for realism, difficulty, and time required for completing the test. Averaging 20 questions per task, the research team provided a written PAT containing approximately 800 test items covering the 45 tasks identified in the *51C/1102 Proficiency Guide* (USACE, 2011) to the USACE. The USACE received ownership of the written PAT test items and answers that the research team created. The USACE can relatively easily convert the PAT from its written format into an automated version for implementation. The PAT will allow leaders in the USACE to more accurately measure a contracting officer's knowledge and capabilities against the established standards contained in the *51C/1102 Proficiency Guide*.

LIST OF REFERENCES

Arzu, J., Castro, B., & Mack, B. (2010). *Contingency contracting officer proficiency assessment test development* (NPS-CM-10–007, Master's thesis, Naval Postgraduate School). Retrieved from Acquisition Research Program website: http://acquisitionresearch.net

U.S. Army Corps of Engineers (USACE). (2011). *51C/1102 proficiency guide for construction, architect-engineer (A-E) and contingency contracting* (EP 715–1-8). Washington, DC: U.S. Government Printing Office.

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I. INTRODUCTION

A. BACKGROUND

The U.S. Army Corps of Engineers (USACE) has played an integral part in the development of the country and its changing defense requirements. Over the last two centuries, the duties and responsibilities of the USACE has included building coastal fortifications, surveying roads and canals, eliminating navigational hazards, responding to natural disasters, and producing both military construction and civil works (U.S. Army Corps of Engineers [USACE], 2012). During this time period, procurement of contracted services has evolved from the quartermaster of the Revolutionary War to today's 51C/1102 contracting officers (51C is the military occupational specialty [MOS] code assigned to contracting officers/specialists; 1102 is the civilian equivalent contracting officer/specialist). The complexities involved in contemporary contracting challenge the force to develop contracting officers capable of understanding and managing contracts to efficiently meet modern demands. The lack of a standardized training regimen with sufficient preparation and mentorship to develop contracting officers has negatively affected the overall performance of the USACE and the contracting community as a whole.

The Army established the Corps of Engineers as a separate, permanent branch on March 16, 1802. Since then, the USACE has acquired an exhaustive list of agencies and national allies as service clients. It manages and/or completes contract programs at home and abroad to support the U.S. Army and Air Force, federal agencies like NASA and the U.S. Postal Service, as well as a massive effort with allies in Saudi Arabia. The Corps also maintains a rigorous research and development program in support of its water resources, construction, and military activities. Since 1941, the USACE has had the responsibility for real estate acquisition, construction, and maintenance for Army facilities, including training camps, government-owned munitions plants, air bases, depots, and hospitals. Currently, it is supporting efforts in the Global War on Terrorism, including reconstruction in Iraq and Afghanistan (USACE, 2012).

This broad scope of operations demands knowledgeable and flexible professionals to competently execute the Corps' mission. Due to the systemic failures of the contracting profession (Gansler et al., 2007), a definitive effort to improve the technical and operational capability of contracting officers is being demanded across the Department of Defense (DoD). Recommendations by the Gansler Commission, Department of Defense Office of Inspector General (DoDIG), and others mentioned in the literature review presented in Chapter II, detail the requirements necessary in overcoming the many shortcomings in defense contracting. The U.S. Army Corps of Engineers published its *51C/1102 Proficiency Guide* in September 2011. The intent of this guide is not to replace the *Army Contracting Command 51C Level One Proficiency Guide* (Department of the Army [DoA], 2010) but to supplement it for construction and architect-engineering purposes. The *51C/1102 Proficiency Guide* identifies essential tasks expected of USACE contracting officers and provides a mentorship tool to assist with properly developing and preparing contracting officers to meet the rigorous needs of USACE operations.

In 2010, the ACC established a proficiency assessment test (PAT) for the 36 tasks listed in the *Army Contracting Command 51C Level One Proficiency Guide* (DoA, 2010). Similarly, this research utilizes the structure and order of the 45 tasks listed in the USACE *51C/1102 Proficiency Guide for Construction, Architect-Engineer, and Contingency Contracting* (EP 715–1-8; USACE, 2011a) as well as the research and methodologies used in conceiving the ACC's PAT to create a separate PAT specifically for construction and Architect-Engineer contracting. This test will enhance the Army's efforts to mentor and develop 51C and 1102 contracting officers to meet the USACE and Army's standards of performance.

B. PROBLEM STATEMENT

The recent creation and distribution of the *51C/1102 Proficiency Guide for Construction, Architect-Engineer and Contingency Contracting* (EP 715–1-8; USACE, 2011a) is an effective tool in standardizing the vital skills in the 51C/1102 repertoire. The next evolutionary step is to develop a supplemental tool that will assist mentors in

assessing competency in performing the 45 tasks in the *51C/1102 Proficiency Guide*. Currently, the USACE does not have a standardized test to measure construction contracting skills. Construction and Architect-Engineer contracting are areas not addressed in the ACC's PAT. Creating the PAT to be utilized as a tool will assist USACE mentors in measuring the proficiency of newer 51C officers and 1102 interns against established Army standards and in customizing the training curriculum to more effectively improve the progress of contracting officers.

C. RESEARCH OBJECTIVES

The objective of this research was to develop a written PAT for the 45 identified tasks in the USACE *51C/1102 Proficiency Guide* (2011a). The research team developed questions to assess proficiency in each of the 45 tasks within the *51C/1102 Proficiency Guide*. Utilizing research conducted by the Arzu, Castro, and Mack (2010) Naval Postgraduate School (NPS) thesis research team, applicable theoretical and academic principles, and feedback from interviews with subject-matter experts, the research team developed a written Construction Contracting Officer Proficiency Assessment Test to provide to the USACE.

To accomplish this, the research team answered the following primary research question: What is the most effective and efficient method of measuring an individual's proficiency in the 45 identified tasks in the *51C/1102 Proficiency Guide* (USACE, 2011a)? Additionally, the team researched methods to develop a PAT and determined the most effective type of test for evaluating comprehension and recollection. The team also implemented a pilot PAT with the assistance of its targeted audience, USACE military contingency contracting officers (MCCOs), to identify the effectiveness and limitations of the research team's approach prior to finalizing the PAT.

D. SCOPE AND DELIVERABLES

This research project's scope is limited to developing a proficiency test covering the 45 tasks listed in the *51C/1102 Proficiency Guide* (USACE, 2011a). Completing this research project required the team to execute the following tasks:

- develop a PAT for measuring 51C/1102 proficiency at the tasks listed in the *51C/1102 Proficiency Guide*, which included questions measuring comprehension and recollection of the 45 tasks;
- vet questions and scenarios through feedback from USACE subject-matter experts to confirm the validity of the questions;
- construct a web-based pilot PAT consisting of six tasks that knowledgeable USACE MCCOs will participate in to confirm that test questions meet requested time and difficulty expectations expressed by the USACE and its test proctors; MCCO feedback will be incorporated into the PAT;
- complete the PAT in a format enabling ease of use in either written or computerized format; and
- provide a compilation of written questions and answers to the USACE upon completion of test production.

E. POTENTIAL BENEFITS

The use of a proficiency test by the USACE will enable its leaders to mentor 51C and 1102 contracting officers to have immediate feedback on the proficiency levels of their subordinates, as well as a tangible progress tool to assist them in providing additional guidance. This tool could introduce contracting officers new to the USACE with the scope of USACE operations and standards. The subject matter can be tested to identify tasks that the individual shows proficiency in or that require additional attention. Leaders could then individualize or focus training to more efficiently address the needs of subordinates. The instantaneous feedback from the test would also lessen the time needed by commanders to assess their unit's training effectiveness.

The PAT will also quantify the 51C/1102's preparedness and familiarity with the skills necessary to accomplish necessary USACE contracting missions. The PAT can also serve as a culminating certification of an individual's preparedness after completing the unit's training program. Initial attempts by the individuals can be recorded and compared with later efforts to demonstrate progress and build confidence in the material.

Additionally, the PAT provides vital feedback to leaders deciding where to assign 51Cs and 1102s. As a training tool, it will assist leaders in identifying individuals who

are prepared for promotion to positions of greater responsibility. This could improve the overall efficiency of the unit by having the right people, competent and capable, in the right positions.

F. LIMITATIONS

The establishment and implementation of the PAT has limitations. The immediate limitations are the delivery method to test individuals, the integrity of the test, and the currency of the PAT based on the currency of the *51C/1102 Proficiency Guide*, as well as updates based on changes in policy and practice. Additionally, the USACE *51C/1102 Proficiency Guide* (2011a) tasks have varying performance measures and standards that make treating testing for each task in a uniform way difficult. Leadership within the USACE will need to implement the risk management process to mitigate some of these limitations to ensure the PAT is, and remains, a viable and effective tool for assessment.

The delivery method to test individuals will have distinctive limitations depending on the method that the USACE chooses. The primary deliverable for this research is the PAT in a static format for ease of delivery in either written or computerized form. Although it is beyond the research scope, discussion with USACE leadership suggests that an online delivery method will be strongly considered based on the success of the Expeditionary Contracting Command's (ECC's) implementation. The limitations of this method raise several questions that need answers. For example, *who will be in charge of implementing the test? How will implementation be funded? Will the test be proctored? How often will it be administered?* The differences in the implementation approach will affect the resources required as well as the mitigation measures needed to protect the integrity of the PAT.

The integrity of the PAT is a concern. Because the test could be copied and the answers disseminated to the individuals being tested, the tool's purpose and effectiveness as a measurement of proficiency could be invalidated. Implementing the test through an automated means may mitigate some of the risk if questions are selected randomly from a database; however, the threat of cheating will still be an issue. This is another area in which USACE leadership can mitigate risk. For example, personnel being assessed could

be required to take the PAT at a proctored location with sufficient oversight to safeguard the questions and prevent answers from being disseminated.

Updates to policy and practice are another limitation to the research. This research is based on the current *51C/1102 Proficiency Guide* (USACE, 2011a) tasks with their associated references that are being continuously updated. Therefore, the PAT deliverable will become outdated as policies and practice change in the subject areas. The USACE will need to mitigate this limitation by updating the PAT periodically as updates are made to the *51C/1102 Proficiency Guide* (USACE, 2011a) to ensure that the PAT remains a viable and effective tool for assessment.

The USACE *51C/1102 Proficiency Guide* (2011a) tasks have varying performance measures and standards that make treating testing for each task in a uniform way difficult. As is discussed later in Chapters III and IV, each of the 45 tasks in the USACE *51C/1102 Proficiency Guide* (2011a) have different performance measures and standards that define acceptable levels of proficiency and that have been deconstructed to formulate questions for the PAT. Many tasks lend themselves to a uniform approach of utilizing multiple-choice questions; however, not all tasks are well suited for a multiple-choice format. This limitation needs to be kept in mind as the PAT is designed as a supplemental tool to assist mentors in assessing proficiency. The PAT should not substitute for the *51C/1102 Proficiency Guide* because it includes several tasks that require interactive and subjective mentor feedback that may take days or weeks to accomplish which is not conducive to a rapid feedback exam. For example, Task 2–8, Develop a Construction Solicitation, is best assessed by measuring the quality and thoroughness of a developed solicitation and not by answering multiple-choice questions that include the correct answers (USACE, 2011a).

Many of the limitations discussed also apply to the ACC PAT initially developed based on research conducted by Arzu et al. (2010). Arzu et al. (2010) reached similar conclusions regarding the limitations of the PAT. The ACC was able to adopt mitigating practices, such as automated delivery and limited distribution of the answer key, that

have protected the PAT and made it effective and efficient. Similarly, the USACE will need to determine an acceptable level of risk and apply risk mitigation techniques to address the limitations discussed.

G. METHODOLOGY

The research methodology was to first grasp a clear understanding of the requirement needs of the USACE, the sponsoring agency, to determine an end-product deliverable that would assist the agency with its mission needs. Because this project closely resembles research conducted by Arzu et al. (2010), the team became familiar with the methodology used to produce an effective PAT for the ACC that had a similar target audience. The team conducted a literature review of applicable Army training doctrine and test-item writing to determine methods for developing the PAT and writing effective questions. The team identified appropriate literature to become familiar with construction contracting, Architect-Engineer contracting, and contingency operations. Because of the specialized area of contracting that the USACE conducts, the preponderance of references to understand the subject matter were obtained from the USACE and tied to its published *51C/1102 Proficiency Guide* (USACE, 2011a). Utilizing knowledge gained from the literature review, the team developed and implemented a pilot PAT based on a limited number of tasks. Knowledgeable MCCO from the USACE completed this pilot PAT and provided feedback on the developed questions and format. The team incorporated this feedback to produce PAT questions covering all 45 tasks identified in the *51C/1102 Proficiency Guide* (USACE, 2011a), which were then reviewed and accepted by the sponsoring agency for future implementation.

The literature review of USACE contracting subject matter is extensive in both its historical timeline and breadth of subject matter. This section of the literature review primarily addresses contemporary issues facing ACC, as well as USACE-specific topics in the 21st century. Based on the failures identified in the Gansler Commission report (Gansler et al., 2007), the research team designated this document as a starting point in the literature review. The USACE Office of Inspector General's database provided

reports applicable to the research, while also giving the explicit details of common challenges in planning, awarding, and administering contracts. The Defense Technical Information Center (DTIC) contributed additional sources on topics relevant to construction contracting in a contingency environment. Supplementary data were acquired through reports from the Government Accountability Office (GAO), USACE archives, and DoD guidance. Reviewing USACE history and identifying the contracting challenges associated with the applicable contracting mission gave the research team perspective and background to create the PAT.

An overview of the USACE's National Contracting Organization (NCO) is discussed to ensure that the research in developing the PAT would meet NCO mission needs. The NCO overview includes the organizational structure, command relationship to USACE, and training methodology. This overview includes how the military contingency contracting teams (MCCTs) are organized and the approach to train MCCOs within the NCO. The PAT is tailored for the NCO-developed *51C/1102 Proficiency Guide* (USACE, 2011a), which is an essential component to the training approach.

The *51C/1102 Proficiency Guide for Construction, Architect-Engineer and Contingency Contracting* (USACE, 2011a) is the primary reference for PAT question development. The *51C/1102 Proficiency Guide* has 45 specific tasks identified that are used to support the USACE contracting mission. These tasks state the performance steps required to meet an acceptable standard of performance. Using the *51C/1102 Proficiency Guide* (USACE, 2011a) was crucial to the research team in building the physical PAT, as it provided an easy and appropriate format for commanders to assess individual performance against overall mission-essential objectives. The performance of each task, from Task 1–1 through Task 4–6, is measured on a "GO" or "NO GO" basis, which aligns with rating methods stated in Army training doctrine (FM 7–1; DoA, 2003). The performance steps provided the key focus for developing answers for the PAT. The *51C/1102 Proficiency Guide* (USACE, 2011a) also links references, policies, and procedures to the tasks, which provided the research team with sources of knowledge to develop and validate the correctness of answers for the PAT. It was essential for the

research team to become familiar with the *51C/1102 Proficiency Guide* (USACE, 2011a) and how it supports the training methodology within the USACE.

The research team also reviewed Army training doctrine. The primary audience for taking the PAT is Army soldiers in the 51C career field. The research team reviewed *Army Training and Leader Development* (Army Regulation [AR] 350–1; DoA, 2009), *Training the Force* (Field Manual [FM] 7–0; DoA, 2002), and *Battle Focused Training* (FM 7–1; DoA, 2003) because they provide overarching Army doctrine for leader development and unit training. The PAT developed in this project can be successfully implemented in an Army center or school as an established method of preliminary training and successive education. Furthermore, the PAT can be utilized as a self-development tool throughout the professional lifespan of an Army Soldier or professional civilian.

One of the challenges of the project was integrating theoretical and academic principles with Army training doctrine in a manner that neither diluted nor compromised either component's fundamentals. The research team performed a literature review for the development and construction of a PAT. The research team utilized Downing and Haladyna's (2006) *Handbook of Test Development* to develop a test construction plan, test blueprint as well as strategies for item writing. The research team also reviewed other sources such as *The Adult Learner* (Knowles, Holton, & Swanson, 1998) for learning theory and guidance for human resource development, and *Test Construction* (Wood, 1960) for understanding test validity. This literature provided the fundamentals for the test's justification. Additionally, the research team reviewed *Manual for the Preparation of Objective Test Questions* (Muller, 2006) to further understand the fundamentals of test-item construction.

Each research member developed questions for each of the 45 tasks identified by the USACE *51C/1102 Proficiency Guide* (2011a). Having each member look at each task, rather than breaking up the tasks for individual effort, allowed each research team member to be familiar with all the references, enabled the research team to brainstorm as a group, and allowed team members to peer review questions other team members put forward. As mentioned, the *51C/1102 Proficiency Guide* (2011a) follows Army training

doctrine by identifying essential tasks to train and gives conditions, standards, and performance steps to achieve the acceptable level of performance for each task. The research team's approach was to "reverse-engineer" the tasks, using an approach similar to that used by Arzu et al. (2010), by identifying the attributes of demonstrated proficiency and making those responses the answers to focus question development around for the PAT.

