

Improving the Certification, Training, and Development of the AT&L Workforce

Life Cycle Logistics Career Field: Competency Validation and Workforce Assessment

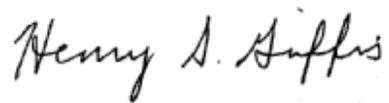
Robert C. Hausmann • Mark Tregar



4825 Mark Center Drive • Alexandria, Virginia 22311-1850

Approved for distribution:

May 2008

A handwritten signature in black ink that reads "Henry S. Griffis". The signature is written in a cursive, slightly slanted style.

Henry S. Griffis
Director, Defense Workforce Analyses
Resource Analysis Division

This document represents the best opinion of CNA at the time of issue.
It does not necessarily represent the opinion of the Department of the Navy.

Distribution limited to DOD agencies. Specific authority: N00014-05-D-0500.
Copies of this document can be obtained through the Defense Technical Information Center at www.dtic.mil
or contact CNA Document Control and Distribution Section at 703-824-2123.

Table of Contents

Executive Summary	1
Background	1
Methodology.....	2
Recommendations and Conclusions.....	4
Introduction.....	9
Methodology	11
Competency Development Methodology	11
The Proposed Life Cycle Logistics Competency Model	12
Pre-Assessment Activities.....	15
We Prepared the Workforce for the Assessment with Communications.....	15
We Conducted a Random Sample Selection.....	15
Participation	16
Major Service Components	16
Military/Civilian Status.....	17
Primary Role.....	17
Retirement Plan	17
Grade/Equivalent Rank	18
Job Title.....	19
Years of Life Cycle Logistics Experience	20

Job Mobility Item	21
Applicability of Our Sample to the LCL Population	22
Life Cycle Logistics Workforce Competency Assessment/Validation Results	25
Validation of the Competency Model	25
Competency Validation Findings.....	27
Overall Look at Ratings	30
Exploratory Factor Analysis Findings	32
Analysis Revealed a Four-Unit Structure	32
Unit of Competence Level Analysis	33
Professional Competency Findings.....	36
Additional Life Cycle Logistics Demographic Comparisons.....	41
Comparison 1: Comparison by Component.....	41
Comparison 2: Comparison by Primary Role	44
Comparison 3: Comparison by Career Level	47
Proficiency Standards Derived from Career Level Analysis.....	49
Recommendations and Conclusions	51
Outcomes of the Current Study.....	51
Use the New Competency Model Structure to Assess the Workforce.....	52
Focus Training Resources and Other Workforce Development Resources on the Highest-Rated Units and Competencies	52
Future Analysis Could Include Life Cycle Logistics Technical Competency Gap Analysis	56
Appendix A: Life Cycle Logistics Competency Model.....	59

Appendix B: Professional Competency Portion.....	63
Appendix C: Proficiency Standards and Other Ratings.....	65
Appendix D: Primary Role Breakdown: Proficiency, Frequency, and Criticality	69
Bibliography	73
List of Tables	75
List of Figures.....	77

This page intentionally left blank.

Executive Summary

Background

In the most recent Acquisition, Technology, and Logistics (AT&L) Human Capital Strategic Plan (v 3.0), the Defense Acquisition University (DAU) has outlined a human capital agenda that includes competency development, assessment, and analysis to assist senior leaders in developing workforce strategies to improve certification, training, and development for the over 120,000-member AT&L workforce. To this end, DAU asked The Center for Naval Analyses (CNA) to develop Competency Models for each of the primary career fields within the AT&L workforce.

To develop the Competency Models for the AT&L workforce, CNA developed a four-phase competency development and management process. The final phase of this process calls for a final validation and workforce assessment. This report is one in a series of reports that will be produced for each of the primary career fields within the AT&L workforce; the current report focuses on the Life Cycle Logistics (LCL) career field. The validation of the LCL Competency Model will enable the use of the model for future training modifications, workforce measurements, and overall human capital strategic planning.

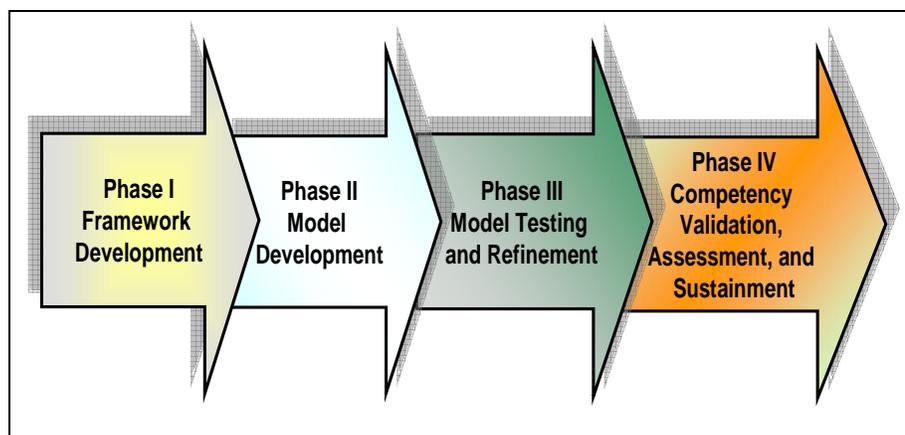
This report is intended to complete Phase IV of our Competency Model development and management process and will:

- **Validate the Competency Model** by testing the proposed Competency Model's applicability to the larger workforce through analysis of respondent competency ratings.
- **Provide for a basic Competency Model structure** for conducting competency assessments using factor analysis results whose output indicates a set of discrete and measurable criterion, which are labeled Units of Competence.

- **Provide a preview at the workforce’s overall proficiency levels** at specific career levels, to document potential proficiency standard levels for further development detailed in Appendix C.

Methodology

The current Life Cycle Logistics Competency Model has undergone an Office of Personnel Management (OPM)-guided development process. This process is grounded in the research literature and has been proven successful in developing Competency Models in both private and public sectors (Lucia and Lepsinger, 1999; Shippmann et al., 2000; Marrelli, Tondora and Hoge, 2005). The methodology consists of four phases:



Phase-Related Details for the Life Cycle Logistics Workforce

We completed Phases I and II through extensive collaboration and data collection with DAU’s Acquisition Workforce and Career Management (AWCM) office, the Life Cycle Logistics Functional Integrated Process Team (FIPT) leadership, and other FIPT members, as well as our 59 LCL Subject Matter Experts (SMEs). During data collection, we collected both quantitative and qualitative data about the work performed by Life Cycle Logisticians. We asked the SMEs to tell us about both the technical and professional competencies.

CNA developed and reported the model to the community of stakeholders at the end of Phase II. This proposed model comprised 41 competencies (31 technical, 10 professional) and 135 technical elements.

Moving forward in our process to Phase III, a CNA-facilitated review of the proposed LCL Competency Model was conducted. The resulting competency model from this facilitated meeting process is the output of Phase III. This facilitated review provides an additional level of validation on the proposed Competency Model as it rolls forward to Phase IV, Competency Validation, Assessment, and Sustainment.

This refined proposed Competency Model comprises 34 competencies (24 technical, 10 professional) and 39 technical elements. The 39 technical elements are composed of technical competency subject matter identified by the LCL SMEs as what is required for successful performance on the job. Please see the technical competency portion of the model in Appendix A and the professional competency portion in Appendix B.

We Prepared the Workforce for Assessment with a Communications Plan

We worked with AWCM and LCL FIPT leadership to draft and refine communication materials to be sent out prior to launch. This was identified as a critical success factor in future efforts. A series of teleconferences and meetings were then held to refine the materials using feedback from both AWCM and FIPT representatives. As part of our effort, CNA and AWCM advised that all LCL career field members be sent an e-mail and attached memo from senior leadership.

We Conducted a Random Sample Selection

We identified a randomly selected 5,635-person sample from the existing DAU source file of over 12,000 individuals who have LCL certification and were enrolled in a DAU course at some point in the past. We e-mailed an invitation from CNA's Competency Assessment (COMPASS) web site to the randomly selected 5,635 participants in two waves over a period of approximately one month.

We asked each participant a series of standardized questions regarding the frequency, criticality, and proficiency of each of our 39 technical competency elements (within 24 technical competencies) and 10 professional competencies. The questions we ask are the following:

- **Frequency - How often do you do this activity in your job?** (1-Almost Never to 5-Very Frequently)
- **Criticality - How critical is this activity in your job?** (1-Not Critical to 5-Extremely Critical)
- **Proficiency - Rate how proficient you are at the competency element behaviors.** (0-No exposure to, or awareness of, this element to 5-Expert)

Of the 5,635 LCL professionals identified, 1,295 completed the assessment for a total response rate of 22.9 percent. We believe the responses provided are generalizable to the LCL population at large due to the size of our sample, the similarity of participants to the population at large on component and military/civilian status, as well as the diversity of respondents' job titles reflecting the diversity of the Life Cycle Logistics career field.

Workforce Gap Analysis Not Conducted Due to Limited Supervisor Input

We sought additional inputs on our participants' proficiency through supervisor assessments. However, we did not achieve enough supervisor assessment results to include this group in our analysis. For this reason, the current assessment results will focus primarily on validation of the Life Cycle Logistics Competency Model, which does not require supervisor input. Our findings are limited in the proficiency gap analysis due to the need for multi-rater feedback we sought, with limited success, on the individual proficiency ratings we collected.

Recommendations and Conclusions

In this study we provide a validated LCL Competency Model, a finalized and data-based Competency Model structure, and a deeper

understanding of the workforce and the priority of the technical and professional competencies. Finally, we have developed some baseline proficiency standards for use in later workforce assessment and other planning efforts.

We have successfully validated the Life Cycle Logistics Competency Model through the assessment ratings collected. We can definitively say that this model is relevant to the Life Cycle Logistics workforce through our stratified assessment. We are confident that the current sample does reflect the Life Cycle Logistics population at large.

Use the New Competency Model Structure to Assess the Workforce

As part of our validation process, we seek to create a final Competency Model structure in later competency management applications. We conducted a factor analysis, a data reduction technique commonly used to uncover the underlying structure of a set of inter-related variables, to better understand the underlying structure of our competencies¹.

Competency Model Structure: Our analysis revealed a structure with four Units of Competence:

- **Unit 1: Utilizing Test Data for Best Design Configuration and Processes**
- **Unit 2: Performance Based Logistics Management and Planning**
- **Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability**
- **Unit 4: Cost Evaluation for Sustainment of Systems**

In addition to the four Units of Competence encapsulating all the technical competencies, we placed the professional competencies in a separate fifth Unit of Competence called **Unit 5, LCL Professional Competencies**.

¹ Past studies have documented the use of factor analysis in developing Competency Model structure (Boyatzis, 1999, Bartram and Brown, 2005, Hausmann and Tregar, 2007).

Focus Training Resources and Other Workforce Development Resources on the Highest-rated Units and Competencies

Utilize Competency-to-Training Matrix for Course Evaluations

An overall Life Cycle Logistics competency-to-training course evaluation could be conducted by creating a competency-to-training course matrix to include both technical and professional competencies. This overall course evaluation could ensure that competencies seen as high in frequency, criticality, and proficiency are covered by the course offerings, in addition to the other competencies within the Competency Model.

According to ratings provided by our participants, **Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability** has the highest ratings across frequency, criticality, and proficiency. This highest rated Unit of Competence, Unit 3, should receive the most attention when deciding upon the application of available training resources.

At the competency level, training resources should focus on the highest-rated technical and professional competencies. At the individual competency level, we see patterns across the workforce with competencies that match up very well to this overall Unit level result with the competencies of *Integrated Product and Process Development (IPPD)* and *Maintaining and Managing Customer Relationships* having high ratings across frequency, criticality, and proficiency.

Our analysis of professional competencies confirms our observation that the job of a Life Cycle Logistician involves constant interface and communication with customers and other stakeholders. The top three professional competencies across frequency, criticality, and proficiency for the current sample were *Interpersonal Skills*, *Customer Service*, and *Written Communication*. These three competencies should also be evaluated for use within LCL course material, and resources should be expended if they are not adequately addressed. In addition, a future analysis could also look into how the current training and professional development opportunities take on *Problem Solving* and *Creativity and Innovation*, as these competencies were rated as highly important during development (Phase II) but rated

much lower in the current Phase IV analysis in criticality, frequency, and proficiency.

Weight the Lower-Rated Competencies Appropriately

As is detailed in the current report, ***Utilizing Simulation and Modeling, Earned Value Management, Human Systems Integration, and Test and Evaluation*** were the lowest rated across all types of ratings (frequency, criticality, and proficiency).

An in-depth look at these competencies and elements may lead to their modification or removal from the competency set. However, these modifications can be impacted by many factors, such as future changes to the workforce or workforce requirements. Our recommendation is that these competencies be considered when making human capital management decisions but weighted accordingly because of their low criticality, frequency, and proficiency.

