

INCLUDING A CRITICAL PATH METHOD OF PROJECT MANAGEMENT  
TO ASSIST THE PLANNING AND TRACKING  
OF STABILITY OPERATIONS

A thesis presented to the Faculty of the U.S. Army  
Command and General Staff College in partial  
fulfillment of the requirements for the  
degree

MASTER OF MILITARY ART AND SCIENCE  
General Studies

by

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2008

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<b>REPORT DOCUMENTATION PAGE</b>				<i>Form Approved</i> <i>OMB No. 0704-0188</i>	
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<b>1. REPORT DATE (DD-MM-YYYY)</b> 12 December 2008		<b>2. REPORT TYPE</b> Master's Thesis		<b>3. DATES COVERED (From - To)</b> FEB 2008 – DEC 2008	
<b>4. TITLE AND SUBTITLE</b> INCLUDING A CRITICAL PATH METHOD OF PROJECT MANAGEMENT TO ASSIST THE PLANNING AND TRACKING OF STABILITY OPERATIONS				<b>5a. CONTRACT NUMBER</b>	
				<b>5b. GRANT NUMBER</b>	
				<b>5c. PROGRAM ELEMENT NUMBER</b>	
<b>6. AUTHOR(S)</b> Joseph S. Cooper, LCDR, USN				<b>5d. PROJECT NUMBER</b>	
				<b>5e. TASK NUMBER</b>	
				<b>5f. WORK UNIT NUMBER</b>	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> U.S. Army Command and General Staff College ATTN: ATZL-SWD-GD Fort Leavenworth, KS 66027-2301				<b>8. PERFORMING ORG REPORT NUMBER</b>	
<b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>				<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>	
				<b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>	
<b>12. DISTRIBUTION / AVAILABILITY STATEMENT</b> Approved for Public Release; Distribution is Unlimited					
<b>13. SUPPLEMENTARY NOTES</b>					
<b>14. ABSTRACT</b> In order to facilitate U. S. national security strategy, the U. S. Military has a renewed focus on conducting Stability Operations. These complex operations often take place over long periods and involve various different, but interrelated tasks. Current methods of planning require subjective analysis and previous experiences to determine prioritization when allocating limited resources. Successfully used in civilian industry as a way to plan and execute complex projects, the critical path method might apply to stability operations. The research attempted to determine if applying the critical path method would assist in developing and conducting stability operations.  The research includes a review of literature outlining current national strategic requirements for conducting stability operations, followed by a description of current planning methods and a systematic method to apply critical path method to stability operations. After conducting an analytical wargame on three conditions of a case study using the War in Iraq, the conclusion was that combining doctrinal, traditional lines of effort with the application of the critical path method can assist future stability operations.					
<b>15. SUBJECT TERMS</b> Planning stability operations, critical path method, lines of effort, planning, maintaining operational timelines					
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b>	<b>18. NUMBER OF PAGES</b>	<b>19a. NAME OF RESPONSIBLE PERSON</b>
<b>a. REPORT</b>	<b>b. ABSTRACT</b>	<b>c. THIS PAGE</b>			<b>19b. PHONE NUMBER (include area code)</b>
(U)	(U)	(U)	(U)	93	

Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std. Z39.18

MASTER OF MILITARY ART AND SCIENCE  
THESIS APPROVAL PAGE

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ASSIST THE PLANNING AND TRACKING OF STABILITY OPERATIONS

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

## ABSTRACT

INCLUDING A CRITICAL PATH METHOD OF PROJECT MANAGEMENT TO ASSIST THE PLANNING AND TRACKING OF STABILITY OPERATIONS, by Joseph S. Cooper, LCDR, USN, 93 pages.

In order to facilitate U. S. national security strategy, the U. S. Military has a renewed focus on conducting Stability Operations. These complex operations often take place over long periods and involve various different, but interrelated tasks. Current methods of planning require subjective analysis and previous experiences to determine prioritization when allocating limited resources. Successfully used in civilian industry as a way to plan and execute complex projects, the critical path method might apply to stability operations. The research attempted to determine if applying the critical path method would assist in developing and conducting stability operations.