Utilizing knowledge gained from the literature review, the team developed and implemented a pilot PAT consisting of six tasks that knowledgeable USACE MCCOs participated in. The MCCOs provided feedback to the team on the developed questions and PAT format. The team incorporated the feedback received to continue producing PAT questions covering all 45 tasks identified in the *51C/1102 Proficiency Guide* (USACE, 2011a). As groups of tasks were completed by subject area, the team provided the research to the sponsor point of contact within the USACE. The USACE utilized knowledgeable and experienced leaders within their organization to review the material and provide feedback.

H. ORGANIZATION OF THIS REPORT

The organization of this report consists of five chapters. Chapter I is an introduction to the research project. The introduction consists of the following topics: background information on the problem, the research problem statement, research objectives, the project scope and deliverables to the USACE, potential benefits of developing a PAT, limitations impacting the PAT, the research methodology, organization of the report, and a summary. Chapter II is a literature review consisting of a multitude of sources on the following topics: common contracting challenges and issues applicable to USACE contracting, Army training doctrine applicable to the problem, and test construction and evaluation. In Chapter III, the researchers give an overview of the USACE NCO as the developing agency for the *51C/1102 Proficiency Guide* (USACE, 2011a), which is discussed in detail. In Chapter IV, the researchers describe the research approach and method to create the PAT as well as the production of and feedback from

the pilot PAT. In Chapter V, the researchers summarize the project and present the conclusion and recommendation areas for further research.

I. SUMMARY

The USACE has played an integral part in the development of the country and its changing defense requirements. Over the last two centuries, the duties and responsibilities of the USACE have included building coastal fortifications, surveying roads and canals, eliminating navigational hazards, responding to natural disasters, and producing both military construction and civil works (USACE, 2012). The lack of a standardized training regimen with sufficient preparation and mentorship of developing the USACE acquisition workforce has negatively affected the overall performance of the USACE and the contracting community as a whole. The USACE published its *51C/1102 Proficiency Guide* in September 2011. The *51C/1102 Proficiency Guide* identifies essential tasks expected of USACE contracting officers and provides a mentorship tool to assist with properly developing and preparing contracting officers to meet the rigorous needs of USACE operations.

The recent creation and distribution of the USACE *51C/1102 Proficiency Guide* (2011a) is an effective tool in standardizing the vital skills in the 51C/1102 repertoire. The next evolutionary step is to develop a supplemental tool that will assist mentors in assessing competency in performing the 45 tasks in the *51C/1102 Proficiency Guide* (USACE, 2011a). The objective of this research is to develop a written PAT for the 45 identified tasks in the USACE *51C/1102 Proficiency Guide* (2011a). A proficiency test will enable USACE leaders mentoring 51C and 1102 contracting officers to have immediate feedback on the proficiency levels of subordinates as well as a tangible progress tool that will assist them in providing additional guidance. This tool could introduce contracting officers new to the USACE with the scope of USACE operations and standards. Additionally, the PAT can quantify USACE team members' preparedness and familiarity with the skills necessary to accomplish necessary USACE contracting missions and may provide USACE leadership with decision-making tools to decide where to assign 51Cs and 1102s.

The establishment and implementation of the PAT has limitations. The immediate limitations are the delivery method to test individuals, the integrity of the test, and updates based on changes in policy and practice. Additionally, the USACE *51C/1102 Proficiency Guide* (2011a) tasks themselves have varying performance measures and standards that make treating testing for each task in a uniform way difficult. Leadership within the USACE will need to implement the risk management process to mitigate some of these limitations and ensure the PAT is, and remains, a viable and effective tool for assessment.

Establishing a PAT based on the *51C/1102 Proficiency Guide* (USACE, 2011a) will strengthen the USACE's training methodology. The PAT will provide an additional tool for the contracting workforce to demonstrate task proficiency to themselves, their supervisors, and other leaders. Creating the PAT as a supplementary tool to the *51C/1102 Proficiency Guide* will further assist USACE mentors in measuring the proficiency of newer 51C officers and 1102 interns against established Army standards and in customizing their training curriculum to more effectively improve contracting officers' progress.

Chapter II is the preponderance of the research literature review. The review primarily addresses contemporary issues facing ACC—as well as USACE-specific topics in the 21st century. The review probes the problems and challenges of contracting with a focus on construction, Architect-Engineer, and contingency contracting. Additionally, applicable Army training doctrine is discussed as well as a review of the literature on test construction and evaluation.

II. LITERATURE REVIEW

A. INTRODUCTION

In June 2010, the Naval Postgraduate School project team of MAJ Juan Arzu, MAJ Beire Castro, and MAJ Brian Mack produced an MBA professional report, *Contingency Contracting Officer Proficiency Assessment Test Development*. Arzu et al. addressed the need for an effective and efficient method of measuring contracting officers' proficiency at assigned tasks and asked how the test can be developed to be best suited for meeting their client's requirements. Their study reviewed two major components: contingency contracting and test construction and evaluation. By researching and understanding the first, Arzu et al. (2010) defined requirements, scope, and depth for the second component.

The field of test development has not made many radical changes or improvements from what was created 50 years ago. This lack of change is evidenced by the many contemporary studies that cite Bloom's *Taxonomy of Educational Objectives* (1956) and Nunnally and Ator's *Educational Measurement and Evaluation* (1972), often using these works as the basis of the studies. The Arzu et al. (2010) research team structured its questions according to Bloom's cognitive domains of remembering, understanding, and applying to tasks, and categorized their questions according to Nunnally and Ator's (1972) principles. The team also implemented further refinements based on Anderson et al.'s *A Taxonomy for Learning, Teaching, and Assessing* (2002), which was a revision and extension of Bloom's (1956) earlier work. The Arzu et al. (2010) professional report not only guided the research team of this report through the rigors of developing a method for measuring individual competencies of an intricate discipline but also was utilized as a quality reading resource for professionals in the contracting career field. The research is thorough and concise, and it answers the primary research question through the coupling of military doctrine and academic theory.

The professional report of Arzu et al. (2010) addresses a dire need inside the ACC for contracting officers that are proficient in their assigned role to support the Army's

activities at home and abroad through procurement and services in a broad spectrum of contracts. It is also the basis for this professional report, which focuses on a similar need in the USACE for its contracting officers who must meet all the ACC proficiencies expected of an Army contracting officer, as well as additional knowledge in construction contracting and in the USACE's unique organizational structure and responsibilities.

This research concentrates on the academic study of principles and applications of item writing and test construction in order to create a practical and useful PAT to evaluate USACE contracting officers based in the skills identified in the USACE's *51C/1102 Proficiency Guide* (EP 715–1-8; USACE, 2011a). Based on the findings of the Arzu et al. research team, the research team of this report conducted a similar examination of topical literature to verify their findings, as well as to explore the possibility of new resources published in the last two years. This research team's review indicated that the theories and studies the previous research team used are still the most contemporary resources available. This enabled the research team of this report to proceed in developing a PAT in a manner parallel to the one for the ACC.

The USACE contracting subject matter is extensive in both its historical timeline and breadth of subject matter. In this literature review, the researchers primarily address contemporary issues facing the ACC, as well as USACE-specific topics in the 21st century. The review probes the problems and challenges of contracting with a focus on construction, Architect-Engineer, and contingency contracting. The matters of training and preparation are reviewed through the lens of contemporary business strategy, "institutional Army" methods, Defense Acquisition University (DAU) courses, and the newly developed soldier's manual of common tasks (EP 715–1-8; USACE, 2011) to identify strengths to build upon and/or deficiencies to overcome in the development and preparation of USACE contracting officers.

B. VALUE WEB THEORY

How does the ACC improve its core competency in defense contracting? And how does it assess the proficiency of its employees to accomplish the mission? An effective means of measuring the performance of Army contracting is to utilize business

models addressing facets of efficiency, structure, and value. From the evaluation we can justify what factors require attention and what scope of attention is necessary.

Brandenburger and Nalebuff (2000) discussed the Value Web theory for effectively analyzing the efficiency and strategy of a firm in order to develop a model of future operations. Scrutinizing the ACC under the Value Web model reveals the interdependence between all parties involved and how change is an expected factor in the theory (Figure 1). The model shows how a participant in the Value Web can hold multiple roles simultaneously. "A key insight of this theory is the importance of focusing on others—namely, allocentrism. To look forward and reason backward, you have to put yourself in the shoes of other players" (Brandenburger & Nalebuff, 2000, p. 58). The key takeaway is to know what attributes or contributions each member in the net [web] brings to the others (Brandenburger & Nalebuff, 2000). The concept of interdependencies between roles in the model builds a framework of rules contracting officers should observe during business interactions to build creative solutions to predicaments, questions, or new developments encountered.

> According to game theory, there are five [elements]: players, added values, rules, tactics, and scope—P.A.R.T.S. for short. These five elements fully describe all interaction, both freewheeling and rule-based. To change the game, you have to change one or more of these elements.
>
> *Players* come first. As we saw in the Value Net, the players are customers, suppliers, substitutors, and complementors. None of the players are fixed. Sometimes it's smart to change who is playing the game. That includes yourself.
>
> *Added values* are what each player brings to the game. There are ways to make yourself a more valuable player—in other words, to raise your added value. And there are ways to lower the added values of other players.
>
> *Rules* give structure to the game. In business, there is no universal set of rules; a rule might arise from law, custom, practicality, or contracts. In addition to using existing rules to their advantage, players may be able to revise them or come up with new ones.

Tactics are moves used to shape the way players perceive the game and hence how they play. Sometimes, tactics are designed to reduce misperceptions; at other times, they are designed to create or maintain uncertainty.

Scope describes the boundaries of the game. It's possible for players to expand or shrink those boundaries.

Successful business strategies begin by assessing and then changing one or more of these elements. PARTS does more than exhort you to think out of the box. It provides the tools to enable you to do so. (Brandenburger & Nalebuff, 2000, p. 61)

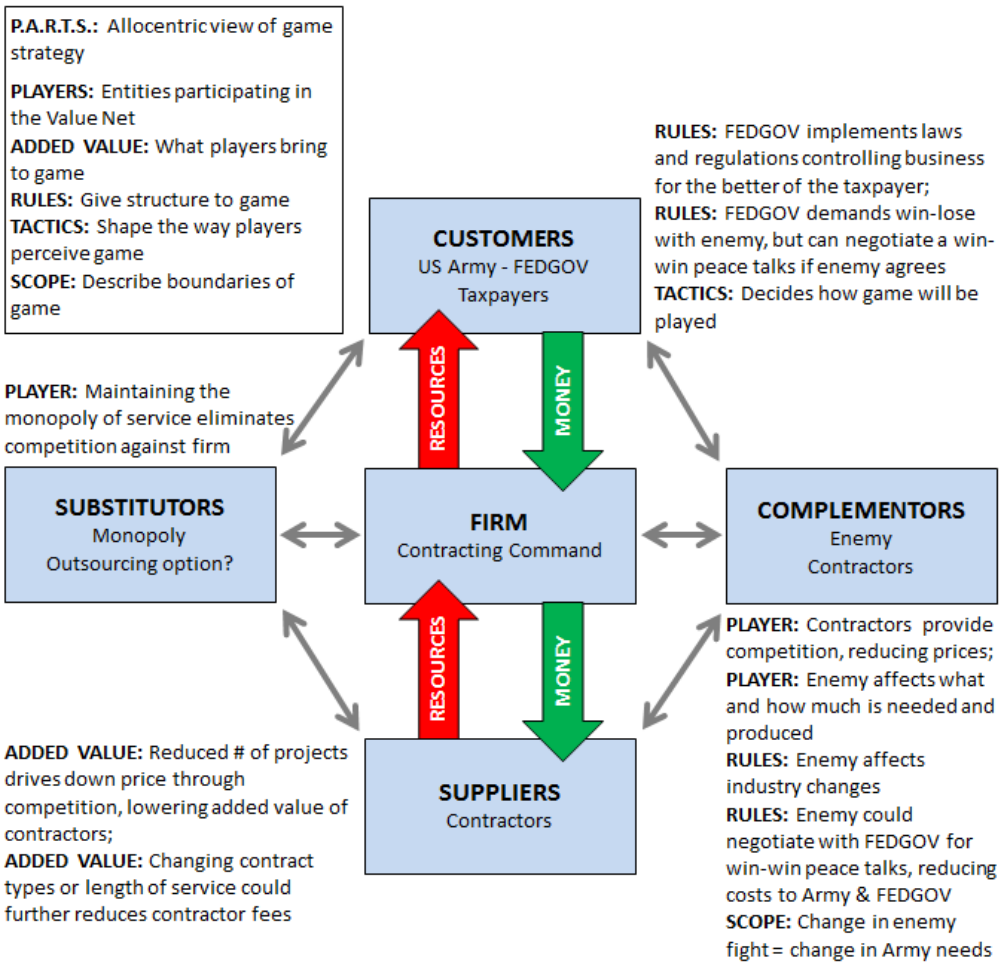

Figure 1. Adapted from the Value Web Model
(After Brandeburger & Nalebuff, 2000, p. 60)

In the context of this model, Hamel and Prahalad (1994) gave an example: "On any given day, AT&T might find Motorola to be a supplier, a buyer, a competitor, and a partner" (Brandeburger & Nalebuff, 2000, p. 60). Hamel and Prahalad (1994) explained the possible relationships between participants and how advantage or leverage can be produced. Explaining the fluidity of roles gives insight for leaders mentoring contracting officers in their wide range of responsibilities. This model encourages thinking outside the entrenched mindset (the typical "us versus them" or "friends and enemies" perspective of relationships), a mindset that will not function effectively on the rapidly changing battlefield.

Contractors hold two positions in this model. This duality of roles reinforces the fact that contract management by suppliers and proposal competition (complementors) are key products of successful operation/interdependence of the firm. This model discards the "us versus them" roles to reveal a mutual exchange affecting both parties. Iniquity by either participant results in reduced performance of the system as a whole, which negatively affects the Agency (or federal government/taxpayers).

In the case of contractor/contracting officer, improving the competencies of a participant is mutually beneficial and improves the firm's operations. This theory implies that competency at a role is not enough, but an aptitude for discovering mutually beneficial exchanges is necessary to produce a consistently evolving and improving firm. The evolution of the firm dictates to what extent success is achieved throughout the model. This evolution will initially come in the form of training and mentorship of contracting officers to achieve increased knowledge of and familiarity with the operational opportunities best suited for the improvement of participants in the Value Web.

1. Strategy and Competitive Advantage

According to Ghemawat and Rivkin (1998), competitive advantage is defined as the wedge between a buyer's willingness to pay and the costs a firm incurs. Additionally, they define added value as "the maximal value created by all participants in a transaction minus the maximal value that could be created without the firm" (Ghemawat & Rivkin,

1998, p. 6). Strategically valuable resources are what gives a firm a competitive edge and are what enable a firm to perform activities better or more cheaply than rivals. These resources can be physical assets (a prime location), intangible assets (a strong brand), or capabilities (a superefficient manufacturing process) (Collis & Montgomery, 2008, p. 142). Although a contracting command is not a for-profit business, it must still maintain a competitive advantage. The strategically valuable resources of a contracting firm are the competencies of individuals. "Firms that generate competitive advantages typically do so by devising strategies that neutralize the unattractive features of their industry and exploit the attractive features" (Ghemawat & Rivkin, 1998, p. 4).

Strategically valuable resources have five characteristics: (1) they are difficult to copy; (2) they depreciate slowly; (3) the company—not employees, suppliers, or customers—controls their value; (4) they cannot be easily substituted; and (5) they are superior to similar resources that competitors own (Collis & Montgomery, 2008, p. 142). As a contracting command, the USACE provides a valuable contracting service to the Army through a small community of professionals. This service requires several years of schooling and training/experience to produce an efficient and capable contracting officer. The USACE organizes/structures these professionals to maximize accountability and professional development of its members. Figure 2 demonstrates the USACE path to the sustained competitive advantage necessary to optimize performance of the firm.

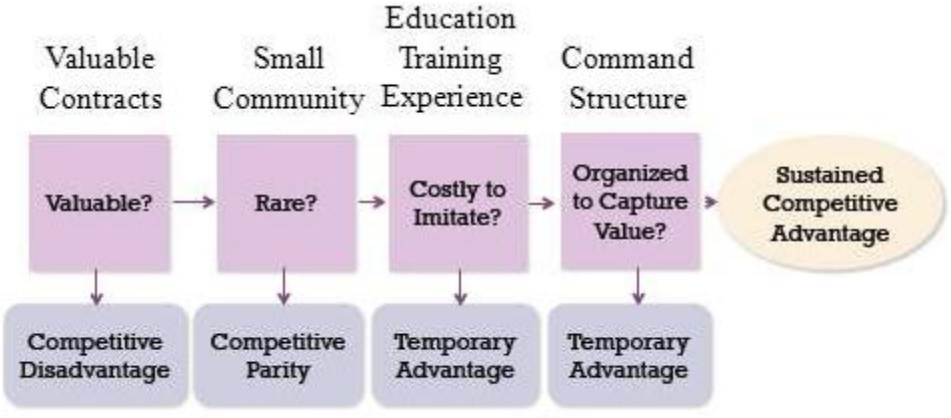

Figure 2. Sustained Competitive Advantage Model
(After Rothaermel, 2013, p. 91)

2. Application

As Arzu et al. (2010) stated, the development of a PAT addresses critical aspects of the key failures described in the Gansler et al. (2007) report. Researching and identifying the important skills and tasks required to improve personnel performance enabled their team to create an assessment tool that was both timely and pertinent to the needs of the contracting command. Referring to the research by Tigges and Snyder (1993), Lasch (2002), and Kirstein (2003), they identified tasks necessary to adequately accomplish the responsibilities of a contingency contracting officer (CCO). Using military doctrine as their basis for product architecture, Arzu et al. (2010) integrated test construction standards and effective learning principles into the format of their PAT. Further detail on this effective template will be discussed in the Testing and Evaluation section (Chapter II, Section C) of this report.