Pay Special Attention to Competencies with Low Proficiency Ratings but High Frequency and Criticality Ratings

When creating a competency-to-course matrix, it is important to pay special attention and ensure course coverage of the competencies with lower proficiency ratings and higher frequency and criticality ratings. If these competencies are needed frequently and are highly critical to LCL jobs – but our workforce has limited proficiency, this is an important finding. In our analysis we found two competencies with these differences in ratings, they are ***Joint Operational Interface*** and ***Maintenance Planning***.

Primary Role and Major Service Component Differences May Signal Different Needs

Differences found across Primary Roles (Acquisition Logistics vs. System Sustainment) and Major Service Components (Army, Navy, Air Force, Fourth Estate) should also be taken into account. Those staff members in Acquisition Logistics have different levels of needs in specific competency areas as their ratings were higher than Systems Sustainment staff across all our Units. In addition, our Component comparison suggests a different role for Army LCL staff,

which may signal different needs across Components. Army participants rated each of our Units of Competence with significantly lower ratings for frequency and criticality. That suggests that there is more specialization of roles for Army LCL staff, which may suggest the usefulness of more tailored training for Army LCL staff. There were no significant differences in proficiency across components.

Utilize Demographic Information for Workforce Planning

Future research and investigations could also include demographic comparison and information. Attrition, retention, and organizational climate/culture data could be connected to the competency results to help with workforce planning. In addition, these predictions could help the DoD understand which competencies are at-risk due to population shifts and their associated proficiency gaps.

Use Proficiency Standards Developed in This Report to Conduct Gap Analysis in the Future

Our validation/workforce assessment reports normally have a gap analysis section for the workforce. The current report does not include a section on gap development areas for two reasons:

- There were no established benchmarks or standards by career level against which to measure
- Supervisors did not provide an adequate number of ratings to truly assess the workforce.

The proficiency standards developed can be used as a baseline proficiency standard for future studies looking at LCL proficiency and gap analysis. In addition, these new standards can be used to look at large workforce planning issues in conjunction with demographic information.

Future steps should revisit the proficiency standards with a panel of experts to ensure that these standards are comparable to certification level and provide correct assumptions about expectations in the workforce. Utilizing these proficiency standards as a baseline for gap analyses can help focus human capital strategies on targeted areas of the workforce and/or required competencies.

Introduction

In the most recent Acquisition, Technology, and Logistics (AT&L) Human Capital Strategic Plan (v 3.0), the Defense Acquisition University (DAU) has outlined the human capital agenda of competency development, assessment, and analysis to assist senior leaders in developing workforce strategies to improve certification, training, and development for the over 120,000-member AT&L workforce. To this end, DAU asked The Center for Naval Analyses (CNA) to develop Competency Models for each of the primary career fields within the AT&L workforce.

To develop these Competency Models, CNA has developed a four-phase competency development and management process. The final phase of our competency development and management process entails a final validation and workforce assessment. The validation of the Life Cycle Logistics (LCL) Competency Model will enable the use of the model for future training modifications, workforce measurements, and overall human capital strategic planning.

Competencies describe capabilities inherent to each individual's job in process-oriented segments, allowing for easier comparisons across functions (Defense Acquisition University, 2005). Competencies define work requirements in units that can be reassigned, reallocated, and utilized with more flexibility. Employers can combine competencies across jobs, across functions, and even define company- or agency-wide competencies that pertain to every employee within the organization (such as "providing superior customer service"). These cross-function or cross-organization competencies can clearly communicate what an organization values, provide recognition and rewards for employees who demonstrate those values, and thus provide a linkage to the goals of organizations, allowing for strategic management of an organization's human capital (Prahalad and Hamel, 1990; Shippmann, et al., 2000).

Competency-based management is dependent on the ability of the community to collaborate to identify the competencies needed each day on the job to perform successfully. Using a competency-based management system that is specific to the needs of AT&L workforce will help organizations focus training dollars, reduce turnover costs, create shorter recruiting cycles, and build employee awareness about what the agency values in its people.

In this report, CNA documents the validation of the LCL Competency Model. This report is intended to complete Phase IV of our Competency Model development process and will do the following:

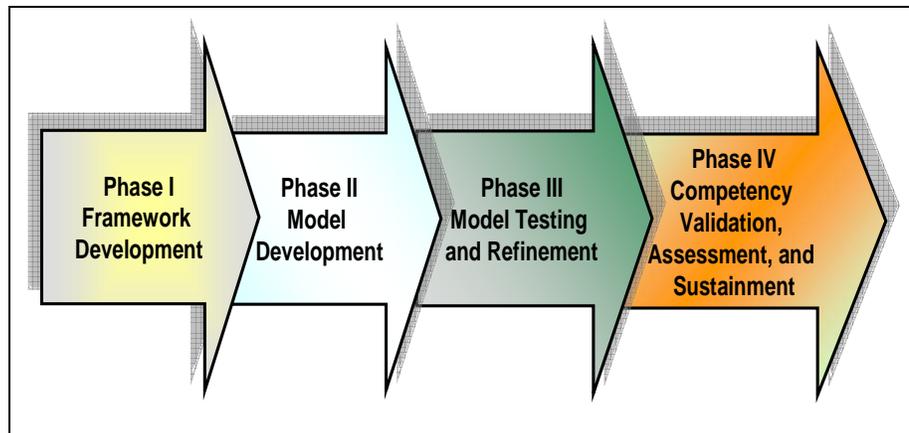
- **Validate the Competency Model** by testing the proposed Competency Model's applicability to the larger workforce through analysis of respondent competency ratings.
- **Provide a basic structure** for conducting competency assessments using factor analysis results whose output indicates a set of discrete and measurable criterion, which are labeled Units of Competence.
- **Provide a preview at the workforce's overall proficiency levels** at specific career levels, to document potential proficiency standard levels for further development as seen in Appendix C.

Methodology

Workforce assessments are the next steps to realizing competency-based management strategies. A competency-based assessment of an organization's human capital is a critical component of maintaining and improving a workforce. A system of ongoing competency assessment empowers organizations to make informed human capital decisions, including effective training and development, selection, and incentive systems.

Competency Development Methodology

The current Life Cycle Logistics workforce Competency Model has undergone an Office of Personnel Management (OPM)-guided development process. This process is grounded in the research literature and has been proven successful in developing Competency Models in both private and public sectors (Lucia and Lepsinger, 1999; Shippmann et al., 2000; Marrelli, Tondora, and Hoge, 2005). The methodology consists of four phases:



Phase I: Framework Development: We convened an Expert Panel comprising senior functional managers who have performed the job and report to senior management. They helped to develop the baseline job framework of major functions, select superior performers who serve as Subject Matter Experts (SMEs) in the next step, and communicate the effort to the community at large.

Phase II: Model Development: We conducted facilitated and online structured interviews with selected SMEs to collect essential job data. The SMEs provided the data to identify key behaviors and refine the job framework developed by the Expert Panel.

Phase III: Model Testing and Refinement: We conducted a pilot assessment with a select group of Expert Panel members to review and refine the model in facilitated and online satellite sessions.

Phase IV: Competency Validation, Assessment, and Sustainment: We further validated the Competency Model and at the same time perform a workforce assessment with a stratified sample of the workforce.

The Proposed Life Cycle Logistics Competency Model

To develop the proposed model Competency Model, we completed Phases I and II through extensive collaboration and data collection with DAU's Acquisition Workforce and Career Management (AWCM) office, Life Cycle Logistics Functional Integrated Process Team (FIPT) leadership, other FIPT members, and our 59 LCL SMEs.

During data collection, we collected both quantitative and qualitative data about the work performed by Life Cycle Logisticians. We asked the SMEs to tell us about both the technical and professional competencies. As part of our data collection, we asked each SME to describe a key situation or experience when he/she felt particularly effective on the job. In addition, we asked each one to rate the professional competencies needed in that particular situation. SMEs gave consistently high ratings to the professional competencies, indicating that they had a significant impact on successful performance on the job. CNA reported the model to the community of stakeholders at the end of Phase II.

This proposed model consisted of 41 competencies (31 technical, 10 professional) and 135 technical elements. This report was delivered in draft form in June 2007. After the proposed Competency Model report was delivered at the conclusion of Phase II, the next step was to facilitate a review of the model in Phase III.

A Facilitated Review of the Proposed Competency Model Was Conducted in Phase III

As a standard part of our Phase III methodology, CNA holds facilitated review meetings of the proposed Competency Model. In this meeting, the Life Cycle Logistics FIPT members who composed a portion of our Expert Panel in Phase I review the model, provide feedback on competency elements, and help to revise elements as needed.

During the review, the Competency Model was reduced from 41 competencies (31 technical, 10 professional) and 135 technical elements to a model with 34 competencies (24 technical, 10 professional), and 39 technical elements. This step provides an additional validation check on each element and competency as it rolls forward to Phase IV.

These 39 elements are composed of technical competency subject matter identified by the Life Cycle Logistic SMEs as what is required for successful performance on the job. Please see the technical competency portion of the model in Appendix A and the professional competency portion in Appendix B. The resulting Competency Model from this facilitated meeting process is utilized and finalized in Phase IV, Competency Validation, Assessment, and Sustainment. See Figure 1 for a display of the changes that occurred to the proposed model during the Phase III review.

Figure 1. Phase III Facilitated Reviews Resulted in Refined Competency Model

Phase II - Proposed Competency Model	Phase III Review	Refined Competency Model
Alternative Sourcing	Retain	Alternative Sourcing
Business Case Analysis	Retain	Business Case Analysis
Configuration Management	Retain	Configuration Management
Contracting for Supplies and Services	Retain	Contracting for Supplies and Services
Cost Estimating		<i>Subsumed by other competencies</i>
Design for Support/Supportability	Retain	Design for Support/ Supportability
Earned Value Management	Retain	Earned Value Management
Human Systems Integration (HSI)	Retain	Human Systems Integration (HSI)
Incorporating Environmental, Safety and Occupational Health Concerns	Retain	Incorporating Environmental, Safety and Occupational Health Concerns
Integrated Product and Processes Development (IPPD)	Retain	Integrated Product and Processes Development (IPPD)
IT Process Management	Retain	IT Process Management
Joint/Operational Logistics Interface	Retain	Joint/Operational Logistics Interface
Logistic Support Elements (w/in Business Management)		<i>Subsumed by other competencies</i>
Logistic Support Elements (w/in Product Support/Sustainment)		<i>Subsumed by other competencies</i>
Maintaining and Managing Customer Relationships	Retain	Maintaining and Managing Customer Relationships
Maintenance Planning	Retain	Maintenance Planning
Managing and Developing Performance Based Agreements (PBAs)	Retain	Managing and Developing Performance Based Agreements (PBAs)
Minimizing Life Cycle Costs	Retain	Minimizing Life Cycle Costs
Obsolescence and DMSMS (Diminishing Manufacturing Sources and Material Shortages) Planning	Retain	Obsolescence and DMSMS (Diminishing Manufacturing Sources and Material Shortages) Planning
PBL Implementation and Execution	Retain	PBL Implementation and Execution
PBL Planning	Retain	PBL Planning
Programming, Planning, Budgeting, and Execution System (PPBES)		<i>Subsumed by other competencies</i>
Risk Management	Retain	Risk Management
Supply Chain Management	Retain	Supply Chain Management
Supportability Analyses and Design Tradeoffs	Retain	Supportability Analyses and Design Tradeoffs
Supportability/Sustainment Requirements		<i>Subsumed by other competencies</i>
Technical Data Management	Retain	Technical Data Management
Test and Evaluation	Retain	Test and Evaluation
Utilizing Best Practices		<i>Subsumed by other competencies</i>
Utilizing Simulation and Modeling Techniques	Retain	Utilizing Simulation and Modeling Techniques
Workload Allocation		<i>Subsumed by other competencies</i>

Pre-Assessment Activities

We Prepared the Workforce for the Assessment with Communications

A goal for the assessment was to identify critical areas for training and development of the LCL workforce. We collaborated with the stakeholders to gather some tailored requirements for the assessment for the LCL community.

We worked with AWCM and LCL FIPT leadership to draft and refine communication materials to be sent out prior to launch. This was identified as a critical success factor in future efforts. A series of teleconferences and meetings were then held to refine the materials using feedback from our site representatives.

A critical success factor of all competency management processes is the communication of the effort to leadership and the LCL community at large. As part of our effort, CNA and AWCM advised that all LCL career field members be sent an e-mail and attached memo from senior leadership. Mr. James D. Hall, Assistant Deputy Under Secretary of Defense (ADUSD), Logistics Plans and Studies, and Mr. Frank Anderson, President of DAU, crafted a joint memo to detail their support for the current effort, to stress the importance of the assessment that was about to begin, and to let the workforce know about their potential participation in the assessment and validation effort.

We Conducted a Random Sample Selection

We identified a randomly selected 5,635 person sample from the existing DAU source file of over 12,000 individuals who have LCL certification and were enrolled in a DAU course at some point in the past. We successfully created a stratified random sample in that we invited members from the major service components at a stratified level compared to the level at which they exist in the population at large. For instance, because the Army makes up a larger percentage of the LCL population at large, a larger number of participants were invited specifically from the Army.