The research includes a review of literature outlining current national strategic requirements for conducting stability operations, followed by a description of current planning methods and a systematic method to apply critical path method to stability operations. After conducting an analytical wargame on three conditions of a case study using the War in Iraq, the conclusion was that combining doctrinal, traditional lines of effort with the application of the critical path method can assist future stability operations.

## ACKNOWLEDGMENTS

First and foremost, I would like to and need to thank my loving wife. I could not have finished this project without her love and support.

I would like to thank my committee for reminding me to use the roadmap to keep me along the path for successfully completing my MMAS.

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## ACRONYMS

CJCS	Chairman Joint Chiefs of Staff
CGSC	Command and General Staff College
COA	course of action
CPM	critical path method
DoD	Department of Defense
DoDD	Department of Defense Directive
DoS	Department of State
FM	Field Manual
FSO	full spectrum operations
IMS	Interagency Management System
ISF	Iraq Security Forces
ISG	Iraq Study Group
JCS	Joint Chiefs of Staff
JP	Joint Publication
LLOO	logical lines of operation
LOE	lines of effort
LOO	lines of operation
MDMP	military decision making process
MOE	measure of effectiveness
MOP	measure of performance
NDS	National Defense Strategy of the United States of America
NMS	The National Military Strategy of the United States of America
NSS	National Security Strategy of the United States of America

PERT	program evaluation review technique
QDR	Quadrennial Defense Review Report
S/CRS	State Departments Office of the Coordinator for Reconstruction and Stabilization
SO	stability operations
TCAF	tactical conflict assessment framework
U. S. GAO	U. S. Government Accountability Office
USAID	U. S. Agency for International Development
USG	U. S. Government

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## CHAPTER 1

### INTRODUCTION

Warfare is now an interlocking system of actions--political, psychological, military--that aims at the overthrow of the established authority in a country and its replacement by another regime. To achieve this end, the aggressor tries to exploit the internal tensions of the country attacked-- ideological, social, religious, economic--any conflict liable to have a profound influence on the population to be conquered. (1961, 6)

Trinquier, *Modern Warfare*

While watching the news coverage of the war in Iraq and starting Command and General Staff Officer Course the question began to form – What is the status of the present war in Iraq and who is tracking its progress? How can the status be objectively determined? What technique or method is used and is it effective and efficient? The initial answer provided was that the U. S. Army uses the Military Decision Making Process (MDMP) to plan stability operations (SO) utilizing lines of effort (LOE) to link “multiple tasks and missions using the logic of purpose – cause and effect – to focus efforts toward establishing operational and strategic conditions” (FM 3-0 2008, 6-13). Figure 1 is an example of LOE in a generic SO. Chapter 2 includes a description of the components of LOE. The Joint definition of SO used in this research is, “An overarching term encompassing various military missions, tasks, and activities conducted outside the United States in coordination with other instruments of national power to maintain or reestablish a safe and secure environment, provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief” (JP 3-0, GL-25). The main SO tasks include establish civil security, establish civil control, restore essential services, support to governance, and support to economic and infrastructure development (FM 3-07 2008, 2-5).