Contracting knowledge areas within the USACE are common to all Army 51Cs, but with additional topics including construction, Architect-Engineer contracts, and the USACE construction format which is a variant of the Uniform Contract Format (UCF) (standardized format used in the preparation of a solicitation and contract). This enabled the research team to compose a similar list that incorporates applicable tasks from the USACE *51C/1102 Proficiency Guide* (EP 715–1-8; 2011a). This list, along with guidance from the *USACE Purple Book* (U.S. Army Corps of Engineer Learning Center [ULC], 2011), a course catalog for the Proponent-Sponsored Engineer Corps Training (PROSPECT), is used for including pertinent subject matter into the research team's PAT.

C. TESTING AND EVALUATION

A comprehensive review of test and assessment concepts facilitated the research group in determining how best to develop and design an effective PAT aligned with core Army training standards exhibiting relevancy to specific tasks, conditions, standards, and performance measures delineated in the *51C/1102 Proficiency Guide* (EP 715–1-8; USACE, 2011a).

1. Training and Assessment

Arzu et al. (2010) utilized Field Manuals (FM) 7–0 (*Training the Force*; DoA, 2002), 7–1 (*Battle Focused Training*; DoA, 2003), and Army Regulation 350–1 (*Army Training and Leader Development*; DoA, 2009) as the three principal references applicable to current Army doctrine in the development of their PAT for CCOs (Arzu et al., 2010). All three of these references correspondingly provide the primary framework to which the development of a suitable PAT designed specifically for construction, Architect-Engineer, and contingency contracting is to be based. Army Regulation 350–1 (DoA, 2009) serves as a collection of policy and guidance explicitly for Army training and leader development standards. FM 7–0 (DoA, 2002) acts as the Army's capstone training policy pertinent to all units, at all levels, and in all components. Ultimately, the goal of FM 7–1 (DoA, 2003) is to shape Army training regulations while placing emphasis on teaching leaders to think through the training process in an effort to create leaders who understand how to think and apply durable training principles to their units and organizations.

Whereas FM 7–0 (DoA, 2002) introduces the training cycle, the linkage of Army training and leader development, and the three domains where training occurs (operational, institutional, and self-development), FM 7–1 (DoA, 2003) demarcates those precisely accountable for training and training support. The Army Training and Leader-Development Model, shown in Figure 3, illustrates an amalgamation of the standards set forth in FM 7–0 (DoA, 2002), FM 7–0 (DoA, 2003), and Army Regulation 350–1 (DoA, 2009).

Figure 3. Army Training and Leader Development Model
(From DoA, 2009, p. 4)

Army Regulation 350–1 (DoA, 2009) states,

> The Army Training and Leader Development Model portrays interaction among three separate but overlapping domains (operational, institutional and self-development) that must be synchronized in order to achieve the goal of trained Soldiers, Army civilians, leaders, and ready units. Training is what the Army does every day. Training builds confidence and competence, while providing essential skills and knowledge. Leader development is the deliberate, continuous, sequential, and progressive process—grounded in Army values—that develop Soldiers and Army civilians into competent and confident leaders capable of decisive action, mission accomplishment, and taking care of Soldiers and their Families. All training and leader development actions occur within the Army culture—a culture that embraces values and ethics, the Warrior Ethos, standards, and enduring principles and imperatives. (DoA, 2009, p. 3)

FM 7–0(DoA, 2002) further explicates leader development, describing this model as a way of:

> …developing trained and ready units led by competent and confident leaders. The model identifies an important interaction that trains soldiers now and develops leaders for the future. Leader Development is a lifelong learning process. The three core domains that shape the critical learning experiences throughout a soldier's and leader's career are the operational, institutional, and self-development domains. Together, these domains interact using feedback and assessment from various sources and methods to maximize warfighting readiness. Each domain has specific, measurable

> actions that must occur to develop our leaders. The operational domain includes home station training, combat training center rotations, joint training exercises, and operational deployments that satisfy national objectives. Each of these actions provides foundational experiences for soldiers, leaders, and unit development. The institutional domain focuses on educating and training soldiers and leaders on the key knowledge, skills, and attributes required to operate in any environment. It includes individual, unit and joint schools, and advanced education. The self-development domain, both structured and informal, focuses on taking those actions necessary to reduce or eliminate the gap between operational and institutional experiences. Throughout this lifelong learning and experience process, there is formal and informal assessment and feedback of performance to prepare leaders for their next level of responsibility. Assessment is the method used to determine the proficiency and potential of leaders against a known standard. (DoA, 2002, p. 1–5)

Army Regulation 350–1 (DoA, 2009) describes each training domain as a complement to the other two, each serving a vital role in the training, leadership development, and unit preparation of every Army soldier and civilian. The institutional domain is inclusive of Army centers and schools that deliver preliminary training and successive functional and professional military education. The operational domain integrates individual, unit, and organizational training activities conducted at home station, during major training events and while operationally deployed. The self-development domain identifies the need for continuous, lifelong learning aimed at enabling and encouraging personal and professional growth that maximizes strengths, overcomes weaknesses, and encourages individuals to attain their development goals (DoA, 2009).

The PAT developed in this project can be successfully implemented in an Army center or school as an established method of preliminary training and successive education. Furthermore, it can be utilized as a self-development tool throughout the professional lifespan of an Army soldier or professional civilian. Although the PAT is not intended to fulfill the operational domain, it can be effectively introduced in the institutional and operational domains, and, furthermore, can add value as an assessment geared toward improving the adult learning process.

Although adult learning is defined as the process of adults gaining knowledge and expertise, adult learning theory takes a more situational position on mutual control (Knowles et al., 1998). Figure 4 provides a four-phase framework representative of the conflict arising between the ideal of individuals taking control of their own decision-making and the reality of adult limitations in taking control of their own decision-making.

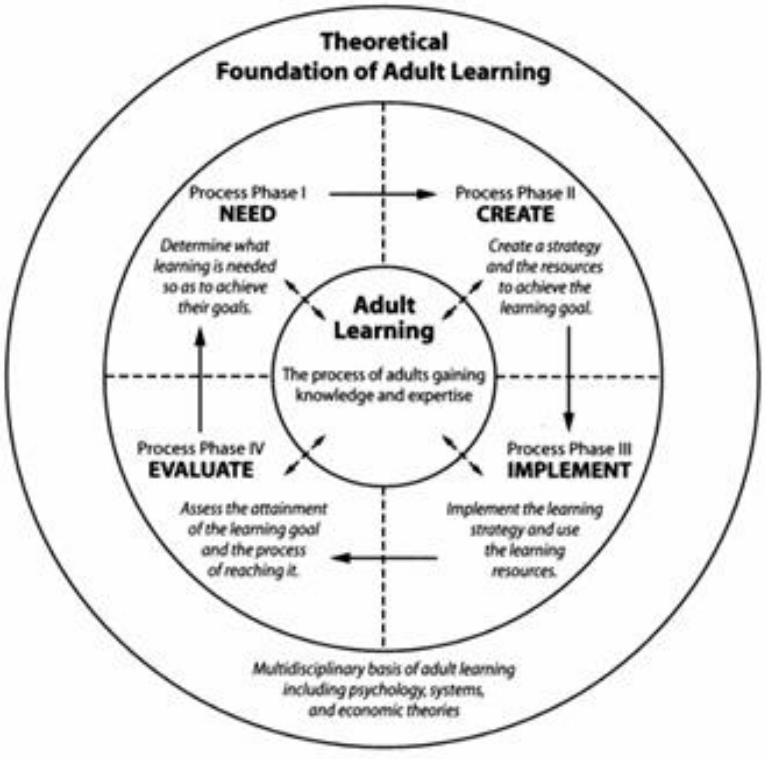

Figure 4. Theoretical Foundation of Adult Learning
(From Knowles et al., 1998, p. 125)

The Need phase focuses on goal attainment through determining what particular learning is required. The Create phase formulates a strategy and applies resources to achieve the specific learning objective. The Implement phase implements the learning strategy while utilizing the learning assets. The Evaluate phase provides an overall evaluation of the learning goal and the method of accomplishing it (Knowles et al., 1998). Moreover, the adult learning theory illustrated in Table 1 provides "sound advice

to Human Resource Development (HRD) at each phase of the planning process" (Knowles et al., 1998, p. 131). Table 1 summarizes this comprehensive guidance as it applies to HRD.

Table 1. Sound Advice of the Adult Learning Theory
(From Knowles et al., 1998, p. 131)

PHASE	SOUND PRACTICE
• Need	• Engage learners in this phase to gain higher motivation. • Do not expect self-reported needs to be accurate for either the individual or organization.
• Create	• Engage learners in this phase to gain higher validity in the selected learning strategies.
• Implement	• Engage learners in this phase to better mediate the actual learning.
• Evaluate	• Engage learners in this phase to gain higher self-reflection and integration of knowledge and expertise being sought.

Although some specialists and researchers in the field hold that the goal of HRD is (or should be) strictly performance improvement on an organizational level, others believe that encouraging learning or the capacity to learn is in and of itself a valuable outcome, and that sponsoring organizations will logically benefit (Knowles et al., 1998). In either context, the PAT built by the team of researchers of this report will benefit both the Soldier (the individual) and the Army (the organization) in the development of key construction, Architect-Engineer, and contingency procedures and concepts. Although the goal of performance-based HRD is to ensure that the HRD process within organizations contributes to the goals of the organizational system within which it functions, it does not automatically imply the use of authoritarian management tactics (Knowles et al., 1998). In consideration to this observation, the authors remained sensitive to the fact that Army training doctrine considers assessment on an

organizational level a commander's duty (DoA, 2002). In other words, authoritarian management tactics are expected within the structure of Army training doctrine and play a critical role in the development of its Soldiers and civilians.

Figure 5 demonstrates how the commander, as the principal trainer, uses multi-echelon methods to fuse leader, battle staff, and individual training requirements into cooperative training events, while distinguishing an overlap in training responsibilities (DoA, 2002).

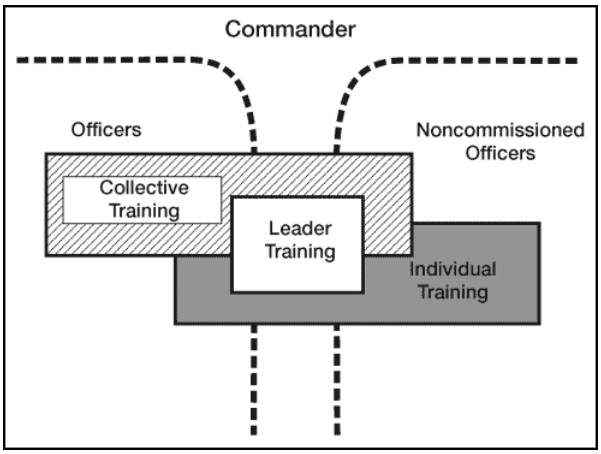

Figure 5. Overlapping Training Opportunities
(From DoA, 2002, p. 2–11)

Most HRD professionals concur that HRD should focus on bolstering the performance requirements of its host organization through the development of the organization's workforce (Knowles et al., 1998). As the Army develops its human resources (its Soldiers and civilians) and increases knowledge on a smaller scale, the Army as a whole benefits on an organizational level.

Assessment is a continuous process and is considered both the beginning and the end of the training-management cycle (Arzu et al., 2010). Commanders are expected to teach, coach, and mentor subordinates throughout this process (DoA, 2002). FM 7–0 (DoA, 2002) describes the commander's role as follows:

> Competent and confident leaders build cohesive organizations with a strong chain of command, high morale, and good discipline. Therefore,

> commanders create leader development programs that develop warfighter professionalism—skills and knowledge. They develop their subordinates' confidence and empower them to make independent, situational-based decisions on the battlefield. Commanders assist subordinates with a self-development program and share experienced insights that encourage subordinates to study and learn their profession. They train leaders to plan training in detail, prepare for training thoroughly, execute aggressively, and evaluate short-term training proficiency in terms of desired long-term results. Effective leader development programs will continuously influence the Army as junior leaders progress to higher levels of responsibility. (p. 2–12)

Commanders are expected to (1) develop subordinates in the proficiency of mission essential tasks; (2) involve themselves personally in the planning, preparing, executing, and assessment of training; (3) demand the achievement of training standards; (4) ensure proper task and event discipline; (5) foster a command climate that is conducive to good training; and (6) eliminate training distractions (DoA, 2002). Furthermore, a commander's/leader's guidance serves as one of the four major steps of the Army's Training Planning Process (depicted in Figure 6).

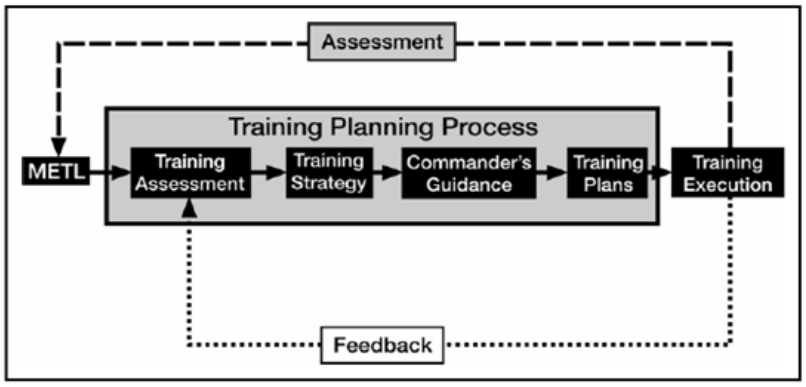

Figure 6. Army Training Planning Process (Training Assessment)
(From DoA, 2003, p. 4–4)

Central to the development of a training plan is the Mission Essential Task List (METL). A mission essential task is a collective task in which an organization has to be proficient to accomplish an appropriate portion of its wartime operational mission (DoA, 2002). The METL consolidates these tasks and sets the groundwork for the unit's training program. Developed by all company-level and above units, and approved by the

designated wartime commander, the METL provides an insightful synthesis of individual goals and organizational requirements (DoA, 2002).

Commanders diligently appraise their unit's ability to execute mission essential tasks based on personal observations, training evaluation results, and input from subordinates; for battle tasks that support their specific METL, commanders then collect performance assessments from responsible subordinates, key staff members, and NCO leaders (DoA, 2003). Figure 7 illustrates the METL development process.

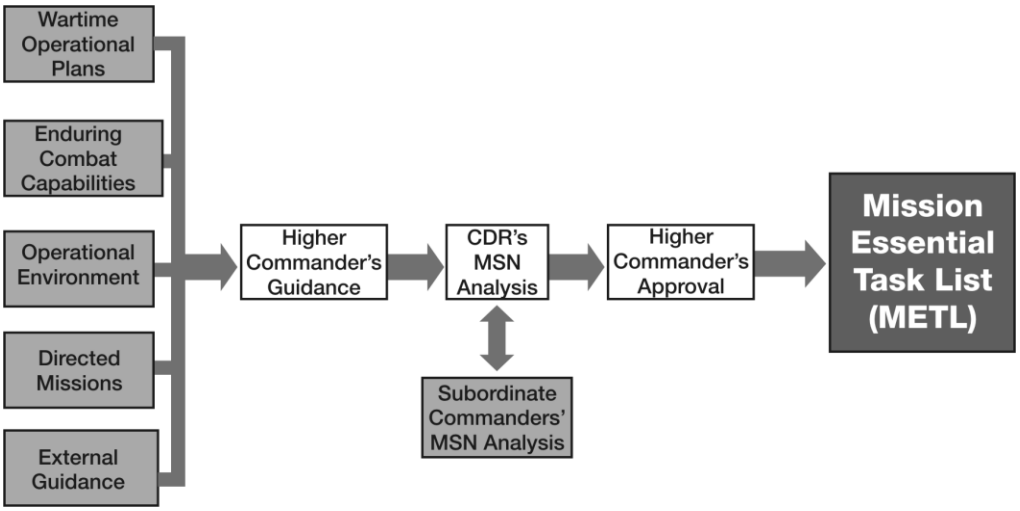

Figure 7. METL Development Process
(From DoA, 2002, p. 3–3)

FM 7–0 (DoA, 2002) describes the many advantages of applying the METL process to the overall Army training development:

> METL development is the catalyst that keeps Army training focused on wartime operational missions. Applying the METL development—
>
> - Focuses the unit's training on essential tasks.
> - Provides a forum for professional discussion and leader development among senior, subordinate and adjacent (peer) commanders concerning the linkage between mission and training.