Participation

We e-mailed an invitation from CNA's Competency Assessment (COMPASS) web site to the randomly selected 5,635 participants in two waves over a period of approximately one month. On average, it took between 35 and 45 minutes for each person to complete the assessment.

A total of 1,366 respondents entered the web site. Seventy-three participants were removed because they did not provide enough useful information for analysis. Therefore, of the 5,635 LCL professionals identified, 1,295 completed the assessment for a total response rate of 22.9 percent.

We did not achieve enough supervisor assessment results to include this group in our analysis. The current assessment results will focus primarily on validation of the Life Cycle Logistics Competency Model, which does not require supervisor input. However, our findings are limited in the proficiency gaps assessment because of the need for multi-rater feedback we sought on the individual proficiency ratings we collected.

Major Service Components

In the current sample we had a very good amount of participation from each of the major service components. As detailed in Table 1, breaking down our sample of 1,295 total respondents, there were 485 (37.5%) Navy, 466 (36.0%) Army, 302 (23.3%) Air Force and 42 (3.2%) Fourth Estate members. It is important to compare our sample to that of the larger LCL population, and these component numbers are an important consideration. A later subsection discusses the current sample's applicability to the current population at large.

Table 1. Major Service Component

Component	Frequency	Percent
Navy (including USMC)	485	37.5
Army	466	36.0
Air Force	302	23.3
Fourth Estate (DCMA, DLA, Other)	42	3.2
Total	1,295	100.0

Military/Civilian Status

Overall, a majority of the members of our sample, 1,241 (95.8%) are civilian versus 54 (4.2%) members being active military (Table 2). This is important when looking at how the Life Cycle Logistics force is staffed when faced with workforce shortages and replacement of separated workforce members.

Table 2. Military versus Civilian Personnel

Military/Civilian Status	Frequency	Percent
Civilian	1241	95.8
Military	54	4.2
Total	1295	100.0

Primary Role

This demographic variable, Primary Role, was created to allow CNA to further understand and break our sample up into differences in roles in the Life Cycle Logistics community. In this item, there were two options – System Sustainment or Acquisition Logistics. As seen in Table 3, in the current sample, there are 688 (53.1%) participants involved in System Sustainment, and 607 (46.9%) involved in Acquisition Logistics.

Table 3. Primary Role

Primary Role	Frequency	Percent
System Sustainment	688	53.1
Acquisition Logistics	607	46.9
Total	1295	100.0

Retirement Plan

Personnel were asked to provide information on their government retirement plan. Government employees can be in either the Civil Service Retirement Systems (CSRS) plan or the Federal Employees Retirement (FERS) plan. Currently, new federal employees can only choose to enroll in the FERS program, as the CSRS plan is being phased out. Thus, those personnel under the CSRS plan have more years in government service than those under the FERS plan.

As shown in Table 4, 806 (62.2%) members of our current sample are under the FERS plan while 428 members (33.1%) indicated that

they were under the CSRS plan. In addition, 16(1.2%) chose Not Applicable (No Retirement Plan), while 20(1.5%) were not sure. Those who chose Not Applicable may have been active military that have more options for retirement.

Table 4. Retirement Plan

Retirement Plan	Frequency	Percent
FERS	806	62.2
CSRS	428	33.1
Not Applicable (No Retirement Plan)	16	1.2
Not Sure	20	1.5
Missing	25	1.9
Total	1295	100.0

Grade/Equivalent Rank

We had good representation from across the workforce according to our grade/equivalent rank results (Table 5). We had a small number of low level grade participants with only 1 (0.1%) GS-7 and 16 (1.2%) GS-9s. A majority of our participants fell in the GS-11 through GS-14 grades making up 1180 (91.1%) of our participants. In addition, we had 15 O4s and 15 O5s participate, each making up 1.2% of our sample. Last, we had 43 (3.3%) GS-15s and 4 (0.3%) SES-level participants. We also had representation from across our enlisted and officer groups with 3(0.2%) from E7 and E8, and 4 (0.3%) E9s.

In later analyses, we used the grade/equivalent rank variable as a proxy for career level to break our sample into three distinct groups: Entry, Journey, and Senior Levels. Career Level information would normally be provided by supervisors in the course of their employee ratings.

Table 5. GS Level Breakdown

Grade/Rank	Frequency	Percent
E7	3	0.2
E8	3	0.2
E9	4	0.3
W4	2	0.2
O2	1	0.1
O3	5	0.4
O4	15	1.2
O5	15	1.2
O6	3	0.2
GS7	1	0.1
GS9	16	1.2
GS11	126	9.7
GS12	518	40.0
GS13	433	33.4
GS14	103	8.0
GS15	43	3.3
SES1	3	0.2
SES2	1	0.1
Total	1295	100.0

Job Title

The Life Cycle Logistics community is a varied community, as evidenced by our current sample's diversity of job titles seen in Table 6. Of the current sample, 698 (53.9%) are identified as Logistics Management Specialists. Other notable job titles include 102 (7.9%) Acquisition Logistics, 59 (4.6%) Equipment Specialists, 47 (3.6%) Inventory Specialists, 36 (2.8%) Integrated Logistics Support (ILS) Managers, and 30 (2.3%) Program/Project Managers. In addition, many respondents coded their job title as "Other," and supplied a text entry for typing in their actual job title. CNA analysts recoded these entries, but 145 (11.2%) unclassified "Others" remained².

² All Program Manager, PM, and Project Manager responses were coded into the "Program Manager/Project Manager" job title. Data managers, technical data managers, and technical data management specialist supervisors were all coded as "Technical Data Management Specialists." All logistics management specialist supervisors and logistics managers were coded as "Logistics Management Specialists."

The “Other” job titles included Directors, Deputy Directors, and Chiefs (i.e. Chief, Budget & Force Mgmt, Chief, Force Application, Chief, Logistics Assistance Division); engineers (Facilities Engineer, Supervisory Project Engineer, General Engineer); and strategic planning positions (i.e. Strategic Planner, Strategic Planning Analyst).

Table 6. Job Title

Job Title	Frequency	Percent
Logistics Management Specialist	698	53.9
Other	145	11.2
Acquisition Logistics	102	7.9
Equipment Specialist	59	4.6
Inventory Specialist	47	3.6
Integrated Logistics Support (ILS) Manager	36	2.8
Program/Project Manager	30	2.3
Deputy or Assistant Program Manager for Logistics	28	2.2
Supply Specialist	21	1.6
Logistics Element Manager	17	1.3
Maintenance Manager	17	1.3
Supply Chain Management	17	1.3
Director of Logistics	15	1.2
Technical Data Management Specialist	14	1.1
Operational Logistics	13	1.0
Logistics Engineer	9	0.7
Supply Systems Analyst	9	0.7
Technical Writer/Editor	8	0.6
Weapon Systems Manager	6	0.5
Supply Chain Manager	2	0.2
Transportation Management Specialist	2	0.2
Total	1295	100.0
Note* - Other		

Years of Life Cycle Logistics Experience

Looking at years of Life Cycle Logistics (LCL) experience (Table 7), 289 (22.3%) have 1 to 5 years of LCL experience and 304 (23.5%) have 6 to 10 years of LCL experience. In addition, 141 (10.9%) have 11 to 15 years of LCL experience, 90 (6.9%) have 15 to 20 years LCL experience and 438 (33.8%) have 21 plus years of LCL experience. The average years of LCL experience in our sample was 14.1 years.

Table 7. Years of Life Cycle Logistics Experience

Years LCL Grouped	Frequency	Percent
1 to 5 Years LCL Experience	289	22.3
6 to 10 Years LCL Experience	304	23.5
11 to 15 Years LCL Experience	141	10.9
16 to 20 Years LCL Experience	90	6.9
21+ Years LCL Experience	438	33.8
Missing	33	2.5
Total	1295	100.0
Average	14.1 years	

As the Acquisition Report to Congress (2006) noted, the Acquisition community at large could be facing a personnel problem in the future. As the senior practitioners begin to retire, the smaller-sized mid-level practitioner population must fill these slots. However, there is a dearth of these mid-level practitioners, which may force less-experienced staff into high-level positions. Alternately the government could elect to go outside the government to fill these positions. A smaller mid-level population available to fill these positions, causes an “experience-vacuum”, sometimes termed a “bathtub effect” within the population.

Job Mobility Item

We also included items dealing with job mobility as our participants move along in their careers seen in Table 8. For item, “I intend to continue working in my current organization until I retire,” 368 (28.4%) and 444 (34.3%) of respondents chose Tend to Agree and Strongly Agree, respectively, while 117 (9.0%) and 123 (9.5%) chose Tend to Disagree or Strongly Disagree, respectively. Finally, 221 (17.1%) chose Hard to Decide.

Looking overall at the results, 62.7% of those who responded intend to continue at their current organization until they retire. This is an important consideration when planning for future workforce requirements and the makeup of the workforce of the future.

Table 8. Job Mobility Item Frequency

Rating	Frequency	Percent
1-Strongly Disagree	117	9.0
2-Tend to Disagree	123	9.5
3-Hard to Decide	221	17.1
4-Tend to Agree	368	28.4
5-Strongly Agree	444	34.3
Missing	22	1.7
Total	1295	100.0

Applicability of Our Sample to the LCL Population

It is important to compare our sample to the LCL population at large. We believe our numbers to be comparable to those of the larger workforce. We have used FY2004 DAWIA and DMDC numbers as our comparison group for population comparisons.

When comparing the current component information to the FY2004 DAWIA and DMDC component information, we see many similarities. In the FY2004 numbers there was a very similar Navy representation (37.6% in FY2004 to our 37.5%), and comparable numbers in Army (44.4% in FY2004 to our 36.0%), Air Force (17.6% to our 23.3%), and Fourth Estate (0.7% in FY2004 to our 3.2%).

Table 9. Major Service Component Comparison FY2004 vs. Current

Component	FY 2004 Percent	Current Results Percent
Army	44.4	36.0
Navy (including USMC)	37.4	37.5
Air Force	17.6	23.3
Fourth Estate (DCMA, DLA, Other)	0.7	3.2
Total	100.1*	100.0

* Due to rounding this total is 100.1

When comparing military/civilian status information to FY2004 data, we see additional similarities. Overall, a majority of the members of our sample, 95.8% are civilian versus 4.2% active military. In the FY2004 numbers, there was a comparable 91.0% in civilian versus military service 9.0%.

Table 10. Military/Civilian Status FY2004 vs. Current Sample

Military/Civilian Status	FY 2004 Percent	Current Results Percent
Civilian	91.0	95.8
Military	9.0	4.2
Total	100.0	100.0

In addition to these two comparisons, our spread of years of LCL experience, diversity of job titles, and overall size of our sample lends credence to our use of the current sample.

This page intentionally left blank

Life Cycle Logistics Workforce Competency Assessment/Validation Results

Validation of the Competency Model

Establishing that the competencies are related to the job of a Life Cycle Logistician is the goal of this validation portion of the assessment report. We do this by utilizing the results from our stratified random sample assessment. We ask each randomly selected individual a standardized set of questions to fully investigate our LCL Competency Model.

In addition in this portion of the report, we establish a data-based Competency Model structure and look at how this structure is related to the job of a Life Cycle Logistician, as well as the relative importance of the uncovered Units of Competence and the individual technical and professional competencies. Last, we establish a set of competency-level proficiency standards for use in later analysis and comparisons.

Competency Rating Details for Technical Competencies

The survey begins by asking each respondent for demographic information and then leads to the more detailed technical competency items. Then each employee is asked to rate frequency, criticality, and their own proficiency, using the scales below for each of the behaviors described in the 39 technical elements. The scales for the technical competencies are detailed in Figure 2.

Figure 2. Competency Ratings for Technical Competencies

Competency: Alternative Sourcing	
Element 1. Conduct alternative sources research (i.e., identify viable suppliers or sources of support).	
Frequency - How often do you do this activity in your job?	
• 1	1- Almost Never
• 2	2- Rarely
• 3	3- Occasionally
• 4	4 - Frequently
• 5	5 - Very Frequently
• NA	N/A - Not Applicable / Not needed in my job
Criticality - How critical is this activity in your job?	
• 1	1 - Not Critical
• 2	2 - Somewhat Critical
• 3	3 - Fairly Critical
• 4	4 - Very Critical
• 5	5 - Extremely Critical
• NA	NA - Not Applicable / Not needed in my job
Proficiency - Rate how proficient you are at the competency element behaviors.	
• 0	No exposure to, or awareness of, this element
• 1	Awareness: Applies the competency in the simplest situations and requires close and extensive guidance
• 2	Basic: Applies the knowledge area or skill in somewhat complex situations
• 3	Intermediate: Applies the knowledge area or skill in complex situations
• 4	Advanced: Applies the knowledge area or skill in considerably complex situations
• 5	Expert: Applies the knowledge area in exceptionally complex situations

We Limited Use of Supervisor’s Input in Assessment

In addition to employee responses we also sought the point of view of supervisors in assessing each respondent’s proficiency for each competency element. This multi-rater feedback would have provided additional support and validation for the self-report data we had already collected.