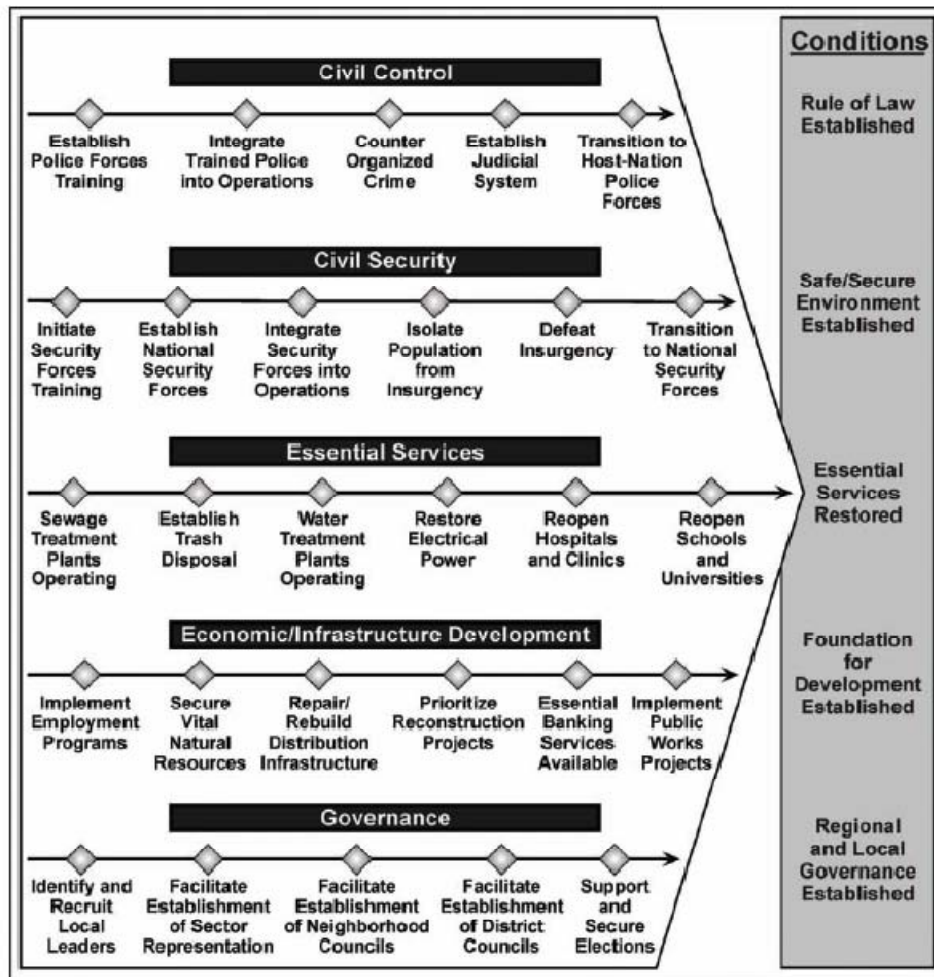


Figure 1. Notional LOE

Source: U. S. Department of the Army, FM 3-0, *Operations* (Washington, DC: Government Printing Office, 2008.), 6-14.

By viewing LOE through a project manager’s frame of reference, it appears to be similar to a critical path method (CPM) network diagram. The resemblance suggests the CPM as another approach to tracking progress toward an end state in SO. One definition of CPM is “the process of employing network techniques to optimize the use of scarce project resources” (Gray 1981, 7). Based on the requirement to optimize operational efforts to save lives and preserve limited resources it is possible for the CPM in

conjunction with LOE to benefit planning, tracking, and decision-making that support SO. Figure 2 contains an example of a network diagram with the critical path highlighted by shading the tasks (the critical path is identified by the dashed arrows labeling them on the diagram). Completing the critical path tasks (1, 2, 3, 7, 8, 9, and 10) on time ensures the project or operation remains on schedule. The non-critical tasks (numbered 4, 5, and 6) have flexibility as to when they must be completed or slop time. If the non-critical path tasks are delayed more that their calculated slop time allows they become part of a new, recalculated critical path. A thorough explanation of the calculations required to determine the critical path and uses of the information available from the CPM is discussed in Chapter 2. The next section introduces the problem statement.