- Enables subordinate commanders and key NCOs to crosswalk collective, leader and individual tasks to the mission.
- Leads to "buy-in" and commitment of unit leaders to the organization's training plan (p. 3–2).

All learning goals in the USACE's *51C/1102 Proficiency Guide* (2011a) are based on specifically stated conditions and standards, and further identified and labeled as individual tasks. Using the *51C/1102 Proficiency Guide* was crucial in building the physical PAT, as it provided an easy and appropriate format for commanders to assess individual performance against overall mission-essential objectives. The performance of each task, from Task 1–1 through Task 4–6, is measured on a "GO" or "NO GO" basis, which aligns with rating methods stated in the FM 7–1 (DoA, 2003).

The following excerpt from FM 7–1 (DoA, 2003) rates individual and mission essential tasks:

> ASSESSMENT RATINGS
>
> The commander's training assessment is required for each METL task. Task proficiency is rated as—
>
> "T" (trained): The unit is trained and has demonstrated proficiency in accomplishing the task to the Army standard. The leader judges task performance to be free of significant shortcomings. Training on "T" tasks is designed to sustain proficiency on that task.
>
> "P" (needs practice): The unit can perform the task with some shortcomings. Performance has demonstrated that the unit does not achieve the standard without some difficulty or has failed to perform some task steps to standard. The shortcomings are not severe enough to require complete retraining. Only refresher training is required.
>
> "U" (untrained): The unit cannot demonstrate an ability to achieve wartime proficiency. The leader prepares a comprehensive plan to train all supporting tasks not executed to standard. Unless the task is a new METL task, a rating of "U" indicates a serious training deficiency and reflects on the unit's wartime readiness posture.

EVALUATION RATINGS

> Evaluation ratings are given for specific task proficiency and should not be confused with leader assessments. Evaluation ratings are ratings assigned directly to the performance of a specific task or component steps of a task. The standard evaluation ratings, discussed further in Chapter 6, are as follows:
>
> "GO": The task or performance step of a task was performed to standard. A rating of GO is normally awarded if all steps in the task are passed.
>
> "NO GO": The task or any performance step in the task was not performed to standard. (DoA, 2003, p. 4–6)

By utilizing the PAT developed for this project, commanders are better equipped to cultivate the management of their units and assess performance of their human resources, while they are also afforded the ability to collect valuable feedback geared toward the explicit improvement of both the construction, Architect-Engineer, and contingency contracting community and the assessment tool itself. This PAT is not envisioned to serve as an all-inclusive training guide. It is intended, however, to offer commanders an instrument to assess individual performance while affording individuals a robust asset to develop their contracting aptitude.

The research team was able to add relevancy and structure by recognizing how the Army develops and executes training programs, assesses education, and evaluates performance on a macro level. The PAT fits well into the overall scheme illustrated by the Army Training Management Cycle (exemplified in Figure 8), which is considered to be the cornerstone of the training process but offers a strong foundation in establishing individual self-development.

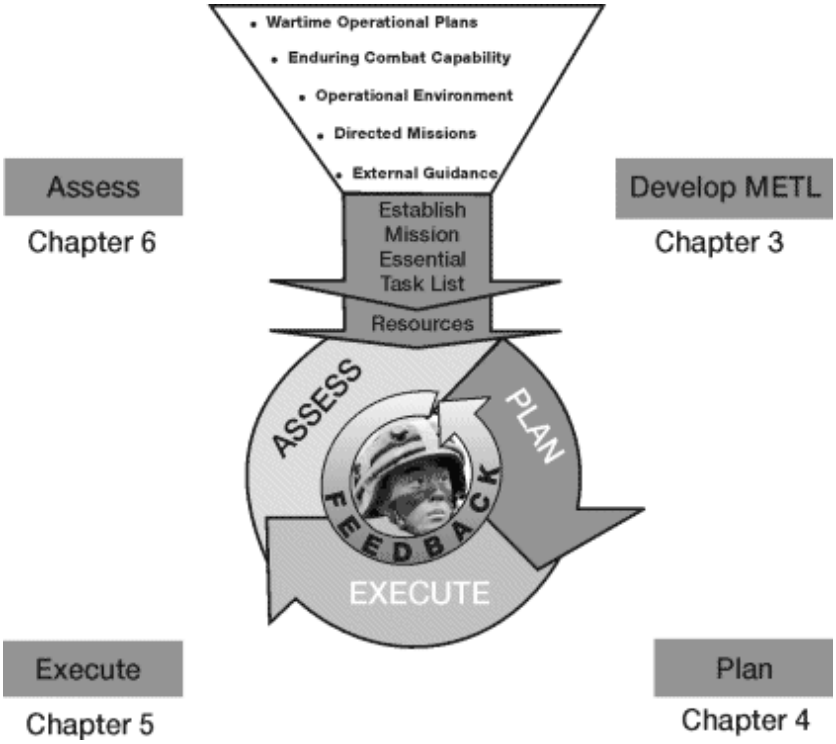

Figure 8. Army Training Management Cycle
(From DoA, 2002, p. 2–15)

In *The Adult Learner*, Knowles et al. (1998) stated,

> If HRD is to be aligned with goals and strategies of the organization, and performance is the primary means by which the goals and strategies or organizations are realized, then it follows that HRD should be first and foremost concerned with maintaining and/or improving performance at the organizational, process, and individual levels. If HRD is to be a value-added activity of the firm (instead of a line item of cost that is to be controlled and minimized), then HRD practitioners must be concerned about performance and how it enables organizations to achieve their goals. (p. 117)

The Army Training and Leader Development Strategy (AT&LDS) closely parallels *The Adult Learner*'s vision of HRD and how it interconnects with organizational strategy and builds upon individual performance. Army Regulation 350–1 (DoA, 2009, p. 3) lists the 10 goals of the Army Training and Leader Development Strategy as follows:

- train units for full spectrum operations;

- develop adaptive and competent leaders;
- enable adaptation of training and leader development;
- train and sustain Soldier and Army civilian skills;
- sustain and improve effectiveness of Combat Training Centers (CTCs);
- provide training at home station and while deployed;
- provide training support system live, virtual, constructive (LVC) (including gaming) enablers;
- increase culture and foreign language competencies;
- provide supporting and integrating capabilities; and
- resource the AT&LDS.

It is the primary goal of this research team to develop a PAT that will be gainfully employed as a flexible instrument used to assess task performance, aid self-development, and strengthen USACE contracting initiatives. A pilot PAT was constructed to gather initial feedback through surveys at the completion of the test. The surveys ask for comments on test difficulty, clarity and validity, and ease of accomplishing the test in the given amount of time. As data returns from initial testing and feedback amasses from additional follow-on surveys conducted by the USACE, it is the research team's hope that the PAT can be altered and improved upon in future years.

The research team, after closely looking at Army training doctrine and associated methodologies, believed the role of andragogy (the methods used to teach adults) was crucial in not only developing the PAT, but also in applying learning principles to adults in the professional environment. Andragogy principles, listed in Figure 9, advance beyond a basic respect for the learner and distinguish the adult learner as a major basis of information for making sound decisions in terms of the learning process (Knowles et al., 1998). Equally important, the research team recognized that andragogy is a classification of components that is not intended to be applied totally or without modification. Central to the ideology of the six core adult learning principles is flexibility (Knowles et al., 1998), which provides a significant fit within commander initiatives and Army culture.

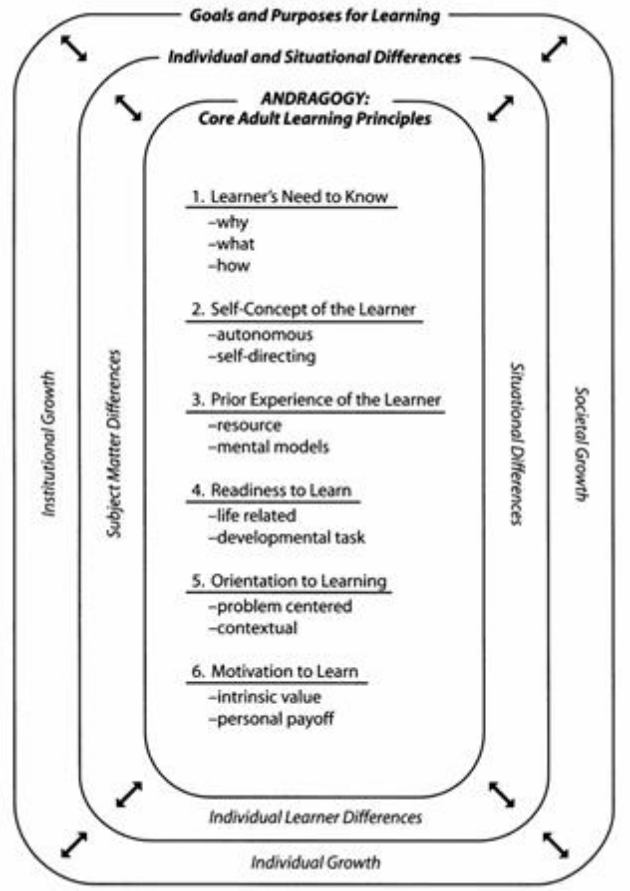

Figure 9. Andragogy in Practice (The Adult Learning Process)
(From Knowles et al., 1998, p. 182)

Learning contracts offer a resource for negotiating an appropriate middle ground between the external needs and expectations of an organization and the learner's internal needs and interests; more importantly, they are a means for making the learning objectives of field-based experience clear and explicit for both the learner and the supervisor (Knowles et al., 1998). Knowles et al. (1998) offered eight categorical stages to support the process of developing a concise and effective learning contract for subordinates and supervisors:

- diagnose your learning needs,
- specify your learning objectives,
- specify learning resources and strategies,
- specify evidence of accomplishment,

- specify how evidence will be validated,
- review the contract,
- carry out the contract, and
- evaluate your learning. (pp. 212–216)

Applied within the organization of the USACE, the PAT would serve as an effective learning contract envisioned to closely correspond to these eight stages. Piskurich, Beckschi, and Hall (2000) justified the increased use of learning contracts for the following reasons:

- to provide more appropriate learning for individuals with diverse backgrounds, experiences, and learning styles;
- to meet the needs of learners in specialized areas;
- to meet needs of learners in rapidly changing fields when no appropriate curriculum or training is available;
- to meet the needs of learners at a distance;
- to save training dollars; and
- to develop self-directed, reflective, continuing learners who can contribute to the success and growth of the organization. (pp. 397–398)

In this segment of the literature review, the research team scrutinized the close relationship existent between Army doctrine and leadership development theories. Moreover, the research team revealed practical significance in the formation of learning contracts and progression of self-development initiatives. These interactions served the research team in building a developmental format for the PAT, as well as identified the significant importance of a PAT in weighing individual performance, refining leadership approaches, and aiding in organizational success. Similar to the format outlined in the PAT project prepared by Arzu et al. in 2010, the subsequent segments of the literature review explore core test principles, test construction methods, test blueprints, and item writing.

2. Core Test Principles

The *Standards for Educational and Psychological Research* (American Psychological Association [APA], American Educational Research Association [AERA], and National Council on Measurement in Education [NCME], 1974) provides a definition of a test:

> A test is a special case of an assignment procedure. It may be thought of as a set of tasks or questions intended to elicit particular types of behavior when presented under standardized conditions and to yield scores that will have desirable psychometric properties such as high reliability and high validity. (p. 2)

Similarly, in *Educational Measurement and Evaluation*, Nunnally and Ator (1972) defined a test as a standardized condition that provides an individual with a score and is designed and controlled to serve a definite purpose. Nunnally and Ator (1972) listed the most essential ingredients of standardization as it applies to testing as follows:

- all students should answer the same questions;
- instructions should be clear, and the same instructions should be given to all students;
- no student should be given any advantage not given to all students; and
- a predetermined system of scoring should uniformly be applied to the answers of all students.

Standardization is the chief determinant of a test's reliability and validity. Though it was conclusive among the sources that reliability and validity were the two most critical test characteristics, several authors suggested supplementary variants. Wood (1960) listed scoring economy and adequacy of content sampling. Marshall and Hales (1972) proposed objectivity, fairness, practicality, and balance. Brennan (2006) made reference to efficiency.

A test is considered to be reliable if it generates highly exact indications of students' standings with respect to one another; if a test is not highly reliable, a zone of uncertainty must be deliberated in interpreting particular scores (Nunnally & Ator, 1972). Marshall and Hayes (1972) referred to reliability as the degree of consistency among test scores. There are multiple methods that initiate reliability:

> Reliability can be defined in several ways—such as the proportion of observed-score variance that is true-score variance, the squared correlation between true scores and observed scores, or the correlation between observed scores on two parallel tests. Several estimates of reliability are widely used, including test/retest, parallel-forms, alternate forms, and internal-consistency estimates. (Allen & Yen, 2001, p. 91)

In *A Handbook of Test Construction: Introduction to Psychometric Design*, Kline (1986) suggested sources of unreliability that include guessing, poor test instructions, or test length.

The reliability of a test or the accuracy with which it measures something in a certain group is a critical determinant of a test's validity (Wood, 1960). A test is considered to be valid if it serves its intended function well (Nunnally & Ator, 1972). It is possible for a test to be reliable but concurrently invalid. Wood (1960) described the relationship between reliability and validity:

> If the test is not measuring whatever it measures consistently, then it cannot be valid for any purpose. On the other hand, it may measure something with a high degree of reliability without being at all useful for the purpose for which it is intended. In other words, a test may have even a perfect degree of reliability and no validity whatever for some particular use. A test of a given degree of reliability will ordinarily have different validities for different purposes. Thus the concept of validity makes sense only if we specify the purpose. Note, moreover, that the notion of purpose here must include the group which is to take the test. (p. 16)

Validity is assessed based on content validity, construct validity, and criterion-related validity (Allen & Yen, 2001). Content validity can be determined based on thorough scrutiny of an assessment proportional to what the assessment is designed to measure and is absolutely required for an acceptable assessment; essentially, the validity of an assessment depends upon the acceptability with which a body of intellectual content is covered (Nunnally & Ator, 1972). Construct validation entails intertwining a web of meaningful relations between a new measure and other supposed measures of an identical attribute (Nunnally & Ator, 1972). Criterion-related validity is interchangeable with the term predictive validity and correlates the scores of a specific criterion (the thing to be predicted) and the actual test (Nunnally & Ator, 1972).

According to the *Standards for Educational and Psychological Research* (APA, AERA, & NCME, 1974), all tests involve a test writer, test taker, and test user. A test user is defined as one who chooses tests, interprets scores, or makes decisions based on test scores (APA, AERA, & NCME, 1974, p. 1). Basic user qualifications apply when tests are specifically used for decisions, as such uses typically require additional technical qualifications; the legitimacy of a test is dependent on the technical skill and knowledge essential to appraise the validity of various types of inferences (APA, AERA, & NCME, 1974, p. 58). See Appendix A for a listing of essential principles for test users.

Based on the research of Nunnally and Ator (1972), and Wood (1960), constructing a PAT that meets the standards of educational and psychological research required clearly identifying participants involved in the PAT's production, management, and execution. The participants are the research team (test writer), the USACE (test user), and the USACE 51C/1102s (test taker). The PAT would be assessed by the USACE leadership for how effectively the subject matter is covered, thereby validating the PAT.

3. Test Construction

Downing and Haladyna's (2006) 12 steps for effective test development (listed in Appendix B) were employed in the construction of the PAT. Systematically following these steps greatly assisted the research team in providing a structured process for creating an effective testing program while also encouraging maximum test validity. According to Downing and Haladyna (2006),

> Effective test development requires a systematic, well-organized approach to ensure sufficient validity evidence to support the proposed inferences from the test scores. A myriad of details and issues, both large and small, comprise the enterprise usually associated with the terms test development and test construction. All of these details must be well executed to produce a test that estimates examinee achievement or ability fairly and consistently in the content domain purported to be measured by the test and to provide documented evidence in support of the proposed test score inferences. (p. 3)

In order to achieve effective test development, the research team employed the 12 steps itemized by Downing and Haladyna (2006, p. 5). The research team's approach for each of these items is discussed in detail in Chapter IV of this report.

Arzu et al. (2010), in building their CCO PAT in 2010, found that focusing on test blueprints and item writing would be most beneficial in the context of test construction and within the overall scope of their project. The research team of this project also exhibits a strong focus in contingency contracting, but adds complexity in the Architect-Engineer and construction contracting niche fields. Test blueprints and item writing add equal value to the PAT in terms of test development and construction.

4. Test Blueprints

The process of creating test specifications directs comprehensive test development activities and completes the operational planning for tests in an organized method. A test blueprint accurately identifies the percentage of test questions to be allocated to each major and minor content area, and what percentage of these questions will be designed to assess specific cognitive knowledge levels (Downing & Haladyna, 2006). Both Downing and Haladyna (2006) and Brennan (2006) used the terms *test blueprints* and *specifications* interchangeably.