However, we did not receive enough supervisor assessment results to include this group in our analysis. Instead, the current assessment results focus primarily on validation of the Life Cycle Logistics Competency Model, which does not require supervisor input.

Each supervisor who participated in the assessment had to be familiar with Life Cycle Logistics to be able to understand the model, and be able to provide proficiency ratings. In addition, each supervisor categorized each ratee as being an Entry, Journey, or Senior level employee. Then each supervisor is asked to rate the proficiency of each employee in his/her purview for the proficiency level he/she believed each employee possessed for each of the 39 competency elements.

Competency Validation Findings

Seven Competencies Stand Out as the Most Frequently Used

Our participants rated each element on a 1 through 5 Likert-type scale for Frequency (*Frequency - How often do you do this activity in your job? 1- Almost Never; 2- Rarely; 3- Occasionally; 4- Frequently, 5- Very Frequently, NA-Not Applicable/Not Needed*). The competencies that our sample performed most frequently are the following:

- *Integrated Product and Process Development (IPPD)*
- *Maintaining and Managing Customer Relationships*
- *Alternative Sourcing*
- *Managing and Developing Performance-Based Agreements (PBAs)*
- *Design for Support Supportability*
- *Joint Operational Interface*
- *Technical Data Management*

As Table 11 shows, all of the competencies had frequency ratings above 3(occasionally). These competencies make up the activities that our participants perform most.

Table 11. Frequency Ratings at the Competency Level

Competency	N	Mean	SD
Integrated Product and Process Development IPPD (C9)	1164	3.7	1.3
Maintaining and Managing Customer Relationships (C11)	1113	3.5	1.1
Alternative Sourcing (C1)	1172	3.2	1.2
Managing and Developing Performance- Based Agreements PBAs (C12)	957	3.1	1.0
Design for Support Supportability (C6)	1057	3.1	1.1
Joint Operational Interface (C10)	1098	3.1	1.3
Technical Data Management (C21)	959	3.1	1.2

Five Competencies Are the Most Critical Competencies

As seen in Table 12, our participants rated each element on a 1 through 5 Likert-type scale for Criticality (*Criticality - How critical is this activity in your job? 1 - Not Critical, 2 - Somewhat Critical, 3 - Fairly Critical, 4 - Very Critical, 5 - Extremely Critical, NA-Not Applicable/Not Needed*). The competencies believed to be most critical are the following:

- *Integrated Product and Process Development (IPPD)*
- *Maintaining and Managing Customer Relationships*
- *Technical Data Management*
- *Managing and Developing Performance-Based Agreements (PBAs)*
- *Design for Support Supportability*

Table 12. Criticality Ratings at the Competency Level

Competency	N	Mean	SD
Integrated Product and Process Development IPPD (C9)	1158	3.7	1.3
Maintaining and Managing Customer Relationships (C11)	1099	3.6	1.1
Technical Data Management (C21)	942	3.3	1.3
Managing and Developing Performance Based Agreements PBAs (C12)	946	3.3	1.1
Design for Support Supportability (C6)	1041	3.3	1.2

The participants stated that these competencies (shown above in Table 12) are seen as the most critical aspects of our participants' jobs. In addition, all competencies listed as most critical to their jobs were also listed in the top rankings of frequency.

Five Competencies Have the Highest Proficiency Ratings

Our participants rated each element on a 0 through 5 Likert-type scale for Proficiency (Proficiency - Rate how proficient you are at the competency element behaviors: 0-No exposure to, or awareness of, this element; 1-Awareness; 2-Basic; 3-Intermediate; 4-Advanced; 5-Expert). The competencies seen by our respondents as those with which they have the highest proficiency are the following:

- *Integrated Product and Process Development (IPPD)*
- *Maintaining and Managing Customer Relationships*
- *Design for Support Supportability*
- *Managing and Developing Performance Based-Agreements (PBAs)*
- *Technical Data Management*
- *Alternative Sourcing*

Table 13. Proficiency Ratings at the Competency Level

Competency	N	Mean	SD
Integrated Product and Process Development IPPD (C9)	1177	3.4	1.2
Maintaining and Managing Customer Relationships (C11)	1144	3.3	1.1
Design for Support Supportability (C6)	1052	3.0	1.1
Managing and Developing Performance Based Agreements PBAs (C12)	997	3.0	1.0
Technical Data Management (C21)	1012	3.0	1.2
Alternative Sourcing (C1)	1215	3.0	1.2

Overall Look at Ratings

Five Competencies Had the Highest Ratings Across Frequency, Criticality, and Proficiency Ratings

There was a large amount of similarity in ratings of frequency, criticality, and proficiency, which demonstrates that the competencies identified in this grouping are truly an integral part of the job. Those competencies that are used the most and are most critical to their job, and are believed to be the competencies where the participants perform with the highest proficiency are the following:

- *Integrated Product and Process Development (IPPD)*
- *Maintaining and Managing Customer Relationships*
- *Design for Support Supportability*
- *Managing and Developing Performance-Based Agreements (PBAs)*
- *Technical Data Management*

This indicates a large degree of correlation in those competencies that are needed most, are utilized most, and are enacted in a proficient manner. Therefore, according to these analyses, the workforce is proficient in the skills that are most critical to their jobs.

Two Competencies Had Low Ratings in Proficiency but High Ratings in Frequency and Criticality

In addition, we looked at those competencies with low ratings on proficiency but high ratings in frequency and criticality in Table 14. This is an important consideration because those competencies that have a lower proficiency rating but relatively high ratings in criticality and frequency may be important targets for training and development efforts. If these competencies are needed frequently and are highly critical – but our workforce has limited proficiency, this is an important component of our analysis. The two competencies where this occurs are *Joint Operational Interface* and *Maintenance Planning*.

Table 14. Low Proficiency Contrasts to High Criticality and Frequency

Competency	Frequency Mean	Criticality Mean	Proficiency Mean
Joint Operational Interface	2.8	3.1	3.1
Maintenance Planning	2.9	2.9	3.2

Several Competencies Had Low Ratings Across All Variables

We also looked at those competencies with low ratings on frequency, criticality, and proficiency. There was also a strong similarity in ratings of frequency, criticality, and proficiency in terms of lowest ratings as seen in Table 15. The competencies that are used the least, are least critical to their job, and are believed to be the competencies where they perform with the lowest proficiency are:

- *Utilizing Simulation and Modeling*
- *Earned Value Management*
- *Human System Integration*
- *Test and Evaluation*

Table 15. Low Ratings on Four Competencies

Competency	Frequency Mean	Criticality Mean	Proficiency Mean
Utilizing Simulation and Modeling	2.4	2.4	2.3
Earned Value Management	2.3	2.5	2.4
Human System Integration	2.4	2.6	2.4
Test and Evaluation	2.3	2.6	2.4

Utilizing Simulation and Modeling has the lowest ratings looking across Table 15 in all three types of ratings (frequency, criticality, and proficiency). Low ratings such as those in these four competencies may suggest that they should not be a part of this community's competency set. These competencies may ultimately reside in the competency set of other career fields or a small subpopulation within the LCL population.

Exploratory Factor Analysis Findings

Analysis Revealed a Four-Unit Structure

As part of our validation process we seek to create a final Competency Model structure in later competency management applications. We conducted a factor analysis, a data reduction technique commonly used to uncover the underlying structure of a set of inter-related variables, to better understand the underlying structure of our competencies. Past studies have documented the use of factor analysis in developing Competency Model structure (Boyatzis, 1999, Bartram and Brown, 2005, Hausmann and Tregar, 2007).

Competency Model Structure: Our analysis revealed a structure with four Units of Competence (see Figure 3):

- **Unit 1: Utilizing Test Data for Best Design Configuration and Processes**
- **Unit 2: Performance Based Logistics Management and Planning**
- **Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability**
- **Unit 4: Cost Evaluation for Sustainment of Systems**

In addition to the four Units of Competence encapsulating all the technical competencies, we placed the professional competencies in a separate fifth Unit of Competence called **Unit 5, LCL Professional Competencies**. When creating an assessment that attempts to measure multiple dimensions, one should use a measure that contains

items that exemplify the intended dimension and distinguish one Unit from another (Hausmann and Weissbein, 2004). If we were to create a performance measure using these results, these new Units would form its basis. Please see Appendix A for the technical Competency Model arranged by Unit.

Figure 3. Exploratory Factor Analysis Results

Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	Unit 2: Performance-Based Logistics Planning and Management	Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	Unit 4: Cost Evaluation for Sustainment of Systems
Test and Evaluation	PBL Planning	Integrated Product and Process Development IPPD	Alternative Sourcing
Technical Data Management	PBL Implementation and Execution	Design for Support Supportability	Business Case Analysis
Configuration Management	Supply Chain Management	Joint Operational Interface	Earned Value Management
Supportability Analyses and Design Tradeoffs	Minimizing Life Cycle Costs	Maintaining and Managing Customer Relationships	Utilizing Simulation and Modeling
Maintenance Planning	Managing and Developing Performance Based Agreements		
IT Process Management	Risk Management		
Human System Integration	Contracting for Supplies and Services		
Incorporating Environmental Safety and Occupational Health			
Obsolescence and DMSMS Planning			

Unit 5: LCL Professional Competencies* <i>(* This Additional Unit of Competence was not part of the Factor Analysis results)</i>
--

Unit of Competence Level Analysis

Unit 3 Is Rated the Highest in Frequency at the Unit Level

Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability, was performed at a distinctly higher frequency level when compared to the other Units. As seen in Table 16, the ratings for frequency showed Unit 3 to be performed most by our LCL workforce with a mean of 3.4. **Unit 1, Utilizing Test Data for Best Design, Configuration, and Processes**, **Unit 2, Performance-Based Logistics Planning and Management**, and **Unit 4, Cost Evaluation for Sustainment of Systems** have frequency ratings of 2.6, 2.7, and 2.6, respectively.

Referring to our competency-level analysis, it is important to note that four of the seven listed as the highest rated competencies for frequency reside in Unit 3 (*Integrated Product and Process Development (IPPD)*, *Maintaining and Managing Customer*

Relationships, Design for Support Supportability, and Joint Operational Interface).

In addition, **Unit 2, Performance-Based Logistics Planning and Management** was the next highest rated. However, when looking at the sample size (n=799) this shows that a portion of the workforce chose NA-Not Applicable, meaning that a portion of the workforce is not involved in these activities. For those that selected this competency for a rating, their ratings were the second highest for frequency of performance.

Table 16. Frequency Ratings at the Unit Level

Unit of Competence	N	Mean	SD
Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	978	3.4	1.0
Unit 2: Performance-Based Logistics Planning and Management	799	2.7	0.9
Unit 4: Cost Evaluation for Sustainment of Systems	921	2.6	0.9
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	758	2.6	0.9

Unit 3 Is Rated the Highest in Criticality at the Unit Level

Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability, was seen as a distinctly more critical level when compared to the other Units. The ratings for criticality, seen in Table 17, show Unit 3 to be viewed as the most critical group of competencies with a mean of 3.5. Below Unit 3, **Unit 1, Utilizing Test Data for Best Design, Configuration, and Processes**, and **Unit 2, Performance-Based Logistics Planning and Management**, each have a mean of 2.9, while **Unit 4, Cost Evaluation for Sustainment of Systems** has a mean criticality of 2.7.

Also, it is important to note that three of the five most critical competencies reside in Unit 3 (*Integrated Product and Process Development (IPPD), Maintaining and Managing Customer Relationships, and Design for Support Supportability*).

Table 17. Criticality Ratings at the Unit Level

Unit of Competence	N	Mean	SD
Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	953	3.5	1.0
Unit 2: Performance-Based Logistics Planning and Management	775	2.9	1.0
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	732	2.9	1.0
Unit 4: Cost Evaluation for Sustainment of Systems	888	2.7	1.0

Unit 3 is Rated the Highest in Proficiency at the Unit Level

The ratings for proficiency in Table 18 show **Unit 3, Collaborate with Customers and IPT members to Enhance Supportability** to be seen as the Unit with the highest level of proficiency for the sample with a mean of 3.3. Below Unit 3, **Unit 1, Utilizing Test Data for Best Design, Configuration, and Processes**, **Unit 2, Performance-Based Logistics Planning and Management**, each have a mean of 2.8, while **Unit 4, Cost Evaluation for Sustainment of Systems**, has a mean proficiency of 2.7.