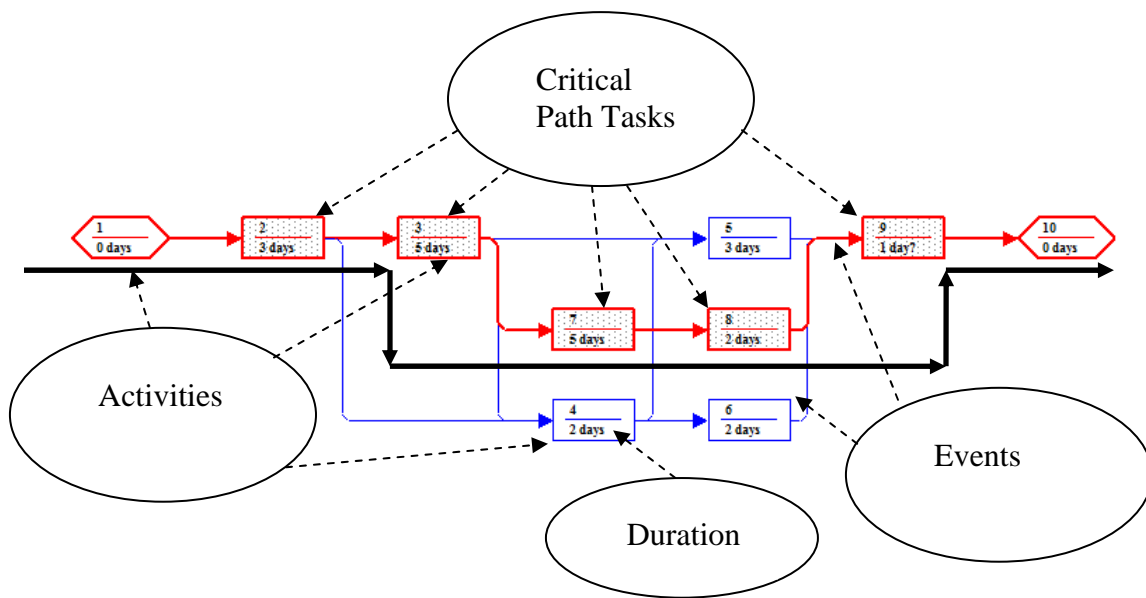


Figure 2. Notional Project Network Diagram

Source: Created by author.

## Problem Statement

Each SO situation is different. SOs range in scale from conducting an exercise with a foreign military to a multinational disaster relief effort on the scale of the Tsunami relief efforts in 2005 to reestablishing a government such as Iraq after Saddam Hussein was removed from power. Due to the wide range of operational objectives, the ability to report progress on SO is difficult. As noted from general media comments during the Vietnam War and Operation Iraqi Freedom, the American population desires an expected timeline specifying the end of each operation. As will be discussed further in Chapter 2, current planning methods do not facilitate objectively determining the overall operational timeline. Another factor complicating SO is the required interaction with non-military organizations. Without adequate coordination of efforts among all organizations, it is difficult to optimize efforts toward a common goal. The challenge of coordinating multiple organizations requires special management methods.

The current method of using LOE provides great insight into how individual operational objectives fit in the overall operation (Dr Jack, The US Army Combined Arms Center Blog Library, comment posted December 05, 2008) but does not include the variable of time or the sequencing of tasks. By adding the CPM to the planning process, the potential exists for increasing SO planning and executing efficiency. A more robust process could result by adding the power of LOE to focus effort toward mission accomplishment and the power of the CPM in overall schedule timeline tracking. By combining these tools, commanders will have a more powerful process to help set priorities along LOE as well as allocate resources to required tasks. A U. S. Government Accountability Office (U. S. GAO) report documents the official status of progress of



improving the interagency SO process. The U. S. GAO presented the report to the House of Representatives outlining the actions required to continue improving government-wide planning and executing capabilities for future operations. This document highlighted the need for clarification on the purpose of Department of State (DoS) Office of the Coordinator for Reconstruction and Stabilization (S/CRS), the lack of common, interagency definitions and Department of Defense (DoD) not establishing a mechanism for more efficient interagency planning (GAO-08-228T 2007, 8-16). The CPM might become a mechanism to bridge the apparent interagency gap. The problem is how to improve planning, tracking, and decision-making that support SO. The next section introduces the thesis.

### Thesis

The combination of the CPM and LOE will aid in planning, tracking, and decision-making that support SO. The adoption of this new “hybrid” approach will assist civilian and military planners, operators, and decision-makers to determine and complete required tasks while providing a common perspective of SO for all stakeholders. The next section introduces the research questions to guide the research of this project.

### Research Questions

Research Question: Does applying LOE and the CPM aid planning, tracking, and decision-making that support SO?

#### Secondary Research Questions:

1. Does creating LOE provide a beneficial process to efficiently plan and report progress for planners, operators, and commanders that support SO?

2. Do LOE aid decision-making and resource allocation that support SO?
3. Does applying the CPM provide planners a beneficial process to efficiently plan and report progress for planners, operators, and commanders that support SO?
4. Does knowing the critical path aid decision-making and resource allocation that support SO?
5. Can the same operation use both LOE and the CPM for planning, tracking, and decision-making that support SO?

#### Underlying Assumptions

1. There will be a need to conduct stability operations with both civilian and military organizations in the future. An assumption shared by General David Petraeus (Robinson 2008, 58-59).
2. DoD planners have access to appropriate training and required project management tools prior to implementing the CPM if the CPM is determined to benefit the planning, tracking, and decision making that support SO.
3. The time estimates and task interdependence used in this study provide adequate accuracy to model real world SO situations.
4. If the CPM was adopted, U. S. Army planners would possess the required knowledge to determine accurate task duration estimates.