Specifications, or blueprints, are responsible for an assessment's content, form, and functional requirements (Brennan, 2006). Marshall and Hales (1972) described the importance of a table of specifications as follows:

> Since the primary purpose of classroom testing is to obtain individual measures for evaluating students regarding their meeting of the instructional objectives, a blueprint for selecting appropriate test items should be developed. (p. 10)

The research team used the principles from Downing and Haladyna (2006) to develop a test blueprint which include:

- the type of testing format to be used (selected response versus constructed response),
- the total number of test items as well as the type or format of test items,
- the cognitive classification system to be used,

- whether or not the test items or performance prompts will contain visual stimuli,
- the expected item scoring rules,
- how test scores will be interpreted (norm or criterion referenced), and
- the time limit for each item. (p. 9)

The research team utilized a single-best answer from multiple-choice selections. The details of the research team's approach to the test blueprint are discussed in Chapter IV.

A teacher must be able to classify instructional objectives into two dimensions: content and cognitive (Marshall & Hales, 1972). Downing and Haladyna (2006) defined content as:

> a conceptual framework that delineates students' knowledge, constructs, skills, concepts, reasoning, and, in some cases, disposition that are intended to be measured by the test. The need for clear content specification and the assurance that the inferences made from the test scores about student achievement are appropriate for the stated purposes of the test are both critical to test validity. Because of the close link between these factors in establishing the validity, content specification is integral to the content validation process. (p. 156)

In order to frame the content of a test, the research team had to answer the following questions: What content would the test cover? How complex to make the test items? What range of content is appropriate? How much emphasis to give to specific focus areas? (Downing & Haladyna, 2006). The research team limited the content to the *51C/1102 Proficiency Guide* and listed references for each subject area. Emphasis and complexity of test items were focused on the performance steps and standards identified for each task.

Bloom's (1956) research efforts explored the taxonomy of educational objectives, while concentrating principally on the cognitive domain, which consists of knowledge, comprehension, application, analysis, synthesis, and evaluation. The revised version of Bloom's taxonomy, depicted in the Figures 10 and 11, focuses strongly on the knowledge dimension useful in the development of the PAT (Downing & Haladyna, 2006).

CATEGORIES & COGNITIVE PROCESSES	ALTERNATIVE NAMES	DEFINITIONS AND EXAMPLES
1. REMEMBER	Retrieve relevant knowledge from long-term memory	
1.1 RECOGNITION	Identifying	Locating knowledge in long-term memory that is consistent with presented material (e.g., Recognize the dates of important events in U.S. history)
1.2 RECALLING	Retrieving	Retrieving relevant knowledge from long-term memory (e.g., Recall the dates of important events in U.S. history)
2. UNDERSTAND	Construct meaning from instructional messages, including oral, writen, and graphic communication	
2.1 INTERPRETING	Clarifying Paraphrasing Representing Translating	Changing from one form of representation (e.g., numerical) to another (e.g., verbal)(e.g., Paraphrase important speeches and documents)
2.2 EXEMPLIFYING	Illustrating Instantiating	Finding a specific example or illustaration oof a concept or principle (e.g., Give examples of various artistic painting styles)
2.3 CLASSIFYING	Categorizing Subsuming	Determining that something belongs to a category (e.g., concept or principle)(e.g., Classify observed or described cases of mental disorders)
2.4 SUMMARIZING	Abstracting Generalizing	Abstracting a general theme or major point(s)(e.g., Write a short summary of the events protrayed on a videotape)
2.5 INFERRING	Concluding, Extrapolating Interpolating Predicting	Drawing a logical conclusion from presented information (e.g., In learning a foreign language, infer grammatical principles from examples)
2.6 COMPARING	Contrasting Mapping Matching	Detecting correspondences between two ideas, objects, and the like (e.g., Compare historical events to contemporary situations)
2.7 EXPLAINING	Constructing models	Constructing a cause-and-effect model of a system (e.g., Explain the causes of important 18th-century events in France)
3. APPLY	Carry out or use a procedure in a given situation	
3.1 EXECUTING	Carrying out	Applying a procedure to a familiar task (e.g., Divide one whole number by another whole number, both with multiple digits)
3.2 IMPLEMENTING	Using	Applying a procedure to an unfamiliar task (e.g., Use Newton's Second Law in situations in which it is appropriate)

Figure 10. Revised Bloom's Taxonomy of Learning Objectives (I)
(Adapted from Anderson et al., 2002, p. 67)

CATEGORIES & COGNITIVE PROCESSES	ALTERNATIVE NAMES	DEFINITIONS AND EXAMPLES
4. ANALYZE	Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose	
4.1 DIFFERENTIATING	Discriminating Distinguishing Focusing Selecting	Distinguishing relevant from irrelevant parts or important from unimportant parts of presented material (e.g., Distinguished between relevant and irrelevant numbers in a mathematical word problem)
4.2 ORGANIZING	Finding Coherence Intergrating Outlining Parsing Structuring	Determining how elements fit or function within a structure (e.g., Structure evidence in a historical description into evidence for and against a particular historical explanation)
4.3 ATTRIBUTING	Deconstructing	Determine a point of view, bias, values, or intent underlying presented material (e.g., Determine the point of view of the author of an essay in terms of his or her political perspective)
5. EVALUATE	Make judgements based on criteria and standards	
5.1 CHECKING	Coordinating Detecting Monitoring Testing	Detecting inconsistencies or fallacies within a process or product; determining whether a process or product has internal consistency; detecting the effectiveness of a procedure as it is being implemented (e.g., Determine if a scientist's conclusions follow from observed data
5.2 CRITIQUING	Judging	Detecting inconsistencies between a product and external criteria, determining whether a product has external consistency; detecting the appropriateness of a procedure for a given problem (e.g., Judge which of two methods is the best way to solve a given problem)
6. CREATE	Put elements together to form a coherent or functional whole, reorganize elements into a new pattern or structure	
6.1 GENERATING	Hypothesizing	Coming up with alternative hypotheses based on criteria (e.g., Generate hypotheses to account for an observed phenomenon)
6.2 PLANNING	Designing	Devising a procedure for accomplishing some task (e.g., Plan a research paper on a given historical topic)
6.3 PRODUCING	Constructing	Inventing a product (e.g., Build habitats for a specific purpose)

Figure 11. Revised Bloom's Taxonomy of Learning Objectives (II)
(Adapted from Anderson et al., 2002, p. 68)

The research team modified Bloom's Taxonomy to simplify question classification into only three categories, which include recall, comprehension and application. This modified version falls closer in line with the following Marshall and Hales (1972) table of specifications.

Marshall and Hales (1972) offer a two-way table of specifications (see Table 2) that reflect a relationship between intellectual activity and content for the instructional objective.

Table 2. Table of Specifications
(From Marshall & Hales, 1972, p. 12)

Table 2.1 Table of specifications

Weight	Content	Level of Objectives			Number of items by content area
		Knowledge 30%	Understanding 40%	Application 30%	
10%	Identifying notes by name	1 *	1	1	3
35%	Combining rhythms to form measures	3	4	3	10
35%	Placing pitches on musical staff	3	5	3	11
20%	Combing pitches and rhythms	2	2	2	6
	Number of items by cognitive classification	9	12	9	30

* Number of items in cell = row weight x column weight x number of test items (for Area I, Knowledge) = 0.30 x 0.10 x 30 = 0.9 items.

The content and purpose of each PAT item is verified through classification (by type and category) to accomplish the necessary breadth and depth of testing. Classifying the test items also ensures that the PAT has a satisfactory distribution of item types within the test. This research provides USACE with an assessment tool that efficiently accomplishes the fundamental expectations of Army training doctrine while applying current educational theory.

5. Item Writing

Although Chapter IV (Methodology) explicitly describes the guidelines the research team employed in writing items within the PAT, this section provides general background on item writing. The basic unit of a test is an item, or the individual "thing" that is scored (Nunnally & Ator, 1972). Both Nunnally and Ator (1972) and Wood (1960) listed the various identities of test items as follows: true or false, multiple choice, identification, short-answer essay, problems, matching, rank order, and completion (Nunnally & Ator, 1972; Wood, 1960). Many different methods and approaches were recommended throughout the references based on the identity of the test item itself. Because the PAT developed for this project uses primarily multiple-choice questions, the majority of item-writing strategies employed were either specifically geared toward the multiple-choice item or suggested as a generic method for all test items.

Good items appear to be deceivingly simple to the novice writer; although it may be easy to construct an item, it is an entirely different matter to construct a *good* item (Marshall & Hales, 1972). Osterlind (1998) incorporated this concept, and distinguished between professional test-item writers and casual test-item writers. In an effort to guide test-item writers of various skill levels, Marshall and Hales (1972) stressed seven core procedures they believed played a critical role in good test-item development:

- Allow adequate time for the construction of items.
- An item should contain a problem to be solved.
- The problem should be defined explicitly.
- The problem should be limited.
- The directions for the test should be stated explicitly.
- Do not use optional questions.
- Construct a detailed key for each question. (pp. 31–32)

Downing and Haladyna (2006) also produced eight item-development strategies:

- Use novel material to test higher level concepts. Paraphrase textbook language or language used during instruction to avoid testing for simple recall.
- Avoid overly specific and overly general content.
- Minimize the amount of reading in each item.
- Avoid window dressing (excess verbiage).
- Word the stem positively, avoid negatives such as *not* or *except*. If negatives are used, use the word cautiously and always ensure that the word appears capitalized and boldface.
- Develop as many effective choices as you can.
- Make sure that only one of these choices is the right answer.
- Place choices in logical or numeric order. (pp. 95–102)

The research team found sufficient guidance for writing good items. Kline (1986) identified several rules for writing good multiple-choice items. These rules include using simple writing; ensuring that the distractors chosen are capable of distracting examinees; having only one correct option; avoiding the use of answers that clue the examinee to other items; and, finally, testing relevant information and avoiding trivial information.

Nunnally and Ator (1972) described the importance of test items as they relate to evaluation:

> The inability to compose good items is the major reason why some teachers do a poor job of evaluating the progress of students. One cardinal fault of many sets of test items is that they are not broadly representative of the important content in a particular unit of instruction. Either they are overly slanted toward one or another aspect of the content, or even if they are broadly representative, they tap only trivial information, e.g., memory for miscellaneous facts. (p. 153)

The research team is prioritizing the performance steps and standards identified for a particular task; therefore, the team must be conscience of not becoming too narrow minded and still develop sufficient questions in related reference areas in order to gain the broad representation discussed by Nunnally and Ator (1972).

The research by Nunnally and Ator (1972), Kline (1986), Downing and Haladyna (2006), and Wood (1960) provided the academic understanding for producing test items written in the most effective manner. Utilizing principles discussed in the research ensures that the PAT items are valid and functional, and that they clearly convey the intent of the test.

D. CONTRACTING DEFICIENCIES

Based on the failures identified in the Gansler (2007) report, the research team designated this document as a starting point in the literature review. Utilizing sources in the *Contingency Contracting* professional report (Arzu et al., 2010), the research team reviewed databases containing studies or reports regarding construction contracting. The USACE Office of Inspector General's database provided reports applicable to the research while also giving the explicit details of common challenges in planning, awarding, and administering contracts. The DTIC contributed additional sources on topics relevant to construction contracting in a contingency environment. Supplementary data for this literature review were acquired through reports from the GAO, USACE archives, and DoD guidance.

For the purpose of this literature review, the research team addresses several topics discussing the ACC, the major command primarily responsible to coordinate and enforce the training needs of the Army's contracting officers. Duties of a contracting officer in the USACE are in addition to the standards expected by the ACC. The focus of ACC training is to produce competent and flexible professionals capable of creating quality contracts that ensure the best possible price with minimal disturbance to project execution. In that context, the research team also reviews in business strategy terms how the ACC (as well as the USACE) is in an unfavorable market, undertaking a low-cost strategy utilizing professional contracting officers (expected to have increased training and preparation) to accomplish more effective contracts for its customers.

A review of the *USACE 51C/1102 Proficiency Guide* (USACE, 2011a) shows that contracting officers within the USACE are challenged with a broad spectrum of competencies in planning, structuring, and managing contracts of differing scope and

types that cover an abundance of supplies and services. In addition to this challenge, policies, regulations, thresholds, and standards are constantly evolving to address contemporary threats. The complexities of this market-battlefield are evident by the frequency and magnitude of failures that occur (Gansler, 2007; GAO, 2012). The exorbitant costs in time, money, and business relations demand an effective and immediate action that will address the shortcomings that cause the costly failures.

1. Complexities Leading to Failure in Contracting

Arzu et al. (2010) explored databases, professional reports/surveys, historical documents, and federal manuals and regulations during their fact-finding search of needs inside the acquisition community (pp. 16–30). A recurring theme across much of the reading was the lack of education/development in core competencies. Complications arising from allegations of waste, fraud, and abuse and significant failures in expeditionary contracting compelled the government to investigate the circumstances and report findings.

In 2007, the report by the Gansler Commission titled *Urgent Reform Required: Army Expeditionary Contracting,* the Commission on Army Acquisition and Program Management in Expeditionary Operations (led by Dr. Jacques S. Gansler, former Under Secretary of Defense [Acquisition, Technology & Logistics (AT&L)]), exposed failures occurring in expeditionary contracting operations. In order to rectify difficulties in the acquisition process, the Gansler Commission (2007) recommended "four overarching changes for the Army":

- increase the stature, quantity, and career development of military and civilian contracting personnel (especially for expeditionary operations);
- restructure the organization [Army] and restore responsibility to facilitate contracting and contract management in expeditionary and CONUS [Continental United States-based] operations;
- provide training and tools for overall contracting activities in expeditionary operations; and
- obtain legislative, regulatory, and policy assistance to enable contracting effectiveness in expeditionary operations. (p. 5)

Additionally, in 2007, the Comptroller General of the United States stated in GAO Report 07–1098T, *Federal Acquisition and Contracting: Systemic Challenges Need Attention*, four key acquisition challenges affecting agencies in the U.S. government. The challenges were (1) separating wants from needs, (2) establishing and supporting realistic program requirements, (3) using contractors in appropriate circumstances and contracts as a management tool, and (4) creating a capable workforce and holding it accountable (GAO, 2007; Arzu et al., 2010).

The Commission on Wartime Contracting (CWC), a congressional commission tasked to investigate wartime fraud, waste, and abuse allegations in Iraq and Afghanistan theaters of operation, cited numerous deficiencies in training of contracting personnel (CWC, 2009). The CWC report, titled *At What Cost? Contingency Contracting in Iraq and Afghanistan*, recognized training problems of the federal civilian and military contracting workforce. Deficiencies stemmed primarily from manpower and lack of sufficient training for contracting personnel (CWC, 2009, p. 26).

In a 2010 report by the Department of Defense Office of Inspector General (DoDIG), similar concerns are reported based on 19 investigations of fraud from October 2007 through April 2010. The findings identified 10 systemic issues related to contracting deficiencies with the top five issue areas being (1) requirements, (2) contract pricing, (3) oversight and surveillance, (4) property accountability, and (5) financial management (DoDIG, 2010). The deficiencies reflect the recurring failures in fundamental practices across the contracting community.

The 2009 DoDIG report *Summary of DoD Office of Inspector General Audits of Acquisition and Contract Administration* summarized major contracting issues found in DoDIG reports from fiscal year (FY) 2003 to FY 2008. In this report, researchers concluded that the areas of management oversight, control, and policy enforcement must continue to be strongly emphasized to protect valuable taxpayer funds (DoDIG, 2009). The researchers of the report also stated that DoD has taken numerous actions to address identified deficiencies in the areas of contingency operations and continuing DoD problems (DoDIG, 2009). In particular, the DoD initiatives addressing contingency operations included revising the DAU contingency contracting curriculum as well as

fielding a handbook, *Contingency Contracting: A Joint Handbook,* (DPAP, 2008)in 2008 that consolidated important contracting information, tools, templates as well as training that a contracting officer could quickly reference (DoDIG, 2009). The intent of fielding the handbook was for training and reference while at home station or deployed (DoDIG, 2009). In a similar way, the USACE *51C/1102 Proficiency Guide* (2011a) discussed in the following section is meant for the same purposes with a heavier application of construction and architect-engineer contracting.

The DoDIG also looked specifically at the USACE in recommending that contracting oversight of military construction projects at Bagram, Afghanistan, be improved (DoDIG, 2012). The DoDIG report indicated that contractor performance on USACE contracts were not properly monitored and relied heavily on the Logistics Civil Augmentation Program for identification of deficiencies with construction (DoDIG, 2012). Recommendations the DoDIG made for improving oversight included verification of quality control plans and training of quality assurance personnel in a contingency environment (DoDIG, 2012).

Contract management within the DoD has remained on the GAO high-risk list since 1993 (Seifert & Ermoshkin, 2010). The 2011 GAO's high-risk area recommendations for DoD contract management included ensuring adequate training of the acquisition workforce to meet organizational needs (GAO, 2011). The USACE *51C/1102 Proficiency Guide* (2011a) and the research team's developed PAT are consistent with this recommendation as tools to further training needed within the USACE.