Three of the six noted as the highest proficiency competencies reside in Unit of Competence 3: *Integrated Product and Process Development IPPD, Maintaining and Managing Customer Relationships, and Design for Support Supportability.*

Table 18. Proficiency Ratings at the Unit Level

Unit of Competence	N	Mean	SD
Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	973	3.3	0.9
Unit 2: Performance-Based Logistics Planning and Management	768	2.8	0.9
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	706	2.8	0.9
Unit 4: Cost Evaluation for Sustainment of Systems	855	2.7	0.8

Unit 3 Is Rated Consistently Higher Than All Other Units in All Ratings

There was a marked amount of similarity in ratings of frequency, criticality, and proficiency ratings. Unit 3 was rated highest on all ratings across the board. This is interesting in that the most critical work being performed the most often involves the work activities in which the workforce believes they are most proficient.

The pattern of Unit 3 results shows that a large amount of the participants' time is spent participating in the IPPD process, and representing Life Cycle Logistics concerns and IPTs, as well as meeting with customers to ensure that their concerns and requirements are met.

Unit 2, Performance-Based Logistics Planning and Management was the second highest rated Unit across all ratings. This shows that activities involving Performance Based Logistics is a large part of the jobs of Life Cycle Logisticians. Unit 2 is performed frequently, a highly critical part of the respondents' jobs, and performed with high proficiency. It is, however, important to note that although this is the second highest rated Unit, there may be a segment of the population that is not involved with these activities at all. There were a large number of respondent's who chose NA (Not Applicable) for this Unit.

Professional Competency Findings

Methodology for the Current Assessment of Professional Competencies

Following the conclusion of the technical competency portion, each participant was asked to rate each of the professional competencies as to their frequency of use, criticality, and proficiency level. See Figure 4 for each rating scale of the ratings.

Professional competencies provide a necessary counterbalance to technical competencies in that these competencies may underlie superior performance versus technical proficiency in specific subject matter.

Figure 4. Display of Question and Rating Scale

<p>Problem Solving: Identifies and analyzes problems; weighs relevance and accuracy of information; generates and evaluates alternative solutions; makes recommendations. Examples:</p> <ul style="list-style-type: none"> • Conduct review of supply system processes to ensure effectiveness of supply chain flows • Coordinate all aspects of training and development to ensure that deficiencies are addressed • Develop recommendations and improvements to system based on reviews of data • Improve reporting processes to ensure accurate and timely data 	
Frequency - How often do you do this skill in your job?	
• 1	1- Almost Never
• 2	2- Rarely
• 3	3- Occasionally
• 4	4 - Frequently
• 5	5 - Very Frequently
• NA	N/A - Not Applicable / Not needed in my job
Criticality - How critical is this activity in your job?	
• 1	1 - Not Critical
• 2	2 - Somewhat Critical
• 3	3 - Fairly Critical
• 4	4 - Very Critical
• 5	5 - Extremely Critical
• NA	NA - Not Applicable / Not needed in my job
Proficiency - How proficient are you in utilizing this skill to be effective on your job?	
• 1	Awareness: Applies the competency in the simplest situations and requires close and extensive guidance
• 2	Basic: Applies the competency in somewhat difficult situations and requires frequent guidance
• 3	Intermediate: Applies the competency in difficult situations and requires little or no guidance
• 4	Advanced: Applies the competency in considerably difficult situations and generally requires no guidance
• 5	Expert: Applies the competency in exceptionally difficult situations and involves serving as a key resource and advises others
• N/A	Not Applicable / Not needed In my job

Current Analysis Works from Development Results from Phase II

Each participant was presented with each of the top ten professional competencies identified in the development process (Phase II). During Competency Model development, our SMEs identified the top professional competencies that they believe are the “difference-makers.” As seen in Figure 5, *Problem Solving*, *Interpersonal Skills*, and

Customer Service were the top-rated professional competencies our SMEs noted as being needed for effective performance in our development process. It is important to now look to the levels that exist in the workforce for these specific and critical professional competencies.

Figure 5. Top-Rated Professional Competencies in the Development Process

1.	Problem Solving
2.	Interpersonal Skills
3.	Customer Service
4.	Team Building
5.	Written Communication
6.	Creativity and Innovation
7.	Oral Communication
8.	Flexibility
9.	Influencing/Negotiating
10.	Accountability

Current Analysis of Professional Competency Results

Analysis revealed many parallels across the frequency, criticality, and proficiency ratings. A positive result is that this shows that our workforce feels most confident in their abilities in those areas that they use the most and are most critical to their jobs. As we know, the job of a Life Cycle Logistician involves constant interface and communication with customers and other stakeholders. As tables 19, 20, and 21 show, the top three professional competencies across frequency, criticality, and proficiency were:

- *Interpersonal Skills*
- *Customer Service*
- *Written Communication*

This is consistent with results in Phase II, as both *Interpersonal Skills* and *Customer Service* were also noted as the top professional competencies within development.

Table 19. Professional Competency Ratings: Frequency

Professional Competency	N	Mean	SD
Interpersonal Skills	1181	4.5	0.8
Customer Service	1181	4.4	0.8
Written Communication	1188	4.3	0.9
Flexibility	1183	4.1	0.9
Accountability	1168	4.1	1.0
Team Building	1145	4.1	1.0
Oral Communication	1184	4.0	1.0
Problem Solving	1143	3.9	1.1
Influencing/Negotiating	1158	3.8	1.0
Creativity and Innovation	1136	3.6	1.1

Table 20. Professional Competency Ratings: Criticality

Professional Competency	N	Mean	SD
Interpersonal Skills	1175	4.4	0.8
Customer Service	1173	4.4	0.8
Written Communication	1184	4.3	0.9
Accountability	1160	4.2	0.9
Team Building	1139	4.2	1.1
Flexibility	1178	4.1	0.9
Oral Communication	1180	4.0	1.0
Problem Solving	1131	3.9	1.1
Influencing/Negotiating	1154	3.9	1.1
Creativity and Innovation	1133	3.7	1.1

Table 21. Professional Competency Ratings: Proficiency

Professional Competency	N	Mean	SD
Interpersonal Skills	1191	4.2	0.9
Customer Service	1184	4.2	0.9
Written Communication	1189	4.1	0.8
Flexibility	1188	4.0	0.9
Accountability	1182	3.9	0.9
Team Building	1162	3.9	1.0
Oral Communication	1190	3.9	0.9
Influencing/Negotiating	1177	3.7	1.0
Problem Solving	1178	3.7	1.1
Creativity and Innovation	1153	3.6	1.0

Opportunities for Positive Change

Looking again at our current results versus our development results, we also see some important differences. Two of the competencies, although highly-rated in the development process, are now on the

lower end of frequency, criticality, and proficiency ratings in the current results. Those two competencies, *Problem Solving* and *Creativity and Innovation* were consistently in the bottom ranking of self-rated proficiency ratings with ratings of 3.7 and 3.6, respectively.

Additional Life Cycle Logistics Demographic Comparisons

Comparison 1: Comparison by Component

Differences Were Found Among Components in Frequency and Criticality

In our analysis, we found some significant differences in the frequency with which competencies are performed and in terms of criticality at the Unit-level (Tables 22 and 23).

Frequency Comparisons

For **Unit 1, Utilizing Test Data for Best Design, Configuration, and Processes**, Army (mean 2.4) performs significantly fewer Unit 1 activities than Air Force or Navy (both with mean of 2.7). At **Unit 2, Performance-Based Logistics Planning and Management activities**, Army (mean 2.5) performs significantly fewer Unit 2 activities than Navy or Air Force (means of 2.8 and 2.9, respectively). At **Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability**, Army (mean of 3.3) performs significantly fewer Unit 3 activities than Navy (mean of 3.5). There were no significant differences in **Unit 4, Cost Evaluation for Sustainment of Systems**.

Table 22. Frequency Comparisons by Component

Unit of Competence	Service Component	N	Mean	SD
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	Army	234	2.4	1.0
	Navy (including USMC)	299	2.7	0.8
	Air Force	201	2.7	0.8
	4th Estate (DCMA, DLA, Other)	24	2.6	1.0
	Total	758	2.6	0.9
Unit 2: Performance-Based Logistics Planning and Management	Army	245	2.5	0.9
	Navy (including USMC)*	310	2.8	0.9
	Air Force	217	2.9	0.9
	4th Estate (DCMA, DLA, Other)	27	2.7	1.1
	Total	799	2.7	0.9
Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	Army	322	3.3	1.0
	Navy (including USMC)	380	3.5	0.9
	Air Force	245	3.4	0.9
	4th Estate (DCMA, DLA, Other)	31	3.2	1.1
	Total	978	3.4	1.0
Unit 4: Cost Evaluation for Sustainment of Systems	Army	302	2.6	0.9
	Navy (including USMC)	343	2.7	0.9
	Air Force	246	2.7	0.8
	4th Estate (DCMA, DLA, Other)	30	2.6	1.0
	Total	921	2.6	0.9

Note –  Shaded boxes denote significant differences among groups

Criticality Comparisons

For **Unit 1, Utilizing Test Data for Best Design, Configuration, and Processes**, Army (mean 2.7) sees this Unit as significantly less critical than Navy (mean of 3.0). At **Unit 2, Performance-Based Logistics Planning and Management**, Army (mean 2.7) sees these activities as significantly less critical than Navy or Air Force (3.0 and 3.1, respectively). At **Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability**, Army (mean of 3.3) sees Unit 3 activities as significantly less critical to their jobs than Navy (mean of 3.6). There were no significant differences across components in criticality at **Unit 4, Cost Evaluation for Sustainment of Systems**. See Table 23.

Table 23. Criticality Comparisons by Component

Unit of Competence	Service Component	N	Mean	SD
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	Army	229	2.7	1.1
	Navy (including USMC)	289	3.0	1.0
	Air Force	195	3.0	0.9
	4th Estate (DCMA, DLA, Other)	19	2.8	1.1
	Total	732	2.9	1.0
Unit 2: Performance-Based Logistics Planning and Management	Army	238	2.7	1.1
	Navy (including USMC)	302	3.0	1.0
	Air Force	210	3.1	0.9
	4th Estate (DCMA, DLA, Other)	25	2.7	1.1
	Total	775	2.9	1.0
Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	Army	311	3.3	1.1
	Navy (including USMC)	372	3.6	0.9
	Air Force	240	3.5	0.9
	4th Estate (DCMA, DLA, Other)	30	3.2	1.2
	Total	953	3.5	1.0
Unit 4: Cost Evaluation for Sustainment of Systems	Army	293	2.6	1.0
	Navy (including USMC)	326	2.7	1.0
	Air Force	240	2.7	0.9
	4th Estate (DCMA, DLA, Other)	29	2.7	1.0
	Total	888	2.7	1.0

No Significant Differences in Proficiency Across Components

We conducted a test for significant differences for the Units of Competence. We found that there were no significant differences on proficiency among the four Major Service Components.

Army LCL Workforce Shows Differences in Patterns of Responses

A pattern can be seen in that, although Army ratings of frequency are significantly lower, so too are their ratings on criticality. We do know that Army represents the largest proportion of the LCL workforce compared to the other Major Service Components, and this may contribute to the differences in ratings. There may be differences in the role of an Army LCL practitioner compared to other components' practitioners. Our Army respondents may have other responsibilities beyond that of the Competency Model and may act on their ratings of relative importance.

Comparison 2: Comparison by Primary Role

Significant Differences Found Among Primary Roles Across All Ratings

Our respondents were asked if they fell into one of two Primary Roles: Acquisition Logistics or System Sustainment. Our analysis revealed significant differences in how often activities are performed and how the activities are viewed in terms of criticality, and self-rated proficiency ratings. Please see Appendix D for differences at the competency level across all ratings.

Frequency Comparisons Across Primary Roles

A common pattern appears in the frequency results with those in Acquisition Logistics performing the activities related to our Units more frequently than Systems Sustainment staff (Table 24). Those who denote themselves as Acquisition Logistics perform more activities related to **Unit 1, Utilizing Test Data for Best Design, Configuration, and Processes** (mean 2.8) than those in System Sustainment (mean 2.5). In **Unit 2, Performance-Based Logistics Planning and Management**, Acquisition Logistics staff have a mean rating of 2.8, compared to a mean of 2.6 for Systems Sustainment staff. In **Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability**, Acquisition Logistics staff have a mean rating of 3.6, compared to a mean of 3.2 for Systems Sustainment staff. In **Unit 4, Cost Evaluation for Sustainment of Systems** Acquisition Logistics staff have a mean rating of 2.7, compared to a mean of 2.6 for Systems Sustainment staff.