#### Constraints

1. The concept of a military approach to using FSO from a project perspective is new.
2. There is little literature on developing LOE available.

3. CPM has documented success as an approach for project management; however the application to SO is new with no known literature.
4. This study will be based on unclassified sources.
5. This study will address post-conflict reconstruction missions for SO and not investigate humanitarian assistance type missions.

### Limitations

Due to the scope of this thesis, it will not investigate:

1. The possible application of the critical path method to Civil Support Operations which are operations conducted on US territories in support of civilian authorities and are similar to SO.
2. The thesis will focus on the U. S. Army specific planning process of the MDMP.
3. The CPM network diagram used for condition 2 and condition 3 was limited to tasks for the operational objectives of enhance and improve ISF, destroy terrorist command and control and infrastructure, and limit negative foreign influence.

### Significance of Research

Civilian and military planners, executers, and decision-makers that support SO could benefit from the results of this research. As described in greater detail in Chapter 2, the DoS was designated the lead agency for SO and DoD as one of many supporting agencies for SO (NSPD 44 2005, 2). The CPM has the potential to provide a common language and planning methodology for both civilian and military participants in SO. With the introduction of full spectrum operations (FSO), the U. S. Military expects to

conduct SO through all phases of operations overseas, as shown in Figure 3. This means whether the joint force is primarily conducting offense or defense it must also be prepared to conduct simultaneous SO. Based on Figure 3, depending on the situation, the level of SO required consumes different amounts of the overall effort from very little in the first two cases to the majority in the last case. Due to the expectation of conducting SO in all future operations, research should be conducted to test the hypothesis that the “hybrid” approach of combining LOE and the CPM is an efficient method for planning, tracking, and decision-making that support SO.

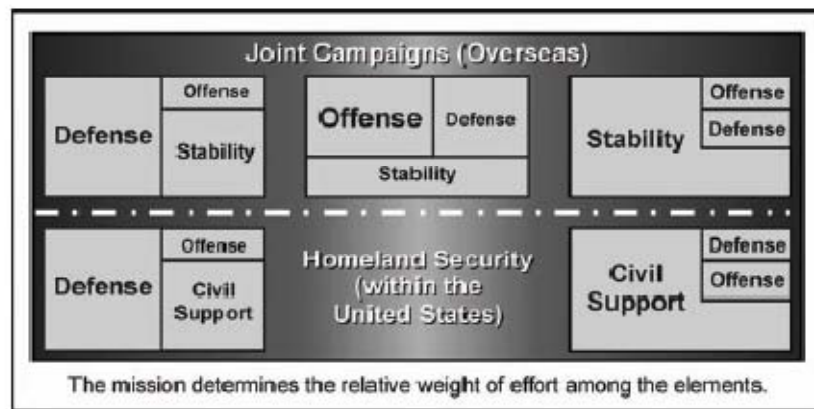


Figure 3. Full Spectrum Operations

Source: U. S. Department of the Army, FM 3-0, *Operations* (Washington, DC: Government Printing Office, 2008), 3-1.

### Summary of Introduction

This chapter provided an introduction of the current method of using LOE for planning, tracking, and decision-making that support SO. Next, the chapter introduced the concept of including the CPM to assist planning, tracking, and decision-making that

support SO, followed by describing the problem that exists with the current methods used for planning, tracking, and decision-making that support SO. The thesis projects that “The application of CPM will aid in the planning, tracking and decision-making that support SO”. The next chapter is a detailed review of available literature on both SO and the CPM as well as methods used by other USG agencies for planning, tracking, and decision-making that support SO.

## CHAPTER 2

### LITERATURE REVIEW

This research answers the question, “Does applying LOE and the CPM aid planning, tracking, and decision-making that support SO?” This chapter’s aim is to review literature that deals with SO, LOE, and the CPM. This chapter has three sections. The first section deals with policy literature. The sources establish the continuing requirement for the USG to conduct SO focusing on the DoD. This requirement originates with the guidance of the President of the United States and includes more detailed guidance provided by both the Secretary of State and Secretary of Defense and their respective inter-departmental organizations including: S/CRCS, U. S. Agency for International Development (USAID), U. S. Joint Chiefs of Staffs (JCS), and the U. S. Army. The second section deals with the current methods used for planning, tracking, and decision-making that support SO by both the DoD and the DoS as well as the proposed method of the CPM, adapted from Gray’s, *Essentials of Project Management*. The section discusses the steps required to complete each approach for planning, tracking, and decision-making that support SO. The final section is a summary of the review of literature.