The findings of the Gansler (2007) report, the Arzu et al. (2010) professional report, DoDIG reports (2009, 2010), and GAO report (2011) describe the current operating environment in contracting as well as relations between participants. This knowledge base serves as the input for modeling how the firm (this is a business term the research team uses in this report to refer to the contracting command) operates. The research team identified model elements that can be changed to improve the performance

and/or efficiency of participants and the firm as a whole. Some of the findings the research team presents exceed the scope of this professional report but would be excellent topics for follow-on research.

2. USACE 51C/1102 Proficiency Guide

In 2011, the *51C/1102 Proficiency Guide* (EP 715–1-8) was created to assist in the fundamental development of USACE members holding MOS 51C or 1102. It structures the essential tasks for training into four subject areas: (1) USACE, (2) Contracting Pre-Award Tasks for Construction Contracting, (3) Contracting Post-Award Tasks for Construction Contracts, and (4) Architect-Engineer Contracting. Topics covered include the following:

Subject Area 1:	Mission and structure of the USACE
	Project management business process
	Civil and military construction
	Funding
Subject Area 2:	Acquisition and source selection planning
	Differences in construction contracting
	Solicitations
	Funding and awarding
	Procurement
Subject Area 3:	Briefings
	Contract administration
	Contract changes
	Claims and audits
	Closeout and terminations
Subject Area 4:	Authority and selection
	Solicitation, negotiation, and award
	Task orders
	A-E post award

A total of 45 tasks distributed across the four subject areas comprise the *51C/1102 Proficiency Guide* (USACE, 2011a). Included at the end of each task are performance measures enabling the mentor/supervisor to confirm understanding of details discussed inside each task. Utilizing the *51C/1102 Proficiency Guide*'s (USACE, 2011a) structure of tasks and incorporating significant performance measures became the basis for the research team's PAT content and order. Mirroring the *51C/1102 Proficiency Guide*

simplifies the mentor/leader's supervision of a 51C/1102s training progress and ensures a comprehensive exposure to subject matter in a more structured or formulated manner.

In order to develop a PAT, the research team needed considerable understanding of the principles of test construction. The research team conducted a literature review of academic and theoretical principles, as well as military doctrine applicable to developing the PAT. This knowledge provided the research team with the tools to create a sound and credible PAT for assisting in the development of contracting officers inside the USACE.

E. SUMMARY

In the literature review, the research team conducted a comprehensive fact-finding mission to discover the most effective means of measuring a test taker's proficiency in a testable subject. The research and/or theory by experts in the fields of education and test construction, as well as the professional report by Arzu et al. (2010), established the structure, format, and means of proofing the reliability of the proposed PAT. This enabled the research team to begin gathering subject matter materials for test-item construction.

The complex and challenging subject of construction contracting is an important facet of the USACE mission. The unique unit structure of the USACE required the research team to explore the NCO and its context within the USACE. In Chapter III, the research team describes in detail the NCO structure and strategy.

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III. USACE NATIONAL CONTRACTING ORGANIZATION AND THE 51C/1102 PROFICIENCY GUIDE

A. INTRODUCTION

This chapter's purpose is to provide an overview of the USACE NCO and implementation of the *51C/1102 Proficiency Guide for Construction, Architect-Engineer and Contingency Contracting* (USACE, 2011a). The NCO overview will include the organization's structure, command relationship to USACE, and training methodology. The training methodology includes implementation of the *51C/1102 Proficiency Guide* (USACE, 2011a), which is discussed in detail, because this guide is the most significant resource for this project.

B. ESTABLISHMENT OF THE U.S. ARMY CORPS OF ENGINEERS NATIONAL CONTRACTING ORGANIZATION

The NCO was established as a result of a USACE organizational structure review conducted in 2007 to improve the effectiveness of the contracting mission within USACE (Van Antwerp, 2010). The vision of the NCO is "a GREAT engineering force of highly disciplined people working with our partners through disciplined thought and action to deliver innovative and sustainable solutions to the Nation's engineering challenges" (USACE, 2011a). The stated mission of the NCO is to "provide vital public engineering services in peace and war to strengthen our Nation's security, energize the economy, and reduce risks from disasters" (USACE, 2011a). The NCO contracting workforce is composed of over 1,500 personnel, including 1,300 contracting officers and contract specialists (Van Antwerp, 2010). The NCO was established in the same year that the Gansler Commission report of 2007 required urgent reform on the part of the Army. As discussed in Chapter II, the Gansler report detailed systemic failures within the Army, particularly for expeditionary contracting operations. The establishment of the NCO was consistent with recommendations from the Gansler report to provide for a single command structure for the contracting workforce within the USACE (Van Antwerp, 2010).

C. NCO ORGANIZATIONAL STRUCTURE

Figure 12 reflects the established organizational structure for the NCO.

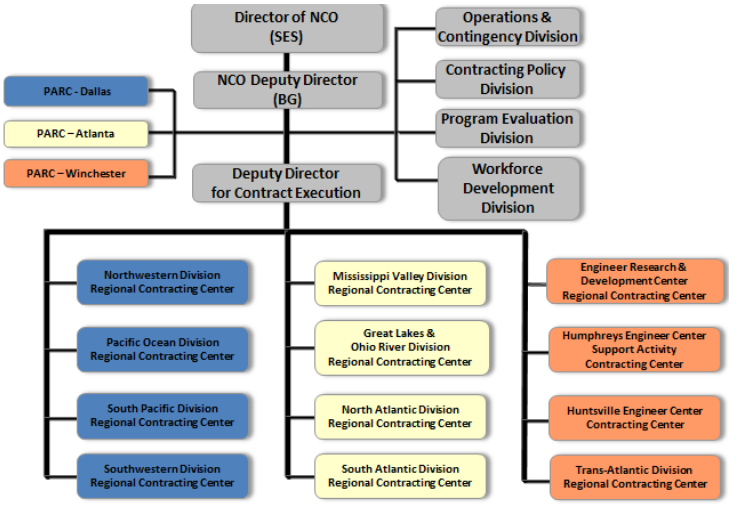

Figure 12. NCO Organizational Structure
(From USACE, 2011b, slide 6)

As shown in Figure 12, the director of the NCO is a senior executive service (SES) position that has an equivalency of a two-star general position. As a result of the establishment of the NCO, the number of principle assistants responsible for contracting (PARCs) increased from one to three to allow greater oversight of regional areas (Van Antwerp, 2010). Further leadership was implemented by creating regional and center contracting chiefs for all of the USACE Districts and Centers (Van Antwerp, 2010).

The command and support relationships between the NCO and USACE are illustrated in Figure 13.

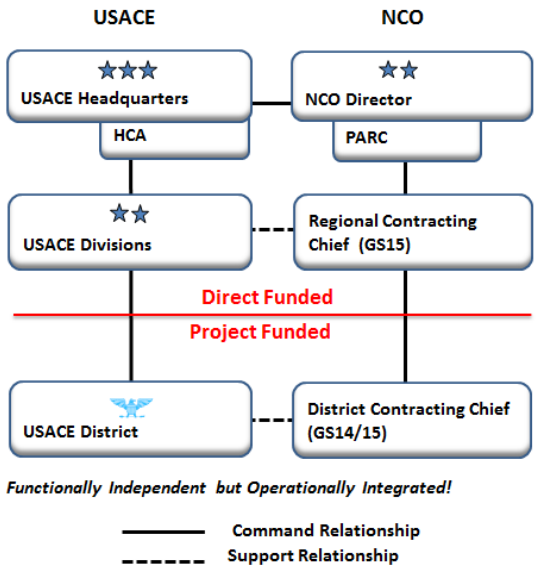

Figure 13. NCO Alignment Within the USACE
(From USACE, 2011b, slide 5)

Figure 13 illustrates the leadership command and support levels within the USACE. Under this structure, the NCO has command authority over the regionally aligned centers and districts that provide support to their respective divisions and districts within the USACE. The funded line reflects that regional organizations and above are direct funded, while districts are supported through funded projects. The effect is that the size of the district contracting personnel pool varies based on the number of projects.

Within this organizational structure, the NCO has further established MCCTs to provide support for military expeditionary contracting operations. The NCO currently has nine MCCTs that are aligned with CONUS districts with a few more identified to stand up over the next few fiscal years. The selected districts have a military mission and are able to train and prepare the soldiers assigned to the teams to be proficient in contingency construction and Architect-Engineer contracting prior to deployment. The structure of the MCCTs typically consists of four MCCOs designated with the 51C MOS code; these MCCOs include one lieutenant colonel, one major, and two senior enlisted non-commissioned officers at the master sergeant and sergeant first-class ranks. This structure closely resembles the ECC's CCT model with the exception that the USACE NCO rank structure is typically one grade higher at each position than the ECC model. To assist

the MCCT-aligned districts, supervisors, and trainers, the USACE NCO developed the *51C/1102 Proficiency Guide For Construction, Architect-Engineer and Contingency Contracting* (USACE, 2011a).

D. TRAINING STRATEGY

The USACE NCO training strategy is to develop MCCOs and newly assigned 1102 civilians with distinctive USACE contracting skills at an acceptable level within the first year to 18 months. This allows MCCOs to support expeditionary deployments and other broadening opportunities within the remaining timeframe of a two- to three-year assignment. The USACE contracting-specific training supplements training required for Defense Acquisition Workforce Improvement Act (DAWIA) certification levels that require DAU or equivalent classes, as well as civilian business-related college credits. It is expected that MCCOs that are not Level II certified upon arrival to the unit achieve Level II certification by the end of their assignment with the USACE. In addition to contracting-related training, MCCOs must also adhere to Army-specific training. For example, training will include Army physical fitness standards, marksmanship, pre-deployment training, and other annual training requirements identified in Army Regulations, such as AR 350–1 *Army Training and Leader Development* (DoA, 2009). For the purposes of this report, the USACE contracting-specific training is discussed further.

To develop the unique skill sets required of an MCCO and 1102, the USACE has established formal training courses and identified key and supporting individual contracting tasks to train through the *51C/1102 Proficiency Guide* (USACE, 2011a). A 51C MOS soldier will receive basic courses in contracting through the DAU or equivalent institutional training to meet DAWIA certification standards. In addition to these courses, the USACE has established its own educational system known as the ULC that offers "virtual engineering and mission support training to develop and sustain competencies cultivating a competent, disciplined, resilient workforce that provides quality solutions" (USACE, 2011a). Additionally, the USACE offers PROSPECT to develop unique skills of the workforce (USACE, 2011). There are five required courses

identified as A-E Contracting, Construction Contract Administration, Estimating for Construction Contract Modifications, Negotiating Construction Contract Modifications, and District Officer Introductory Course, as well as highly recommended courses to include Design/Build Construction (USACE, 2011a). There are a multitude of common and specialized tasks expected of a USACE contracting officer throughout the contracting process. In addition to formal DAU and PROSPECT training, the USACE (2011a) has developed a *51C/1102 Proficiency Guide* for key and supporting skill tasks required of a USACE contracting officer.

Many of the key and supporting skill tasks identified in the USACE 51C/1102 *Proficiency Guide* (2011a) supplement the tasks that can be found in the *Army Contracting Command 51C Level One Proficiency Guide* (DoA, 2010). The ACC proficiency guide is used to establish an acceptable level of individual competency in the focus areas of commercial items, simplified acquisition procedures, procurement of supplies, services and minor construction, contract planning, and contract closeout (DoA, 2010). These skills are contracting basics that are also applicable to USACE contracting officers. Therefore, it is desirable that MCCOs assigned to the USACE have at least one previous assignment with the ACC prior to being assigned to USACE, because the specialized tasks require training at a more advanced or specialized level (USACE, 2011a). Due to Army manning constraints, it is not always possible to assign MCCOs to the USACE that have had a previous assignment with the ACC. Therefore, the training strategy is adapted to assign personnel within the USACE to have a mix of "seasoned," or experienced, MCCOs with initial entry personnel.

The initial entry personnel to the 51C field will focus on areas commonly associated with ACC training for their first six months and transition to USACE construction and A-E contracting tasks for their remaining time. Figure 14 illustrates the typical training timeline for a USACE MCCO.

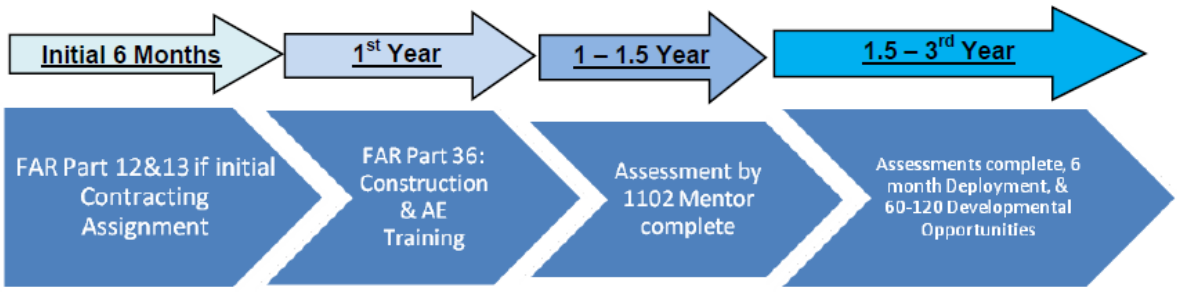

Figure 14. USACE 51C Training and Developmental Timeline (From USACE, 2011a, ch. 1 p. 4)

Construction and A-E contracting tasks are the focus of the first year of an MCCO assignment with a slight exception if this is the initial 51C contracting assignment for the MCCO. Newly assigned MCCOs/1102s are assigned supervisors and mentors to assist them in their development of and training in contracting-related tasks. MCCOs in their first year are typically non-deployable for contracting contingency missions due to their lack of experience, which is supported by the USACE and guidance from the Director of Acquisition Career Management (DoA, 2008). MCCOs are assessed by their mentors/supervisors as their training progresses and should meet acceptable standards within 12 to 18 months. After the initial 12- to 18-month training period, officers become part of an availability pool to support expeditionary operations that are typically six-month deployment rotations. Trained MCCOs may also have the opportunity for 60- to 120-day temporary assignments to other districts or missions to broaden their contracting experience. For MCCOs and 1102s that have completed the initial level of training, continuous learning is emphasized through individual planning with supervisor approval that requires 80 continuous learning points (CLPs) every two years that is consistent with acquisition workforce policy.

E. PROFICIENCY GUIDE

The USACE *51C/1102 Proficiency Guide* (2011a) is intended primarily for MCCOs and the supervisors and mentors assigned to them, but the guide may also be used for civilians, such as interns. As previously discussed, the *51C/1102 Proficiency Guide* (USACE, 2011a) is not intended to replace ACC-level tasks, but it is designed in

addition to these tasks to focus on the USACE's unique skill requirements for a contracting professional. The *51C/1102 Proficiency Guide* (USACE, 2011a) has 45 specific tasks identified overall that are broken down into four subject areas as follows:

- Subject Area 1: USACE
- Subject Area 2: Contracting Pre-Award Tasks for Construction Contracting
- Subject Area 3: Contracting Post-Award Tasks for Construction Contracts
- Subject Area 4: Architect-Engineer Contracting

Appendix C provides a breakdown of the associated specific tasks related to each subject area.

The *51C/1102 Proficiency Guide* (USACE, 2011a)_is structured based on Army regulations such as AR 350–1 (DoA, 2009) that dictate education and training publications "establish tasks, conditions, and standards for military occupational specialties." Accordingly, each task, the *51C/1102 Proficiency Guide* (USACE, 2011a) provides the conditions that the task is meant to be performed under and the acceptable level of performance indicated through the standard and associated performance steps that are rated on a subjective "GO" or "NO GO" basis by the evaluator. The task, conditions, and performance measures give focus for the PAT and scenario development and provide the research team with key areas to emphasize.

F. SUMMARY

In this chapter, the research team provided an overview of the USACE NCO and implementation of the *51C/1102 Proficiency Guide for Construction, Architect-Engineer, and Contingency Contracting* (USACE, 2011a). The NCO organizational structure, command relationship to the USACE, and training methodology were also described down to the MCCO individual level that the PAT is being developed for. The *51C/1102 Proficiency Guide* task, conditions, standards, and proficiency measures were discussed that provides the authors a focus for PAT development.

MCCTs within the USACE NCO structure are a relatively new concept and have been expanding based on additional resources and funding as a result of

recommendations by the Gansler (2007) Commission under the Army's "Grow the Acquisition Workforce" initiative (Van Antwerp, 2010). To train the MCCOs assigned to the MCCTs, the USACE NCO has adopted a similar training strategy to that of the ACC by developing its own version of a *Soldier's Manual of Common Tasks* (SMCT) that is concentrated on USACE construction and Architect-Engineer contracting functions. As Arzu et al. (2010) determined, the ACC SMCT was "incomplete without a formalized proficiency assessment test" (p. 59), and so too is the USACE *51C/1102 Proficiency Guide*. The ECC has successfully implemented the PAT with supporting foundational work by Arzu et al. (2010). Due to the success within the ACC, the USACE (2011a) has requested the support of the authors to develop a PAT based on the tasks identified in their *51C/1102 Proficiency Guide*, which is the primary goal of this research. The development of the USACE PAT is discussed in the following chapter.