Table 24. Frequency Comparisons by Primary Role

Unit of Competence	Primary Role	N	Mean	SD
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	System Sustainment	379	2.5	0.9
	Acquisition Logistics	379	2.8	0.9
	Total	758	2.6	0.9
Unit 2: Performance-Based Logistics Planning and Management	System Sustainment	409	2.6	0.9
	Acquisition Logistics	390	2.8	0.9
	Total	799	2.7	0.9
Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	System Sustainment	501	3.2	1.0
	Acquisition Logistics	477	3.6	0.9
	Total	978	3.4	1.0
Unit 4: Cost Evaluation for Sustainment of Systems	System Sustainment	465	2.6	0.9
	Acquisition Logistics	456	2.7	0.9
	Total	921	2.6	0.9

Criticality Comparisons Across Primary Roles

A similar pattern to the frequency comparison also occurs in the criticality results (Table 25). Those who denote themselves as Acquisition Logistics see activities related to **Unit 1, Utilizing Test Data for Best Design, Configuration, and Processes** as more critical (mean 3.1) than those in System Sustainment (mean 2.7). In **Unit 2, Performance-Based Logistics Planning and Management**, Acquisition Logistics staff have a mean criticality rating of 3.1, compared to a mean of 2.8 for Systems Sustainment staff. In **Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability**, Acquisition Logistics staff have a mean criticality rating of 3.7, compared to a mean of 3.3 for Systems Sustainment staff. In **Unit 4, Cost Evaluation for Sustainment of Systems**, Acquisition Logistics staff have a mean criticality rating of 2.8, compared to a mean of 2.6 for Systems Sustainment staff.

Table 25. Criticality Comparisons by Primary Role

Unit of Competence	Primary Role	N	Mean	SD
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	System Sustainment	366	2.7	1.0
	Acquisition Logistics	366	3.1	1.0
	Total	732	2.9	1.0
Unit 2: Performance-Based Logistics Planning and Management	System Sustainment	390	2.8	1.0
	Acquisition Logistics	385	3.1	1.0
	Total	775	2.9	1.0
Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	System Sustainment	491	3.3	1.0
	Acquisition Logistics	462	3.7	0.9
	Total	953	3.5	1.0
Unit 4: Cost Evaluation for Sustainment of Systems	System Sustainment	448	2.6	1.0
	Acquisition Logistics	440	2.8	1.0
	Total	888	2.7	1.0

Proficiency Comparisons Across Primary Roles

A similar pattern to the frequency comparison also occurs in the proficiency results (Table 26). Those who denote their Primary Role as Acquisition Logistics rate themselves as more proficient (mean 3.0) than those in System Sustainment (mean 2.7) in **Unit 1, Utilizing Test Data for Best Design, Configuration, and Processes**. In

Unit 2, Performance-Based Logistics Planning and Management, Acquisition Logistics staff have a mean rating of 2.9, compared to a mean of 2.8 for Systems Sustainment staff. In **Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability,** Acquisition Logistics staff have a mean rating of 3.4, compared to a mean of 3.1 for Systems Sustainment staff. In **Unit 4, Cost Evaluation for Sustainment of Systems,** Acquisition Logistics staff have a mean rating of 2.8, compared to a mean of 2.6 for Systems Sustainment staff.

Table 26. Proficiency Comparisons by Component

Unit of Competence	Primary Role	N	Mean	SD
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	System Sustainment	353	2.7	0.8
	Acquisition Logistics	353	3.0	0.9
	Total	706	2.8	0.9
Unit 2: Performance-Based Logistics Planning and Management	System Sustainment	399	2.8	0.9
	Acquisition Logistics	369	2.9	0.9
	Total	768	2.8	0.9
Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability	System Sustainment	502	3.1	0.9
	Acquisition Logistics	471	3.4	0.9
	Total	973	3.3	0.9
Unit 4: Cost Evaluation for Sustainment of Systems	System Sustainment	444	2.6	0.8
	Acquisition Logistics	411	2.8	0.9
	Total	855	2.7	0.8

Comparison 3: Comparison by Career Level

Career Level Variable Development

Table 27 shows career level as a percentage of the total workforce using our grouping of the grade/equivalent rank demographic variable. The Entry Level group includes the grade/equivalent rank designations of 18 participants with the grade/equivalent rank of E1-E4, GS-5-GS-9, and O1-O2 (1.4% of our sample). The Journey Level group has 1084 participants and includes those with the grade/equivalent rank designation of E5-E6, GS11-GS13, O3, and W4 (83.7% of our sample). Last, the Senior Career Level group includes 193 participants with the grade/equivalent rank of E7-E9, GS14-GS15, SES1-SES5, and O4-O8 (14.9% of our sample).

Table 27. Career Level as Percentage of Total Workforce

Career Level	Frequency	Percent
Entry Level	18	1.4
Journey Level	1084	83.7
Senior Level	193	14.9
Total	1295	100.0

No Significant Differences Found Among Components in Frequency and Criticality

In the course of our analysis, we did not find any significant differences in how often activities are carried out and how the activities are viewed in terms of criticality and frequency in our career level comparisons.

Significant Differences Found Between Career Levels in Proficiency in Units

We found significant differences in proficiency across the Units between Career Levels (Table 28). We found **Unit 2, Performance-Based Logistics Planning and Management** was performed at a significantly higher proficiency level by our Senior Level respondents (mean 3.1) compared to our Journey Level (mean 2.8) and Entry Level (mean 2.5) respondents. We found that **Unit 3, Collaborate with Customers and IPT members to Enhance Supportability**, was

performed at a significantly higher proficiency level by our Senior Level respondents (mean 3.6) compared to our Journey Level respondents (mean 3.2) and Entry Level respondents (mean 2.5). Finally, we found that **Unit 4, Cost Evaluation for Sustainment of Systems**, was performed at a significantly higher proficiency level by our Senior Level respondents' (mean 2.9) compared to our Journey Level (mean 2.6) and Entry Level respondents (mean of 2.3).

These results are not surprising in that we would expect our Senior Level respondents to be more proficient than our Journey Level staff. This also seems to suggest that our Senior Level respondents are involved to the same level with each activity as are our Journey and Entry Level respondents.

Table 28. Proficiency By Career Level

Unit of Competence	Career Level	Sample	Mean	SD
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	Entry	6	2.6	1.0
	Journey	560	2.8	0.9
	Senior	140	2.9	0.8
	Total	706	2.8	0.9
Unit 2: Performance-Based Logistics Planning and Management	Entry	6	2.5	1.0
	Journey	615	2.8	0.9
	Senior	147	3.1	0.9
	Total	768	2.8	0.9
Unit 3: Collaborate with Customers and IPT members to Enhance Supportability	Entry	9	2.5	1.0
	Journey	797	3.2	0.9
	Senior	167	3.6	0.9
	Total	973	3.3	0.9
Unit 4: Cost Evaluation for Sustainment of Systems	Entry	9	2.3	0.9
	Journey	692	2.6	0.8
	Senior	154	2.9	0.8
	Total	855	2.7	0.8

Proficiency Standards Derived from Career Level Analysis

Career level information would normally be provided by supervisors in other assessments. Because we lacked this group, we used our Grade/Equivalent Rank variable as a proxy for career level to break our sample into three distinct groups: Entry, Journey, and Senior Levels (as noted in our previous section).

Our results show that Entry Level and Journey Level participants rate themselves as having lower proficiency levels than Senior Level on average across all competencies (see Table 29). As we would expect, the proficiency level of the workforce increases as Career Level increases. This result lends credence to the use of career level that is based on grade/equivalent rank as a stand-in for the supervisor demarcating the career level of our participants.

The proposed standards for each career level are based on the mean proficiency ratings at each career level. The collected proficiency level for each competency can be seen in Appendix C.

Table 29. Career Level Means Across All Competencies

Career Level	Mean Proficiency Rating
Entry Level	2.2
Journey Level	2.7
Senior Level	3.0

This page intentionally left blank.

Recommendations and Conclusions

Outcomes of the Current Study

The current study's results provide for the end of Phase IV of our competency development and management process and includes the following outcomes:

- A LCL Competency Model that is validated through analysis of respondent competency ratings to include both Frequency and Criticality ratings.
- A data-based four-Unit of Competence Competency Model structure developed based on our analysis of participant responses.³
- Proficiency standards developed for use in future applications and sustainment of the model.

In addition to these three outcomes, we have gained a deeper understanding of the competencies used by the workforce and a layout of future activities to ensure sustainment of the Competency Model. We can definitively say that this model is relevant to the Life Cycle Logistics workforce. Our comparisons of Component and Military/Civilian breakdown demonstrate our sample's match to the population. We are confident that the current sample does reflect the Life Cycle Logistics population at large.

³ In addition to the four Units of Competence encapsulating all the technical competencies, we placed the professional competencies in a separate fifth Unit of Competence called **Unit 5, LCL Professional Competencies**

Use the New Competency Model Structure to Assess the Workforce

As part of our validation process, we seek to create a final Competency Model structure for use in later competency management applications. We conducted a factor analysis, a data reduction technique commonly used to uncover the underlying structure of a set of inter-related variables, to better understand the underlying structure of our competencies. Past studies have documented the use of factor analysis in developing Competency Model structure (Boyatzis, 1999, Bartram and Brown, 2005, Hausmann and Tregar, 2007).

Competency Model Structure: Our analysis revealed a structure with four Units of Competence:

- **Unit 1: Utilizing Test Data for Best Design Configuration and Processes**
- **Unit 2: Performance-Based Logistics Management and Planning**
- **Unit 3: Collaborate with Customers and IPT Members to Enhance Supportability**
- **Unit 4: Cost Evaluation for Sustainment of Systems.**

In addition to the four Units of Competence encapsulating all the technical competencies, we placed the professional competencies in a separate fifth Unit of Competence called **Unit 5, LCL Professional Competencies**.

Focus Training Resources and Other Workforce Development Resources on the Highest-Rated Units and Competencies

Utilize Competency-to-Training Matrix for Course Evaluations

At the Unit level resources should focus on the highest rated Unit

An overall LCL competency-to-training course evaluation could be conducted by creating a competency-to-training course matrix to

include both technical and professional competencies. This overall course evaluation could ensure that competencies seen as high in frequency, criticality, and proficiency are targeted. According to ratings provided by our participants, **Unit 3, Collaborate with Customers and IPT Members to Enhance Supportability** has the highest ratings across frequency, criticality, and proficiency. This highest-rated Unit of Competence, Unit 3, should receive the most attention in dividing up resources for training courses.

At the competency level, training resources should focus on the highest rated technical and professional competencies.

At the individual competency level, we see patterns across the workforce with competencies that match up very well to this overall Unit level result with the competencies of *Integrated Product and Process Development (IPPD)* and *Maintaining and Managing Customer Relationships* having high ratings across frequency, criticality, and proficiency.

Our analysis of professional competencies confirms our observation that the job of a Life Cycle Logistician involves constant interface and communication with customers and other stakeholders. The top three professional competencies across frequency, criticality, and proficiency for the current sample were *Interpersonal Skills, Customer Service*, and *Written Communication*. These three competencies should also be evaluated for their degree of utilization within LCL course material. Just as recommended for the technical competencies, resources should be directed to modify courses if there is not adequate coverage of these professional competencies.

In addition, there are some important issues in the differences between those identified as important in the development in the Phase II report and the collected ratings we now see. There were two such mismatches revealed in the results in Phases II and IV of our process for the competencies *Problem Solving* and *Creativity and Innovation*. For instance, *Problem Solving* was rated on the lower end of proficiency (3.7) in this assessment, whereas it was identified in development as the most important professional competency. Such findings may highlight an area for positive change in training and development opportunities for the workforce. A future analysis could also look into how the current training and professional de-

velopment opportunities take on these additional professional competencies.

Leaders responsible for developing Life Cycle Logistics professionals need to determine how best to enhance or augment the current training and development opportunities and tools to ensure that they are incorporating both professional competencies and technical competencies, as problem solving and customer service skills are just as related to superior performance on the job as the technical skills. For example, training courses could include action and scenario-based learning events using real case studies in the LCL career field. This training should be tailored to ensure that the competencies needed for superior performance are included.

Weight the Lower-Rated Competencies Appropriately

As was detailed in our report, *Utilizing Simulation and Modeling*, *Earned Value Management*, *Human Systems Integration*, and *Test and Evaluation* were the lowest-rated across all types of ratings (frequency, criticality, and proficiency).

An in-depth look at these competencies and elements may lead to their modification or removal from the competency set. However, these modifications can be impacted by many factors, such as future changes to the workforce or workforce requirements. For instance, in some career fields, technological changes may affect the workforce and competencies that are not currently highly rated may grow in importance at a later date and for that reason may remain in the competency set.

In many cases, we would recommend the removal of these competencies if they are deemed to be done the least, the least critical, and the least proficient. Our recommendation is that they be considered when making human capital management decisions but weighted accordingly because of their low criticality, frequency, and proficiency.

Pay Special Attention to Competencies with Low Proficiency Ratings but High Frequency and Criticality Ratings

Differences in proficiency versus other ratings are an important consideration because those competencies that have lower proficiency ratings but relatively higher ratings in criticality and frequency may be important targets for training and development efforts.

If these competencies are needed frequently and are highly critical but the workforce has limited proficiency, this is an important finding produced by our analysis and one that should receive a high priority for resolution. The two competencies with these differences in ratings are *Joint Operational Interface* and *Maintenance Planning*.