#### Policy Literature: The Strategic Requirement For Continued SO

This section addresses U. S. policy requiring the U. S. Government (USG) to maintain the capability to conduct SO and identifies the organization directed to lead the coordination required to optimize interdepartmental efforts. This section contains four subsections. The first subsections includes a brief discussion of Presidential documents

outlining U. S. National Strategy as it relates to the current and future conduct of SO. The second subsection explains DoS strategy detailing current efforts and expected future conduct of SO. The third subsection describes DoD strategy detailing current and future SO including the Secretary of Defense, the Joint Chiefs of Staff (JCS), and the U. S. Army. The fourth and final subsection is a summary of this section including excerpts from the U. S. GAO report detailing the USG progress toward the Presidential strategy.

#### Presidential SO Strategic Level Documents

This subsection outlines the Presidential documents outlining U. S. national strategy as it applies to SO. The pertinent Presidential guidance applicable to this study, chronologically originates with *National Security Presidential Directive 44* (NSPD-44) directing the Secretary of State to coordinate and lead integrated USG efforts, involving all U.S. Departments and Agencies with relevant capabilities, to prepare, plan for, and conduct stabilization and reconstruction activities (NSPD-44 2005, 2). NSPD-44 directs that DoS establish a new office, the S/CRS (NSPD-44 2005, 2-3). The President further reinforced his guidance by directing DoS take the lead role in SO in the 2006 *National Security Strategy of the United States of America* (NSS) (NSS 2006, 16). In summary, the President's strategic guidance is for a whole of government approach to SO with DoS as the lead agency. The next section deals with DoS strategic level documents.

#### DoS SO Strategic Level Documents

This subsection discusses two relevant DoS documents that provide the DoS strategic guidance as well as a standardized terminology for the S/CRS to conduct SO.

The first document is the *DoS Strategic Plan of 2007* and the second is the *Post-Conflict Reconstruction Essential Tasks*.

The Secretary of State lays out some specific ends in the DoS strategic plan quoted in the passage below.

We will develop U.S. Government and partner capacity to conduct effective stabilization and reconstruction operations. We will lead and coordinate whole-of-government efforts to prepare, plan for, and conduct stabilization and reconstruction operations. We will strengthen collaboration with key partners, including the UN, the G8, regional organizations, and bilateral allies to improve international conflict prevention efforts and bolster national and international capabilities to Civilian Stability Sources respond to conflict and post-conflict situations. Recognizing that post-conflict states may have limited capacity and precarious legitimacy, the Department and USAID will help governments meet immediate demands for security and justice through transformational assistance strategies that will rely heavily on legitimate non-governmental actors, while strengthening legitimate state institutions. (DoS 2007, 14-15)

The above selection reiterates Presidential guidance and provides detailed direction to the entire DoS. The second document, *Post-Conflict Reconstruction Essential Tasks* contains a list of all expected post-conflict reconstruction tasks. The list organizes tasks into five categories sequentially placed in three broad time categories of initial response, transformation, and fostering stability. These categories of initial response, transformation, and fostering stability correlate to short, mid, and long-term tasks. The main categories of tasks are security, governance and participation, humanitarian assistance and social well-being, economic stabilization and infrastructure, and justice and reconciliation. The next subsection describes the DoD SO strategic level documents that deal with SO.



## DoD SO Strategic Level Documents

This subsection deals with the 2008 *National Defense Strategy (NDS)* guidance for SO and how the *NDS* complements the *NSS* and NSPD-44. Since the 2008 *NDS* superseded the 2004 *National Military Strategy of the United States of America (NMS)*, the *NMS* will not be discussed. Additionally, this subsection reviews how the 2006 *Quadrennial Defense Review Report (QDR)* and The Department of Defense Directive (DoDD) 3000.05 establish the importance of SO to the DoD.