IV. PROFICIENCY ASSESSMENT TEST DEVELOPMENT

A. INTRODUCTION

In this chapter, the researchers discuss the development of the PAT. The PAT was developed through a combination of customer input, as well as techniques and practices learned through the literature review. The test construction plan, test blueprint, and item writing are discussed in further detail. To determine validity of the research approach, the team developed a pilot PAT that was administered to experienced and knowledgeable MCCOs within USACE that provided anonymous feedback.

B. TEST CONSTRUCTION PLAN

In constructing the PAT, the research team applied Downing and Haladyna's (2006) 12 steps for effective test development identified in the literature review. The 12 steps include overall plan, content definition, test specifications, item development, test design and assembly, test production, test administration, scoring test responses, passing scores, reporting test results, item banking, and test technical report (Downing & Haladyna, 2006).

Step 1 is the overall plan, which encompasses "systematic guidance for all test development activities" (Downing & Haladyna, 2006). This step is the basis for most of the research scope and deliverables described in Chapter I. The research team developed a PAT for measuring 51C/1102 proficiency tasks in a format that enables ease of use in either a written or computerized format. Developed scenarios and items were vetted through feedback from USACE subject matter experts. The research team also conducted a pilot PAT for further assurance that the approach met the requested time and difficulty expectations expressed by the USACE. The USACE is the decision-maker and will best determine how to implement, administer, safeguard, and update the delivered test upon completion of our PAT deliverable.

Content definition (Step 2) asks the question, "What content is to be tested?" (Downing & Haladyna, 2006). The research team, with guidance from the USACE, treated everything in the USACE *51C/1102 Proficiency Guide* (2011a) as acceptable for

testing. Additionally, any references listed for proficiency tasks were also determined acceptable for item writing. References not listed by the *51C/1102 Proficiency Guide* were for the most part restricted from being utilized for item writing as the research team did not have adequate experience or domain knowledge to ascertain how the reference impacted the organization.

Test specifications and item development, Steps 3 and 4, respectively, are discussed in detail in Sections C and D of this chapter (Downing & Haladyna, 2006).

For test design and assembly (Step 5), the research team designed the test to easily facilitate incorporation into a computer-based delivery method. The items written for the PAT are in the form of single-best-answer multiple-choice questions, which facilitates a simplified answer key (Downing & Haladyna, 2006). The simple answer key allows for easier test administration, as well as instant grading and feedback to the test-taking individual. The research team assembled and grouped items based on the 45 identified tasks in the *51C/1102 Proficiency Guide*. The research team checked to ensure that the answers on the final PAT deliverable were balanced as far as where the correct response was indicated.

Test production concerns in Step 6 are the security and safeguarding of the PAT deliverable (Downing & Haladyna, 2006). To address this concern, the research team worked exclusively through the designated USACE representatives. The USACE is aware of the need to safeguard the PAT and determine the extent that items are reviewed for validity.

The concerns for Step 7, test administration, are the security issues associated with a decentralized computer delivery method (Downing & Haladyna, 2006). The research team has taken action to allow flexibility in test administration by providing an overage of items to allow for an item bank grouped by task. The item bank will make administering different versions of the PAT possible and allow that some test items that are determined to be highly unreliable or misunderstood be thrown out.

Scoring examination responses is Step 8 (Downing & Haladyna, 2006). As discussed, the research team designed the test for extremely simple scoring that can be easily accomplished through computer software that provides immediate feedback to the test administrator and the examinee.

The passing score (Step 9) discussed between the USACE and the research team was determined to be answering 80% or more of the items correctly (Downing & Haladyna, 2006). This is a traditional standard and allows the examinee some room for error. The USACE always has the ability to raise or lower the standard for passing as PAT reliability becomes more greatly defined. A passing score represents a "GO" or "NO GO" for the given PAT.

Reporting examination results (Step 10), item banking (Step 11), and test technical report (Step 12) are areas that are beyond the scope of this research. The research team recommends that the USACE provide accurate and timely feedback to the examinee upon PAT submission. Given the test design and simplified administration, prompt feedback to examinees should not be a problem to implement. As discussed, the USACE should consider item-banking approaches to protect the security of the PAT. Whether USACE determines to outsource test administration through a contract or conduct administration internally, a test technical report will be critical to indicate PAT validity and recommendations to improve future versions.

C. TEST BLUEPRINT

The research team developed a test blueprint for the PAT. The general process of creating a test blueprint is described in the literature review. Test blueprint is Step 3, test specifications, of Downing and Haladyna's (2006) 12 steps for effective test development. Test specifications or blueprint development by the research team was the final part of operational planning for the PAT (Downing & Haladyna, 2006).

The research team chose the selected response approach as a testing format. The rationale behind this decision was to meet the customer's expectation for test administration that allows flexibility and to follow the precedent set by the ACC's PATs for contingency contracting. The selected response approach simplifies the administration

requirements for the PAT that is desired given the geographic separation within the USACE command. The PAT is to be used as a supplement to the *51C/1102 Proficiency Guide* (USACE, 2011a) that allows trainers and supervisors to add performance and constructed response approaches for the center/district requirements to further demonstrate proficiency for a given task area.

The test blueprint the research team developed in collaboration with USACE determined that each PAT administered would consist of 20 items. This number was to account for reliability as well as time constraints. Twenty questions are also consistent with the precedent set by the testing administration conducted by the ECC contingency contracting PATs. Each test-item format is in the form of single-best answer from multiple-choice selections. The research team classified questions into three categories modified from Bloom's *Taxonomy of Educational Objectives: Cognitive Domain* (1956). The categories include recall, comprehension, and application. Based on the research team's limited knowledge and experience in construction and architect-engineer contracting, the overwhelming majority of questions the research team produced fell into the recall category. The research team relied on assistance from the USACE for clarification of the reference material, as well as novel scenarios and input for comprehension and application questions.

The blueprint the research team determined was to concentrate questions covering the major performance measures of each task with a limited number of questions based on minor areas taken from references associated with the task. The research team developed questions with the intent of allowing an examinee approximately two minutes per question, regardless of the category type. All questions developed would be given equal scoring and examinees would be allowed to utilize any reference material identified in the *51C/1102 Proficiency Guide* (USACE, 2011a) while testing. The consequences of an examinee failing the PAT were determined to be low as the examinee could retake the PAT with minor impact on recurring test administration, time and costs.

D. ITEM WRITING

The test blueprint that the research team developed determined the PAT to be constructed as a selected response approach consisting of single-best answer from a multiple-choice answer selection. The research team constructed items that utilized the principles and guidelines discussed in Chapter II of this report that pertained to developing multiple-choice items.

A sample of items that the research team developed can be found in Appendix D. Figure 15 is an example that demonstrates the strategies learned for developing multiple-choice items.

Figure 15. Item Constructed for Task 1–4 of the USACE *51C/1102 Proficiency Guide* (From USACE, 2011a)

As shown in Figure 15, the research team applied the Downing and Haladyna (2006) strategies and rules. The strategies the research team incorporated for constructing this particular item included positively wording the item stem, reducing the reading involved by the examinee, ensuring only one correct answer, placing the answer selections in a reasonable order, removing superfluous language, and staying away from content that is too specific (Downing & Haladyna, 2006). The item developed is also consistent with rules for developing effective multiple-choice items: the composition of the item is straightforward, the distractors are effective, only one answer is correct, the item does not give away hints for other items and vice versa, and the content is not trivial (Downing & Haladyna, 2006).

The example in Figure 15 and the other examples provided in Appendix D are representative of typical multiple-choice items the research team developed. The research team utilized item-writing references to gain insight for developing effective multiple-choice items.

E. RELIABILITY AND VALIDITY

The research team identified reliability and validity as core test principles during the literature review. Reliability involves the degree that examinees achieve consistent results on the PAT (Marshall & Hales, 1972). Content validity is a measure of acceptability with which a body of intellectual content is covered (Nunnally & Ator, 1972). To ensure that items relate to important task content, the research team constructed items to reinforce the standards and performance tasks associated with a given task. The standards and performance tasks have already been pre-determined as areas to show proficiency in for a given task as publicized in the *51C/1102 Proficiency Guide* (USACE, 2011a). By covering these areas, the research team is reasonably confident that as long as the items have a high degree of reliability, they will also have validity.

Ascertaining the reliability for the PAT as described in the literature review is beyond the scope of the research. Determining reliability through methods such as test/retest, parallel-forms, alternate forms, and internal-consistency estimates are areas for further research. Alternatively, the research team implemented a pilot PAT for experienced MCCO's within the USACE. The PAT results did not show statistically significant data to draw any conclusion of reliability. The research team did receive valuable feedback from examinees through an anonymous survey following the pilot PAT, which provided the research team insight for blueprinting as well as some assurance that the items were challenging with a sound methodology. Although the USACE has vetted the items the PAT incorporates, the research team recommends that the USACE take future action to substantiate the PAT as reliable and valid through analysis of PAT responses during implementation.

F. PILOT PAT FEEDBACK

The pilot PAT the research team developed and deployed provided an anonymous link consisting of 25 multiple-choice items with a time limit of 60 minutes offered to all MCCOs within the USACE who had sufficient experience. As indicated in the preceding section, the research team did not have statistically significant data to draw a conclusion on reliability. The research team further developed an anonymous survey link for examinees to provide feedback on the PAT.

The feedback provided by the examinees was limited but useful to the research team. The consensus among those examinees that provided feedback indicated that approximately 2.5 minutes per question was adequate; however, all respondents had a preference for the exam to be untimed. All respondents confirmed that the pilot PAT properly captured the subject matter of the *51C/1102 Proficiency Guide* (USACE, 2011a) and was challenging to them. Items for the pilot PAT were developed using both the *51C/1102 Proficiency Guide* and the associated references linked from the *51C/1102 Proficiency Guide* for the specified tasks. All respondents felt the subject matter for the PAT should not be restricted solely to the *51C/1102 Proficiency Guide* but should also include the reference material to promote learning and research.

Responses to a question asking respondents to identify a negative aspect of the pilot test produced limited responses with the take-away for the research team that not all examinees completed the exam within the allotted time. For time purposes, the research team needs to ensure that reading is reduced for items and that superfluous language is removed. Providing more or less time for the PAT should be relatively easy to implement as needed through analysis of future PAT responses.

G. SUMMARY

The development of the PAT consisted of a combination of customer input, as well as techniques and practices learned through the literature review. The research team applied Downing and Haladyna's (2006) 12 steps for effective test development in determining the PAT construction plan. The test blueprint is a selected response approach of a single-best answer from a multiple-choice selection. The blueprint selected allows

flexibility and follows the precedent set by the ACC's PATs for contingency contracting. The research team gained insight through implementing a pilot PAT. The examinees for the pilot PAT were anonymous MCCOs within USACE who had sufficient experience and knowledge. The MCCOs provided feedback that further assured the research team that the PAT methodology is sound. Chapter V summarizes the research, provides the conclusion, and recommends areas for further research.

V. SUMMARY, CONCLUSION, AND AREAS FOR FURTHER RESEARCH

A. SUMMARY

The USACE is a vital component of U.S. national defense that executes necessary construction contracts in civil, military, and contingency scenarios. Near the epicenter of responsibility are contracting officers who ensure the USACE mission happens with the greatest of efficiency. Minimal knowledge of construction contracting is imparted to an Army 51C contracting officer before being assigned to the USACE, where it becomes a primary function of the contracting officer. In addition, the DoDIG has identified management oversight, control, and policy enforcement as contracting deficiencies, and thus require ongoing attention in an effort to protect valuable taxpayer funds (DoDIG, 2009). In 2011, the USACE produced the *51C/1102 Proficiency Guide* (USACE, 2011a) in an effort to define training tasks for leaders and mentors in developing neophyte contracting officers unfamiliar with construction contracting.

Following the example of the Arzu et al. (2010) research team developing a PAT for the ACC, the research team of this report researched and created a similar PAT to assist the USACE in assessing and developing the proficiency of its contracting officers. The theories and principles reviewed in the research justified the composition of PAT items and provided guidelines for valid test-item writing. The *51C/1102 Proficiency Guide* (USACE, 2011a), along with feedback from the USACE leadership, organized the test items into 45 tasks, grouped within four subject areas, which provide a definitive path for contracting officers to follow for professional development in construction contracting.

The research team's test items were vetted by USACE subject matter experts for realism, difficulty, and time required for completing the test. Averaging 20 questions per task, the research team provided a written PAT containing approximately 800 test items covering the 45 tasks identified in the *51C/1102 Proficiency Guide* (USACE, 2011a) to the USACE. In accordance with feedback from the USACE, test items were arranged into topical groups, as shown in Figure 16.

SUBJECT AREA 1: USACE

Tasks 1-1 to 1-3
Tasks 1-4 to 1-6

SUBJECT AREA 2: Pre-Award Tasks

Tasks 2-1 to 2-3
Tasks 2-4 to 2-8
Tasks 2-9 to 2-11
Task 2-12
Tasks 2-13 to 2-17

SUBJECT AREA 3: Post-Award Tasks

Tasks 3-1 to 3-4
Tasks 3-5 to 3-9
Tasks 3-10 to 3-12
Tasks 3-13 to 3-16

SUBJECT AREA 4: A-E Contracting

Tasks 4-1 to 4-2
Tasks 4-3 to 4-4
Tasks 4-5 to 4-6

Figure 16. List of PAT Test Topics

Arranging test items into 14 topics does not change the quantity of test items but provides a test format that groups tasks into 14 tests instead of 45. Utilizing the same battery of test items, this arrangement enlarges the pool of test items available per test. More importantly, this arrangement reduces the start and stop time needed to transition between test-taking sessions while maintaining the test's subject assessment of construction contracting tasks.

B. CONCLUSION

The researchers of this project have explored the principles of test development, theories of education and understanding, and strategic business models on the importance of resources. The intent was to formulate a tool for the USACE to improve the efficiency of a prized resource: its contracting officers. The research team produced approximately 800 questions in an effort to, at the very least, establish a skill-testing starting point for the USACE efforts in mentoring/developing its contracting officers new to construction contracting.

Although the research team created and utilized a pilot PAT, its purpose was to quickly and easily acquire test and survey data for research, not to serve as an official portion of the PAT. A benefit to the online test was to demonstrate the ease of creating and introducing test-taking via online media for the workforce. Although a full-scale, online PAT was beyond the scope of this research, the online format provided numerous benefits, which this research team will recommend at the time of presentation of the written PAT to the USACE. The format of the test items and answers in the PAT can be easily converted to a digital, online test format.

At the completion of this research project, all test items and answers were submitted to the USACE. The USACE will have ownership of the written PAT test items and answers that the research team created. Afterwards, the USACE can convert the PAT from its written format into a usable and implementable test. The PAT will allow leaders in the USACE to more accurately measure a contracting officer's knowledge and capabilities against the established standards contained in the *51C/1102 Proficiency Guide* (USACE, 2011a). The PAT will assess a contracting officer's readiness for positions of increased responsibility or diversity in assignments.

C. AREAS FOR FURTHER RESEARCH

Several topics of interest were discovered during the past year that the research team recommends for follow-on research. As mentioned in Chapter V, Section B, digitizing the PAT and formatting it for online testing would greatly assist the USACE in testing its workforce. The research team created a pilot PAT utilizing the Naval Postgraduate School's SAKAI web server to host the test in a format utilized for classroom activities as well as course exams. Further research could evaluate formats for online tests and/or conduct a cost analysis of possible web hosting options capable of meeting the USACE specifications/criteria.

Limiting the written PAT to 20 questions per task was meant to enable PAT creation while keeping the workload reasonable for the time period provided. Creating additional questions to increase the PAT item database would be a valuable research

effort. Also, developing additional scenario-based test items that challenge multiple tasks and skills in a culminating manner would greatly increase the depth of proficiency challenged by the PAT.

Another research topic could be to expand the scope of the PAT to other competencies within the USACE or go beyond the USACE to contracting within the Army. A research team could construct a PAT with a focus on another contracting or procurement topic. The PAT can also be expanded to other military Agencies or the entire DoD.

A vital aspect of the PAT will be the results. A research team could assess the results from the USACE PAT to inform the USACE of additional training needs. This assessment would provide essential feedback that could greatly improve training efficiency within the USACE. This assessment could also provide feedback to DAU for developing DAU courses.

Finally, in Chapter II, Section B, the research team reviewed business strategy for competitive advantage and, at a micro-level, how the knowledge and experience of contracting officers is a resource to achieve competitive advantage. Another topic of research could be the analysis at a macro-level of the USACE for how effectively it is utilizing its resources (personnel and systems). The topic has tremendous potential to improve the strategic and competitive advantage of the USACE. The research could develop an effective means of measuring the performance of the USACE contracting by utilizing business models addressing facets of efficiency, structure, and value. An example could be evaluating the USACE's use of resources and providing feedback that could result in reforms to command structure, training practices, and/or manpower just to mention a few possibilities.