Primary Role and Major Service Component Differences May Signal Different Needs for Training Content

Differences found across Primary Roles (Acquisition Logistics and System Sustainment) and major Service Components should also be taken into account. Those staff members in Acquisition Logistics may have different levels of needs in specific competency areas as their ratings were higher across all our Units.

Our Component comparison suggests a different role for Army LCL staff, which may signal different needs. The Army LCL workforce members show differences in patterns of responses in frequency and criticality. This seems to suggest that there are differences in the role of an Army LCL practitioner compared to other components. However, this difference does not suggest that the Army logisticians are doing their job in a negative way, but it does suggest a difference in roles. It is important to note that we found no differences between components on proficiency levels.

Utilize Demographic Information for Workforce Planning

Future research and investigations could include demographic comparison and information. Attrition, retention, and organizational climate/culture data could be connected to the competency results to help with workforce planning. In addition, these predictions could help the DoD understand which competencies are at-risk due to population shifts and their associated proficiency gaps.

Looking overall at the results, 62.7% of those who responded intend to continue at their current organization until they retire. This is an important consideration when planning for future workforce requirements and the makeup of the workforce of the future.

Future Analysis Could Include Life Cycle Logistics Technical Competency Gap Analysis

Our validation/workforce assessment reports normally have a gap analysis section for the workforce. The current report does not include a section on gap development areas for two reasons.

- There were no established benchmarks or standards by career level against which to measure
- Supervisors did not provide an adequate number of ratings to truly assess the workforce.

However, the outcome of this report does include a grouping of the competency means at Entry, Journey, and Senior career levels that is seen below. As noted earlier, career level information would normally be provided by supervisors in other assessments. Because we lacked this group, we used our Grade/Equivalent Rank variable as a proxy for career level to break our sample into three distinct groups: Entry, Journey, and Senior levels (as noted in our previous section). In addition, as previously noted, without supervisor ratings, we did not feel the data could give an accurate picture of percent of staff with gaps in proficiency compared to our benchmark proficiency standards. Please see Appendix C to review these preliminary proficiency standards.

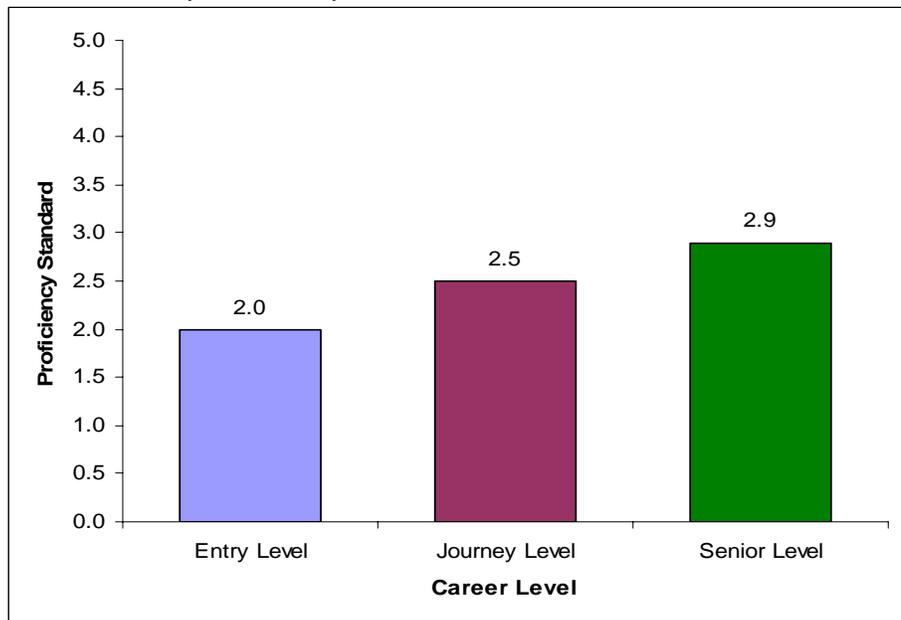
Utilize the Proficiency Standards in Later Applications

The proficiency standards can be used as a baseline proficiency standard for future studies looking at LCL proficiency and gap analysis. In addition, these new standards can be used to look at large workforce planning issues in conjunction with demographic information.

Future steps should revisit the proficiency standards with a panel of experts to ensure that these standards are comparable to certification level and provide correct assumptions about expectations in the workforce. Utilizing these proficiency standards as a baseline for future analysis will prove to be a valuable workforce assessment tool.

For example, as shown in Figure 6, the competency of PBL Implementation and Execution had an average proficiency rating across the career levels of Entry, Journey, and Senior Levels of 2.0, 2.5, and 2.9, respectively. These could be used at a later date as benchmarks or proficiency standards for later comparisons and reviews. One could use these standards to look at gaps in the workforce and then develop specific strategies based on these gap results to help in supporting the warfighter.

Figure 6. Proficiency Standard Example: PBL Implementation and Execution



It is important to note that these standards are not to be used for performance evaluations as they have not been validated for use in any selection applications. See Appendix C for the complete proposed competency proficiency standards for Entry, Journey, and Senior Levels.

This page intentionally left blank.

Appendix A: Life Cycle Logistics Competency Model

The current Competency Model is composed of 4 Units of Competence, 24 technical competencies (with 39 technical elements), and 10 professional competencies.

Unit	Competency	Element
Unit 1: Utilizing Test Data for Best Design, Configuration, and Processes	Test and Evaluation (C22)	Contribute to the development of test plans, concepts and processes to test supportability concepts. (E35)
		Review Test and Evaluation Master Plan (TEMP) and Test and Evaluation Plan (TEP) to ensure consideration of logistics support factors. (E36)
	Technical Data Management (C21)	Ensure the availability of sufficient technical data throughout the system life cycle. (E33)
		Account for the technical data requirements of Commercial off-the-shelf (COTS) components. (E34)
	Configuration Management (C24)	Assess Engineering Change Proposals to ensure supportability requirements have been addressed. (E38)
		Participate in physical configuration audits to ensure the product received matches documentation. (E39)
	Supportability Analyses and Design Tradeoffs (C19)	Plan logistics support elements based on comprehensive systems engineering requirements analysis. (E30)
		Perform maintenance planning tasks, including functions such as Maintenance Task Analysis, Level of Repair Analysis, Core Workload Assessment, Depot Source of Repair, etc. (E31)
	Maintenance Planning (C20)	Ensure maintenance planning is incorporated in the acquisition strategy for the system (i.e., when, where, and how). (E32)
	IT Process Management (C23)	Ensure the information technology requirements (developmental, functional, security, supportability, and operational) are included. (E37)
	Human Systems Integration (HSI) (C7)	Assess the impact of Human Systems Integration (HSI) decisions on system supportability. (E10)
	Incorporating Environmental, Safety and Occupational Health Concerns (C8)	Incorporate Environmental, Safety and Occupational Health (ESOH) considerations into the system support plan. (E11)
	Obsolescence and DMSMS (Diminishing Manufacturing Sources and Material Shortages) Planning (C14)	Develop Diminishing Manufacturing Sources and Material Shortages (DMSMS) Plans that address the management of risks, issues and resolutions. (E22)

Unit	Competency	Element
Unit 2: Performance-Based Logistics Planning and Management	PBL Planning (C15)	Translate logistics support requirements into performance outcome measures. (E23)
	PBL Implementation and Execution (C16)	Analyze Performance-Based Logistics (PBL) options to ensure most cost-effective method of logistics support is chosen. (E24)
		Participate in product reviews to ensure supportability requirements are being met in a timely manner. (E25)
	Supply Chain Management (C18)	Assess supply chain capability of contractor and/or Government to execute the product support plan. (E29)
	Minimizing Life Cycle Costs (C13)	Conduct Life Cycle Cost Analysis to determine costs at different levels of support. (E19)
		Conduct cost analysis to identify baseline and total life cycle costs. (E20)
		Analyze manpower requirements criteria to validate manpower and personnel needs. (E21)
	Managing and Developing Performance Based Agreements (PBAs) (C12)	Monitor logistics support plans for performance and timelines (i.e. Integrated Logistics Support Plan, Life Cycle Sustainment Plan). (E16)
		Ensure key supportability metrics are included in the PBA. (E17)
		Implement mechanisms to measure and monitor logistics performance on key supportability metrics. (E18)
		Coordinate with Service/Agency financial representatives to ensure Performance Based Logistics (PBL) funding strategies are in place. (E26)
	Risk Management (C17)	Develop a risk management strategy to address uncertainty in logistics support. (E27)
		Measure and monitor logistics support outcomes to update risk management profiles. (E28)
	Contracting for Supplies and Services (C3)	Participate in the development of Performance-Based Agreements (PBAs). (E3)

Unit	Competency	Element
Unit 3: Collaborate with Customers and IPT members to Enhance Supportability	Integrated Product and Processes Development (IPPD) (C9)	Contribute to an IPT to ensure logistics considerations are represented in the program. (E12)
	Design for Support/Supportability (C6)	Review system design documents to ensure supportability is part of the system design. (E7)
		Participate in Independent Logistics Assessment to ensure supportability is part of the system design. (E8)
		Ensure customer (warfighter/operational user) support requirements are reflected in the system design. (E9)
	Joint/Operational Logistics Interface (C10)	Consider Joint support opportunities/requirements in the supportability strategy. (E13)
	Maintaining and Managing Customer Relationships (C11)	Communicate with the customer to verify that logistics requirements are stated accurately in the system design. (E14)
Use customer feedback tools or methods to refine, maintain, and/or share logistics information. (E15)		

Unit	Competency	Element
Unit 4: Cost Evaluation for Sustainment of Systems	Utilizing Simulation and Modeling Techniques (C2)	Use modeling and simulation to estimate cost and/or performance parameters. (E2)
	Alternative Sourcing (C1)	Conduct alternative sources research (i.e. identify viable suppliers or sources of support). (E1)
	Business Case Analysis (C4)	Participate in or provide input to the development of a Business Case Analysis to ensure supportability is part of the total cost. (E4)
		Assess contractor business case analysis to ensure it meets supportability requirements. (E5)
Earned Value Management (C5)	Provide supportability data to ensure inclusion in EVM tracking where appropriate. (E6)	

Appendix B: Professional Competency Portion

Figure 7. Professional Competencies and Descriptions

Competency Name	Description
Problem Solving	Identifies and analyzes problems; weighs relevance and accuracy of information; generates and evaluates alternative solutions; makes recommendations.
Interpersonal Skills	Treats others with courtesy, sensitivity, and respect; considers and responds appropriately to the needs and feelings of different situations;
Customer Service	Anticipates and meets the needs of both internal and external customers; delivers high-quality products and services; is committed to continuous improvement;
Team Building	Inspires and fosters team commitment, spirit, pride, and trust; facilitates cooperation and motivates team members to accomplish group goals.
Written Communication	Writes in a clear, concise, organized, and convincing manner for the intended audience.
Creativity and Innovation	Develops new insights into situations; questions conventional approaches; encourages new ideas and innovations; designs and implements new or cutting edge programs/processes.
Oral Communication	Makes clear and convincing oral presentations. Listens effectively; clarifies information as needed.
Flexibility	Is open to change and new information; rapidly adapts to new information, changing conditions, or unexpected obstacles.
Influencing/Negotiating	Persuades others; builds consensus through give and take; gains cooperation from others to obtain information and accomplish goals.
Accountability	Holds self and others accountable for measurable high-quality, timely, and cost-effective results. Determines objectives, sets priorities, and delegates work. Accepts responsibility for mistakes. Complies with established control systems and rules.

This page intentionally left blank.