The 2008 *NDS* identifies “ungoverned, undergoverned, misgoverned, and contested areas” (NDS 2008, 3) as areas where instability could occur (NDS 2008, 3), possibly requiring SO. One of the key U. S. interests, “promoting international security to reduce conflict and foster economic growth” (NDS 2008, 6), is a key component of the desired endstate of SO. With the adoption of FSO, the U. S. Army conducts SO during four of the five key objectives (NDS 2008, 6). The only objective that will not include SO is Defend the Homeland because those operations would occur within the U. S. Specifically, SO take place in the objectives: Win the Long War, Promote Security, Deter Conflict, and Win our Nation’s Wars (NDS 2008, 6). Finally, *NDS* 2008 states that the DoD must work toward improvements specified in the 2006 *QDR* (NDS 2008, 18).

The *QDR* states the DoD is and will continue to transform to a force ready to do FSO which includes SO (QDR 2006, 23) as described in 2008 FM 3-0, *Operations* and shown in Figure 3. The DoDD 3000.05 directs SO become a core mission for the U.S. military and that SO be given the same priority as combat operations (DoDD 3000.05 2005, 2). Then DoDD 3000.05 states that integrated civilian and military efforts are crucial to successful stability operations.

Whether conducting or supporting stability operations, the Department of Defense shall be prepared to work closely with relevant U.S. Departments and Agencies, foreign governments and security forces, global and regional international organizations (hereafter referred to as “International Organizations”), U.S. and foreign nongovernmental organizations (hereafter referred to as “NGOs”), and private sector individuals and for-profit companies (hereafter referred to as “Private Sector”) (DoDD 3000.05 2005, 3).

Therefore, the *NDS*, *QDR*, and DoDD 3500.05 all stress the importance of SO and direct the DoD to prepare to: prepare for SO, conduct SO when directed, and continue conducting SO where SO is occurring. Next is the SO strategic requirement summary.

### SO Strategic Requirement Summary

This subsection summarized the hierarchical SO guidance for the U. S. The U. S. SO policy originates from the President as contained in the 2006 NSS and 2006 NSPD-44. Both documents direct the DoS to be the lead agency for coordinating post-conflict SO and in resource-constrained environments. Both documents also mandate the DOS develop and use methods to optimize scarce USG resources, ensuring a whole of government approach. Additionally, both documents state that the USG expects to conduct SO for the foreseeable future. The DoS and the DoD both published guidance to their respective departments specifying their policy and describe planning requirements guiding their departments to follow Presidential policy. The next section deals with current and proposed methods to plan and track SO.

### Current and Proposed Methods To Plan and Track SO

This section has two main subsections. The first subsection is a discussion of planning models currently used for planning, tracking, and decision-making that support

SO. The second subsection discusses the steps required to include the CPM in the MDMP process for planning, tracking, and decision-making that support SO.

#### Current Methods to Plan and Track SO

This subsection contains six parts. The first part deals with a general doctrinal basis for planning, tracking, and decision-making that support SO such as the MDMP, LOE, MOP, and MOE. The second part deals the U. S. Army SO specific doctrinal considerations. The third part deals with emerging evolutionary discussion from non-doctrinal sources on LOE, MOP, and MOE. The fourth part deals with describing the steps of the MDMP, the current method used to plan and develop objectives to track the progress of SO. The fifth part deals with describing the TCAF steps. The sixth part deals with introducing Interagency Management System (IMS). The next part supplies definitions of doctrinal terms and concepts required for planning, tracking, and decision-making that support SO.

Operational concepts that apply to all components of FSO, therefore SO, include the MDMP, LOE, MOP, and MOE. One way to state the requirement for the decision making methods, specifically the MDMP is

Commanders continuously combine analytic and intuitive approaches to decisionmaking to exercise battle command. Analytic decisionmaking approaches a problem systematically. The analytic approach aims to produce the *optimal* solution to a problem from among the solutions identified. The Army's analytic approach is the military decisionmaking process (MDMP). In contrast, *intuitive decisionmaking* is the act of reaching a conclusion that emphasizes pattern recognition based on knowledge, judgment, experience, education, intelligence, boldness, perception, and character (FM 3-0 2008, 5-2).