APPENDIX

A. ESSENTIAL PRINCIPLES FOR TEST USERS

1. [A] test user should have a general knowledge of measurement principles and of the limitations of test interpretations, and how well they match the qualifications required to use a specific test.
2. A test user should know his own qualifications and how well they match the qualifications required for the uses of specific tests.
3. One who has the responsibility for decisions about individuals or policies that are based on test results should have an understanding of psychological or educational measurement.
4. The principal test users within an organization should make every effort to be sure that all those in the organization who are charged with responsibilities related to test use and interpretation have received training appropriate to those responsibilities.
5. Anyone administering a test for decision-making purposes should be competent to administer that test or class of tests. If not qualified, he should seek the necessary training regardless of his educational attainments.
6. Tests users should seek to avoid bias in test selection and interpretation or even the appearance of discriminatory practice.
7. Institutional test users should establish procedures for periodic internal review of test use.
8. The choice or development of tests, test batteries, or other assessment procedures should be based on clearly formulated goals and hypotheses.
9. The test user should consider the possibility that different hypotheses may be appropriate for people from different populations.
10. A test user should consider more than one variable for assessment and the assessment of any given variable by more than one method.
11. In choosing a method of assessment, a test user should consider his own degree of experience with it and also the prior experience of the test taker.
12. In choosing an existing test, a test user should relate its history of research and development to his intended use of the instrument.
13. In general, a test user should try to choose or to develop an assessment technique in which “tester-effect” is minimized, or in which reliability of assessment across testers can be assured.
14. A test user is expected to follow carefully the standardized procedures described in the test manual for administering a test.

15. A test user must fully understand the administrative procedures to be followed.

16. A test user should make periodic checks on material, equipment and procedures to maintain standardization.

17. The test user is responsible for accuracy in scoring, checking, coding, or record test results.

18. When test scoring equipment is used the test user should insist on evidence of its accuracy; when feasible, he should make spot checks against hand scoring or develop some other system of quality control.

19. The test user shares with the test developer or distributor a responsibility for maintaining test security.

20. All reasonable precautions should be taken to safeguard test material.

21. A test user should consider the total context of testing in interpreting an obtained score before making any decisions.

22. A test user should recognize that estimates of reliability do not indicate criterion-related validity.

23. A test user should examine carefully the rationale and validity of computer-based interpretations of test scores.

24. In norm-referenced interpretations, a test user should interpret an obtained score with reference to sets of norms appropriate for the individual tested and for the intended use.

25. Test users should avoid the use of terms such as IQ, IQ equivalent, or grade equivalent where other terms provide more meaningful interpretations of a score.

26. A test user should examine differences between characteristics of a person tested and of those of the population on whom the test was developed or norms developed. His responsibility includes deciding whether the differences are so great that the test should not be used for that person.

27. The test user should consider alternative interpretations of a given score.

28. A test user should develop procedures for systematically eliminating from data filers test-score information that has, because of the lapse of time, become obsolete.

B. TWELVE STEPS FOR EFFECTIVE TEST DEVELOPMENT

Step 1 Overall plan
Step 2 Content definition
Step 3 Test specifications
Step 4 Item development
Step 5 Test design and assembly
Step 6 Test production
Step 7 Test administration
Step 8 Scoring test responses
Step 9 Passing scores
Step 10 Reporting test results
Step 11 Item banking
Step 12 Test technical report

C. USACE 51C/1102 PROFICIENCY GUIDE TASKS

USACE

Task 1–1 Explain the Mission of the U.S. Army Corps of Engineers
Task 1–2 Explain the Mission and Organizational Structure of the National Contracting Organization (NCO)
Task 1–3 Explain the USACE Project Management Business Process (PMBP)
Task 1–4 Explain the Differences between Civil and Military Construction Contracting
Task 1–5 Correctly Apply Automated Information Systems (AIS) Used in USACE to Accomplish Construction Contracting
Task 1–6 Explain Types of Funding Used For Construction Contracts

CONTRACTING PRE-AWARD TASKS FOR CONSTRUCTION CONTRACTING

Task 2–1 Develop an Acquisition Plan for a Construction Contract
Task 2–2 The Role of Small Business in Contingency/Emergency Contracting
Task 2–3 Develop a Source Selection Plan
Task 2–4 Develop a Presolicitation Announcement for Construction
Task 2–5 Explain How the Construction Contract Format Differs From the Uniform Contract Format Used for Other Types of Solicitations
Task 2–6 Review Construction Plans and Specifications
Task 2–7 Obtain Presolicitation Clearances
Task 2–8 Develop a Construction Solicitation
Task 2–9 Conduct Peer Review
Task 2–10 Issue Solicitation – On the Street
Task 2–11 Receive Proposals and Determine Responsiveness
Task 2–12 Conduct Source Selection Process
Task 2–13 Explain Contract Funding Process
Task 2–14 Perform Construction Pre-Award and Award Functions
Task 2–15 Process Pre and Post Award Protests
Task 2–16 Procurement of Construction Phase Support Services
Task 2–17 Provide Contingency Contracting Support in CONUS to a Federal Emergency Management Agency (FEMA) Contingency Response Team (CRT)

CONTRACTING POST AWARD TASKS FOR CONSTRUCTION CONTRACTS

Task 3–1 Notification and Debriefing of Unsuccessful Offerors
Task 3–2 Conduct Post Award Functions up to Notice to Proceed (NTP)
Task 3–3 Explain the Roles and Responsibilities of the Construction Contract Administration Team

Task 3–4 Explain the Construction Contract Administration Process in USACE
Task 3–5 Perform Construction Contract Administration
Task 3–6 Explain Payments Under Construction Contracts
Task 3–7 Explain Acceleration and Expediting of Construction Contracts
Task 3–8 Explain the Construction Contract Modification Process
Task 3–9 Establish a Profit Objective Using the Alternate Weighted Guidelines Method
Task 3–10 Obtain and Use a Defense Contract Audit Agency (DCAA) Audit
Task 3–11 Process Claims
Task 3–12 Perform Construction Contract Closeout
Task 3–13 Explain the Authority for and Types of Contract Terminations
Task 3–14 Explain Recurring Issues in Construction Contracts
Task 3–15 Coordinate with, Prepare for and Respond to Audits and Inspections by Oversight Agencies
Task 3–16 Explain the Types and Battle Rhythm of Datacalls and Recurring Reports

ARCHITECT-ENGINEER CONTRACTING

Task 4–1 Explain the Authority for Architect-Engineer (A-E) Contracting
Task 4–2 Explain the Architect-Engineer (A-E) Selection Process
Task 4–3 Develop an Architect-Engineer (A-E) Solicitation/Request for Price Proposal
Task 4–4 Negotiate and Award and Architect-Engineer (A-E) Contract
Task 4–5 Execute the Architect-Engineer (A-E) Task Order Process
Task 4–6 Execute Post Award Actions under Architect-Engineer (A-E) Contracts

D. SAMPLE TEST ITEMS

The following ten items are examples the research team developed for the Proficiency Assessment Tool. The correct selection is in bold font.

1. To provide vital public engineering services in peace and war to strengthen our Nation's security, energize the economy and reduce risks from disasters is:
    - **A. The USACE Mission**
    - B. The USACE Vision
    - C. A goal of USACE
    - D. A USACE objective

Item developed for Task 1–1: *Explain the Mission of the U.S. Army Corps of Engineers*

2. The _____ is responsible for oversight and technical execution of the contracting mission in USACE.
    - A. Head of Contracting Activity
    - B. Regional Contracting Chief
    - C. Director of the National Contracting Organization
    - **D. Regional PARC**

Item developed for Task 1–2: *Explain the Mission and Organizational Structure of the National Contracting Organization (NCO)*

3. Identify the primary automated information system (AIS) used in the development and execution of a construction contract:
    - A. Corps of Engineers Financial Management System (CEFMS)
    - **B. Standard Procurement System (SPS)**
    - C. Project Management Information System (P2)
    - D. Federal Procurement Data System (FPDS)

Item developed for Task 1–5: *Correctly Apply Automated Information Systems (AIS) Used in USACE to Accomplish Construction Contracting*

4. A complete requirements package is accepted by contracting. Assuming no discussions, the PALT for a large Multiple Award Task Order Contract using LPTA should take:
    - A. 32 days
    - **B. 45 days**
    - C. 90 days
    - D. 120 days

Item developed for Task 2–1: *Develop an Acquisition Plan for a Construction Contract*

5. The decision regarding the designation of the Source Selection Authority must be supported by a recommendation from the _____.
    A. District or Center Contracting Chief
    B. Division or District Commander
    C. Principle Assistant Responsible for Contracting (PARC)
    D. Source Selection

Item developed for Task 2–3: *Develop a Source Selection Plan*

6. The SI-CCCB and UFGS WG agreed to a 14 character designation of MF 2004 section numbers in the format "NN NN NN.NN NN" where N's are numbers. What is the subject of section "01 00 00"?
    A. Concrete
    B. Existing Conditions
    C. General Requirements
    D. Procurement and Contracting Requirements

Item developed for Task 2–5: *Explain How the Construction Contract Format Differs from the Uniform Contract Format Used for Other Types of Solicitations*

7. Using the USACE format, identify the section labeled "Technical Provisions"
    A. 00010
    B. 00100
    C. 00600C
    D. 16999

Item developed for Task 2–5: *Explain How the Construction Contract Format Differs from the Uniform Contract Format Used for Other Types of Solicitations*

8. If a court reporter is used during a Pre-proposal conference, who is responsible for procuring the services of the court reporter?
    A. Contract Specialist
    B. Contracting Officer
    C. Project Manager
    D. The assigned Primary Contractor

Item developed for Task 2–10: *Issue Solicitation – On The Street*

9. ACOs may be warranted to make contract changes under applicable clauses for actions not exceeding an absolute value of _____.
    A. $100,000
    B. $250,000
    C. $500,000
    D. $1,000,000

Item developed for Task 3–3: *Explain Roles and Responsibilities of the Construction Contract Administration Team*

10. Which of the following is **NOT** a proper Alternative Dispute Resolution technique within the Corps of Engineers?
    A. Mediation
    B. Mini-trial
    C. Non-binding arbitration
    D. Binding arbitration

Item developed for Task 3–11: *Process Claims*

LIST OF REFERENCES

Allen, M. J., & Yen, W. M. (2001). *Introduction to measurement theory*. Belmont, CA: Waveland Press.

American Psychological Association (APA), American Educational Research Association (AERA), & National Council on Measurement in Education (NCME). (1974). *Standards for educational & psychological tests*. Washington, DC: American Psychological Association.

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., & Pintrich, P. R. (2002). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives.* New York, NY: Taylor & Francis.

Arzu, J., Castro, B., & Mack, B. (2010). *Contingency contracting officer proficiency assessment test development* (NPS-CM-10–007, Master's thesis, Naval Postgraduate School). Retrieved from Acquisition Research Program website: http://acquisitionresearch.net

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals* (1st ed.). New York, NY: Longmans, Green.

Brandenburger, A., & Nalebuff, B. (1995, July-August). The right game: Use game theory to shape strategy. *Harvard Business Review*, pp. 57–71.

Brennan, R. L. (2006). *Educational measurement*. Lenham, MD: Rowman & Littlefield Education.

Collis, D., & Montgomery, C. (2008, July-August). Competing on resources. *Harvard Business Review,* 140–150.

Commission on Wartime Contracting (CWC). (2009, June). *At what cost? Contingency contracting in Iraq and Afghanistan*. Washington, DC.

Defense Procurement and Acquisition Policy (DPAP). (2008). *Contingency-contracting:A joint handbook for the 21st century*. Maxwell, AL: Air Force Logistics Management Agency

Department of the Army (DoA). (2002). *Training the force* (Field Manual [FM] 7–0). Washington, DC.

Department of the Army (DoA). (2003). *Battle focused training* (Field Manual [FM] 7–1). Washington, DC.

Department of the Army (DoA). (2008, March 31). *Director of Acquisition Career Management Guidance Memorandum #4.* Washington, DC: Office of the Assistant Secretary of the Army (Acquisition, Logistics, and Technology).

Department of the Army (DoA). (2009). *Army training and leader development* (Army Regulation 350–1). Retrieved from http://www.apd.army.mil/pdffiles/r350_1.pdf

Department of the Army (DoA). (2010, September 13). *Army contracting command 51C level one proficiency guide*. Fort Belvoir, VA.

Department of Defense Office of Inspector General (DoDIG). (2009, April 22). *Summary of DoD Office of Inspector General audits of acquisition and contract administration* (Report No.D-2009–071,). Washington, DC: DoD IG.

Department of Defense Office of Inspector General (DoDIG). (2010). *Contingency contracting: A framework for reform* (Report No. D-2010–059). Washington, DC: DoD IG.

Department of Defense Office of Inspector General (DoDIG) (2012, November 26). *U.S. Army Corps of Engineers Needs to Improve Contract Oversight of Military Construction Projects at Bagram Airfield, Afghanistan* (Report No.D-2013–024). Washington, DC: DoD IG.

Downing, S. M., & Haladyna, T. M. (2006). *Handbook of test development*. Mahwah, NJ: L. Erlbaum.

Gansler, J., Berteau, D., Naddox, D., Oliver, D., Salomon, L., & Singley, G. (2007). *Urgent reform required: Army expeditionary contracting: Report of the Commission on Army Acquisition and Program Management in Expeditionary Operations*. Washington, DC: Department of the Army.

Ghemawat, P., & Rivkin, J. (2006, February). Creating competitive advantage. *Harvard Business Review*, pp. 1–21.

Government Accountability Office (GAO). (2007). *Federal acquisition and contracting: Systemic challenges need attention* (07–1098T). Washington, DC: Walker, D.

Government Accountability Office (GAO). (2011, February). *High Risk Series An Update* (11–394T). Retrieved from U.S. Government Accountability Office: http://www.gao.gov/new.items/d11278.pdf

Government Accountability Office (GAO). (2011, April). *Contingency contracting: Observation on actions needed to address systemic challenges* (11–580). Washington, DC: Francis, P.

Government Accountability Office (GAO). (2012, August). *Agency actions to address recommendations by the Commission on Wartime Contracting in Iraq and Afghanistan* (12–854R). Washington, DC: Hutton, P. & Russell, C.

Hamel, G., & Prahalad, C. K. (1994). *Competing for the future*. Cambridge, MA: Harvard Business School Press.

Kirstein, J. (2003). *A study of the efficacy of unit contingency contracting training*. Wright-Patterson Air Force Base, OH: Air Force Institute of Technology.

Kline, P. (1986). *A handbook of test construction: Introduction to psychometric design*. New York, NY: Methuen.

Knowles, M. S., Holton, E., & Swanson, R. A. (1998). *The adult learner: The definitive classic in adult education and human resource development* (5th ed.). Houston, TX: Gulf Publishing.

Lasch, P. (2002). *Analysis of Air Force contingency contracting training needs*. Wright-Patterson Air Force Base, OH: Air Force Institute of Technology.

Marshall, J. C., & Hales, L. W. (1972). *Essentials of testing*. Reading, MA: Addison-Wesley.

Muller, E. W. (2006). *Manual for the preparation of objective test questions*. Montvale, NJ: Institute for Supply Management.

Nunnally, J. C., & Ator, N. A. (1972). *Educational measurement and evaluation* (2nd ed.). New York, NY: McGraw-Hill.

Osterlind, S. J. (1998). *Constructing test items: Multiple-choice, constructed-response, performance, and other formats* (2nd ed.). Boston, MA: Kluwer Academic.

Piskurich, G. M., Beckschi, P., & Hall, B. (2000). *The ASTD handbook of training design and delivery*. New York, NY: McGraw-Hill.

Rothaermel, F. T. (2013). *Strategic management: Concepts and cases*. Irwin, NY: McGraw-Hill.

Seifert, A. & Ermoshkin, I. (2010). *Analysis of Government Accountability Office and Department of Defense Inspector General Reports and Commercial Sources on Service Contracts.* (MBA Professional Report, Naval Postgraduate School). Retrieved from http://edocs.nps.edu/npspubs/scholarly/MBAPR/2010/Jun/10Jun_Seifert_MBA.pdf.

Tigges, J., & Snyder, T. (1993). *A study of Air Force theater-based contingency contracting training requirements for a power projection strategy*. Wright-Patterson Air Force Base, OH: Air Force Institute of Technology.

U.S. Army Corps of Engineers (USACE). (2011a). *51C/1102 proficiency guide for construction, architect-engineer (A-E) and contingency contracting* (EP 715–1-8). Washington, DC: U.S. Government Printing Office.

U.S. Army Corps of Engineers (USACE). (2011b, October 31). *National Contracting Organization brief: BG Ted Harrison*. Washington, DC.

U.S. Army Corps of Engineers (USACE). (2012). USACE history. Retrieved from http://www.usace.army.mil/About/History/BriefHistoryoftheCorps/Introduction.aspx

U.S. Army Corps of Engineers Learning Center (ULC). (2011). *The purple book and PROSPECT training needs survey: Managers and supervisors training handbook.* Washington, DC: U.S. Government Printing Office.

Van Antwerp, R. (2010, September 16). *Prepared testimony* [Testimony before the Commission on Wartime Contracting in Iraq and Afghanistan]. Retrieved from http://www.wartimecontracting.gov/index/php/hearings/commission/hearing2010–09–16

Wood, D. A. (1960). *Test construction development and interpretation of achievement tests.* Columbus, OH: Charles E. Merrill Books.

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