Appendix C: Proficiency Standards and Other Ratings

	Highest-Rated Competencies Across All Ratings
	Lowest-Rated Competencies Across All Ratings
	Low Proficiency but High Frequency and Criticality

Competency	Career Level	Baseline Proficiency Standard	Frequency Mean	Criticality Mean
Alternative Sourcing C1	Entry	2.7	3.5	3.4
	Journey	2.9	3.2	3.1
	Senior	3.1	3.0	2.9
	Total	3.0	3.2	3.1
Utilizing Simulation and Modeling C2	Entry	2.2	2.5	2.6
	Journey	2.3	2.4	2.4
	Senior	2.5	2.4	2.5
	Total	2.3	2.4	2.4
Contracting for Supplies and Services C3	Entry	2.2	2.7	2.6
	Journey	2.5	2.7	2.7
	Senior	3.0	2.9	3.0
	Total	2.6	2.7	2.8
Business Case Analysis C4	Entry	2.1	2.3	2.5
	Journey	2.5	2.5	2.7
	Senior	2.9	2.8	3.0
	Total	2.6	2.5	2.7
Earned Value Management C5	Entry	2.0	2.2	2.5
	Journey	2.3	2.3	2.5
	Senior	2.5	2.4	2.5
	Total	2.4	2.3	2.5

Competency	Career Level	Baseline Proficiency Standard	Frequency Mean	Criticality Mean
Design for Support Supportability C6	Entry	2.3	2.8	3.2
	Journey	3.0	3.1	3.2
	Senior	3.4	3.1	3.3
	Total	3.0	3.1	3.3
Human System Integration C7	Entry	2.1	2.6	2.8
	Journey	2.3	2.4	2.6
	Senior	2.5	2.4	2.6
	Total	2.4	2.4	2.6
Incorporating Environmental Safety and Occupational health C8	Entry	2.3	2.3	2.4
	Journey	2.4	2.5	2.7
	Senior	2.4	2.4	2.7
	Total	2.4	2.5	2.7
Integrated Product and Process Development IPPD C9	Entry	2.1	2.8	2.9
	Journey	3.4	3.7	3.7
	Senior	3.9	3.7	3.8
	Total	3.4	3.7	3.7
Joint Operational Interface C10	Entry	2.3	3.0	3.3
	Journey	2.8	3.1	3.1
	Senior	3.2	3.0	3.1
	Total	2.8	3.1	3.1
Maintaining and Managing Customer Relationships C11	Entry	3.0	3.4	3.6
	Journey	3.3	3.5	3.6
	Senior	3.6	3.5	3.6
	Total	3.3	3.5	3.6
Managing and Developing Performance Based Agreements PBAs C12	Entry	2.4	2.7	3.0
	Journey	2.9	3.1	3.2
	Senior	3.3	3.2	3.3
	Total	3.0	3.1	3.3
Minimizing Life Cycle Costs C13	Entry	1.9	2.3	2.6
	Journey	2.5	2.5	2.8
	Senior	3.0	2.6	2.9
	Total	2.6	2.5	2.8
Obsolescence and DMSMS Planning C14	Entry	1.8	2.2	2.6
	Journey	2.4	2.4	2.6
	Senior	2.9	2.8	3.1
	Total	2.5	2.5	2.7
PBL Planning C15	Entry	1.7	1.8	2.3
	Journey	2.4	2.4	2.8
	Senior	2.6	2.4	2.8
	Total	2.5	2.4	2.8

Competency	Career Level	Baseline Proficiency Standard	Frequency Mean	Criticality Mean
PBL Implementation and Execution C16	Entry	2.0	2.3	2.5
	Journey	2.5	2.6	2.8
	Senior	2.9	2.7	2.9
	Total	2.6	2.6	2.8
Risk Management C17	Entry	2.1	2.1	2.6
	Journey	2.6	2.6	2.9
	Senior	3.1	2.9	3.1
	Total	2.7	2.7	2.9
Supply Chain Management C18	Entry	2.2	3.1	3.2
	Journey	2.7	2.8	3.0
	Senior	3.0	2.9	3.1
	Total	2.7	2.8	3.0
Supportability Analyses and Design Tradeoffs C19	Entry	2.2	2.3	3.2
	Journey	2.6	2.6	2.9
	Senior	2.9	2.6	2.9
	Total	2.7	2.6	2.9
Maintenance Planning C20	Entry	2.1	2.6	3.3
	Journey	2.8	2.9	3.2
	Senior	3.2	3.0	3.3
	Total	2.9	2.9	3.2
Technical Data Management C21	Entry	2.5	3.2	3.6
	Journey	3.0	3.1	3.3
	Senior	3.2	3.0	3.3
	Total	3.0	3.1	3.3
Test and Evaluation C22	Entry	2.0	2.1	2.7
	Journey	2.4	2.3	2.6
	Senior	2.7	2.3	2.7
	Total	2.4	2.3	2.6
IT process Management C23	Entry	2.0	2.4	2.4
	Journey	2.3	2.5	2.5
	Senior	2.6	2.6	2.6
	Total	2.4	2.5	2.5
Configuration Management C24	Entry	2.6	3.1	3.3
	Journey	2.9	2.7	3.1
	Senior	3.0	2.6	3.0
	Total	2.9	2.7	3.1

This page intentionally left blank.

Appendix D: Primary Role Breakdown: Proficiency, Frequency, and Criticality

Note: This Appendix provides a breakdown of all ratings by Primary Role. Shaded blue are those comparisons that do not have significant differences. All other comparisons have significant differences.

	Highest-Rated Competencies Across All Ratings
	Lowest-Rated Competencies Across All Ratings
	Low Proficiency but High Frequency and Criticality
	Low No Significant Differences Between Comparison

Competency	Primary Role	Proficiency Mean	Frequency Mean	Criticality Mean
Alternative Sourcing C1	System Sustainment	2.9	3.1	3.1
	Acquisition Logistics	3.1	3.3	3.1
	Total	3.0	3.2	3.1
Utilizing Simulation and Modeling C2	System Sustainment	2.2	2.3	2.3
	Acquisition Logistics	2.4	2.5	2.6
	Total	2.3	2.4	2.4
Contracting for Supplies and Services C3	System Sustainment	2.5	2.6	2.6
	Acquisition Logistics	2.6	2.8	2.9
	Total	2.6	2.7	2.8
Business Case Analysis C4	System Sustainment	2.4	2.4	2.6
	Acquisition Logistics	2.7	2.7	2.9
	Total	2.6	2.5	2.7
Earned Value Management C5	System Sustainment	2.3	2.2	2.3
	Acquisition Logistics	2.4	2.5	2.6
	Total	2.4	2.3	2.5
Design for Support Supportability C6	System Sustainment	2.9	2.8	3.0
	Acquisition Logistics	3.2	3.4	3.5
	Total	3.0	3.1	3.3

Competency	Primary Role	Proficiency Mean	Frequency Mean	Criticality Mean
Human System Integration C7	System Sustainment	2.2	2.2	2.4
	Acquisition Logistics	2.6	2.7	2.9
	Total	2.4	2.4	2.6
Incorporating Environmental Safety and Occupational health C8	System Sustainment	2.3	2.4	2.6
	Acquisition Logistics	2.4	2.7	2.9
	Total	2.4	2.5	2.7
Integrated Product and Process Development IPPD C9	System Sustainment	3.3	3.5	3.5
	Acquisition Logistics	3.6	3.9	3.9
	Total	3.4	3.7	3.7
Joint Operational Interface C10	System Sustainment	2.7	2.9	2.9
	Acquisition Logistics	3.0	3.2	3.3
	Total	2.8	3.1	3.1
Maintaining and Managing Customer Relationships C11	System Sustainment	3.2	3.4	3.5
	Acquisition Logistics	3.4	3.7	3.8
	Total	3.3	3.5	3.6
Managing and Developing Performance Based Agreements PBAs C12	System Sustainment	2.9	2.9	3.1
	Acquisition Logistics	3.1	3.3	3.4
	Total	3.0	3.1	3.3
Minimizing Life Cycle Costs C13	System Sustainment	2.5	2.4	2.7
	Acquisition Logistics	2.7	2.6	2.9
	Total	2.6	2.5	2.8
Obsolescence and DMSMS Planning C14	System Sustainment	2.4	2.3	2.5
	Acquisition Logistics	2.6	2.6	2.9
	Total	2.5	2.5	2.7
PBL Planning C15	System Sustainment	2.4	2.4	2.7
	Acquisition Logistics	2.5	2.4	2.8
	Total	2.5	2.4	2.8
PBL Implementation and Execution C16	System Sustainment	2.5	2.5	2.7
	Acquisition Logistics	2.7	2.7	2.9
	Total	2.6	2.6	2.8

Competency	Primary Role	Proficiency Mean	Frequency Mean	Criticality Mean
Risk Management C17	System Sustainment	2.6	2.6	2.8
	Acquisition Logistics	2.8	2.8	3.0
	Total	2.7	2.7	2.9
Supply Chain Management C18	System Sustainment	2.7	2.8	3.0
	Acquisition Logistics	2.8	2.9	3.1
	Total	2.7	2.8	3.0
Supportability Analyses and Design Tradeoffs C19	System Sustainment	2.5	2.5	2.7
	Acquisition Logistics	2.8	2.8	3.1
	Total	2.7	2.6	2.9
Maintenance Planning C20	System Sustainment	2.7	2.7	3.0
	Acquisition Logistics	3.1	3.1	3.4
	Total	2.9	2.9	3.2
Technical Data Management C21	System Sustainment	2.9	2.9	3.1
	Acquisition Logistics	3.1	3.2	3.5
	Total	3.0	3.1	3.3
Test and Evaluation C22	System Sustainment	2.3	2.1	2.4
	Acquisition Logistics	2.6	2.5	2.8
	Total	2.4	2.3	2.6
IT process Management C23	System Sustainment	2.3	2.4	2.6
	Acquisition Logistics	2.5	2.6	3.0
	Total	2.4	2.5	2.8
Configuration Management C24	System Sustainment	2.8	2.7	3.0
	Acquisition Logistics	3.0	2.8	3.2
	Total	2.9	2.7	3.1

This page intentionally left blank.

Bibliography

Acquisition Advisory Panel. (2006). Report of the Acquisition Advisory Panel to the Office of Federal Procurement Policy and the United States Congress – Final Panel Working Draft. Retrieved March 31, 2008 from <http://www.acquisition.gov/comp/aap/documents/Introduction%20and%20Executive%20Summary.pdf>

Bartram D., and Brown, A. (2005). OPQ32 Technical Manual Supplement - Great Eight Factor model OPQ32 report. Dave Bartram & Anna Brown. England: SHL Group

Boyatzis, R.E. (1999). Clustering Competence in Emotional Intelligence: Insights from the Emotional Competence Inventory (ECI) In Reuven Bar-On, R and James D. A. Parker (Eds.). *The Handbook of Emotional Intelligence: Theory, Development, Assessment, and Application at Home, School and in the Workplace*. San Francisco: Jossey-Bass

Defense Acquisition University. (2005). Shifting from a course-centric to competency-centric approach for AT&L workforce capability: Proposed competency structure and process

Department of Defense. (2004). Component DAWIA & DMDC Data (30 September 2004)

Hausmann, R., and Tregar, M. (2007). Program Management Career Field: Proposed Competency Model. CNA CRM 0015349.A2/Final

Hausmann, R. and Weissbein, D. (2004) Is Online Leadership Effective? CNA Technical Report CRM D0010384.A2/Final

Lucia, A.D. and Lepsinger, R. (1999). *The Art and Science of Competency Models*, San Francisco: Jossey-Bass / Pfeiffer

Marelli, A.F., Tondora, J., and Hoge, M.A. (2005). Strategies for developing Competency Models. *Administration and Policy in Mental Health*, 32, 5/6, 533-561

Prahalad, C. K., and Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review*, 79 - 91

Shippmann, J.S., Ash, R.A., Battista, M., Carr, L., Eyde, L.D., Hesketh, B., Kehoe, J.; Pearlman, K., Prien, E.P., and Sanchez, J.I. (2000). The practice of competency modeling. *Personnel Psychology*. 53(3), 703-740

List of Tables

Table 1.	Major Service Component	16
Table 2.	Military versus Civilian Personnel	17
Table 3.	Primary Role	17
Table 4.	Retirement Plan	18
Table 5.	GS Level Breakdown	19
Table 6.	Job Title	20
Table 7.	Years of Life Cycle Logistics Experience	21
Table 8.	Job Mobility Item Frequency	22
Table 9.	Major Service Component Comparison FY2004 vs. Current	22
Table 10.	Military/Civilian Status FY2004 vs. Current Sample	23
Table 11.	Frequency Ratings at the Competency Level	28
Table 12.	Criticality Ratings at the Competency Level	29
Table 13.	Proficiency Ratings at the Competency Level	30
Table 14.	Low Proficiency Contrasts to High Criticality and Frequency	31
Table 15.	Low Ratings on Four Competencies	31
Table 16.	Frequency Ratings at the Unit Level	34
Table 17.	Criticality Ratings at the Unit Level	35
Table 18.	Proficiency Ratings at the Unit Level	35
Table 19.	Professional Competency Ratings: Frequency	39
Table 20.	Professional Competency Ratings: Criticality	39
Table 21.	Professional Competency Ratings: Proficiency	39
Table 22.	Frequency Comparisons by Component	42
Table 23.	Criticality Comparisons by Component	43
Table 24.	Frequency Comparisons by Primary Role	44
Table 25.	Criticality Comparisons by Primary Role	45
Table 26.	Proficiency Comparisons by Component	46
Table 27.	Career Level as Percentage of Total Workforce	47
Table 28.	Proficiency By Career Level	48
Table 29.	Career Level Means Across All Competencies	49

This page intentionally left blank.

List of Figures

Figure 1.	Phase III Facilitated Reviews Resulted in Refined Competency Model	14
Figure 2.	Competency Ratings for Technical Competencies	26
Figure 3.	Exploratory Factor Analysis Results	33
Figure 4.	Display of Question and Rating Scale	37
Figure 5.	Top-Rated Professional Competencies in the Development Process	38
Figure 6.	Proficiency Standard Example: PBL Implementation and Execution	57
Figure 7.	Professional Competencies and Descriptions	63

This page intentionally left blank.