Chapter 1 contained the FM 3-0, *Operations* definition of LOE. For the purpose of this study, logical lines of operation (LLOO) are synonymous with LOE. MOP are "criterion

used to assess friendly actions that is tied to measuring task accomplishment” (FM 3-0, Glossary-9) and are used to determine the task is being done right. MOE are “criterion used to assess changes in system behavior, capability, or operational environment that is tied to measuring the attainment of an endstate, achievement of an objective, or creation of an effect” (FM 3-0, Glossary 9) and used to determine if the right task is being done. MOP and MOE must be chosen carefully to ensure they measure the desired progress toward the desired endstate. The next part of this subsection will describe the U. S. Army SO specific doctrinal planning considerations.

FM 3-0, *Operations* deals with general U. S. Army operations and FM 5-0, *Army Planning and Orders Development* deals with the general MDMP process. FM 3-07, *Stability Operations* deals with specific SO doctrinal planning considerations. This part of the subsection will highlight SO relevant planning guidelines from FM 3-07. As previously described, the DoS is the lead USG agency for SO in post-conflict situations. In order to assist DoD and DoS to conduct integrated SO, FM 3-07, provides Figure 4 to show the correlation between U. S. Army stability tasks and DoS stability sectors. Each of the main stability tasks as well as their subtasks from Figure 4 are defined (FM 3-07 2008, 2-9 – 2-12 and 3-1 – 3-22) giving the SO planner a place to determine what tasks should be completed and, during the planning process, to help ensure required tasks are not overlooked. The Stability tasks definitions follow:

1. Establish Civil Security. “Within the security sector, initial response tasks aim to establish a safe and secure environment; transformation tasks focus on developing legitimate and stable security institutions; and fostering sustainability tasks consolidate host-nation capacity-building activities. These conditions define success within the

sector but also reflect the end state that ensures the foundation for enduring stability and peace” (FM 3-07 2008, 3-2 - 3-3).

2. Establish Civil Control. “Civil control regulates selected behavior and activities of individuals and groups. It reduces risk to individuals or groups and promotes security” (FM 3-07 2008, 3-5).

3. Restore Essential Services. “The activities associated with this primary stability task extend beyond simply restoring local civil services and addressing the effects of humanitarian crises. While military forces generally center efforts on the initial response tasks for immediate needs of the populace, other civilian agencies and organizations focus on broader humanitarian issues and social well-being” (FM 3-07 2008, 3-9).

4. Support to Governance. “When a legitimate and functional host-nation government is present, military forces operating to support the state have a limited role. However, if the host-nation government cannot adequately perform its basic civil functions--whatever the reason--some degree of military support to governance may be necessary” (FM 3-07 2008, 3-13).

5. Support to Economic and Infrastructure Development. “Sound economic policies promote equitable, sustainable growth. It is the key to remedying underlying tensions in society. This allows the state to progress toward recovery and eventually long-term economic development” (FM 3-07 2008, 3-14).

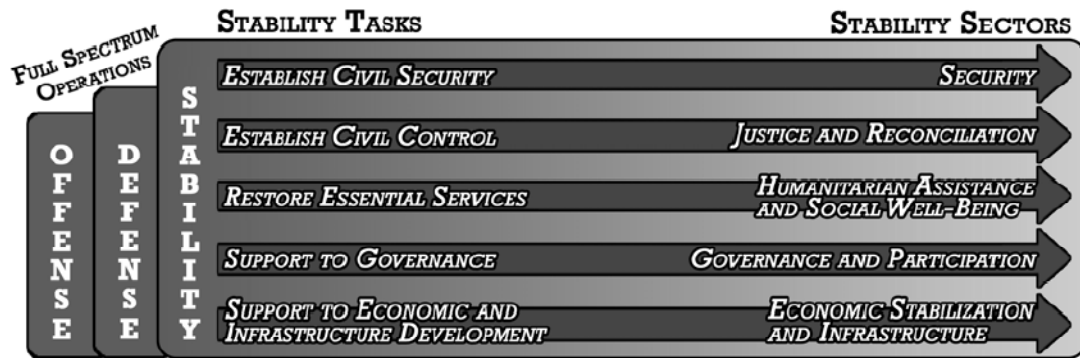


Figure 4. An Integrated Approach to Stability Operations

Source: U. S. Department of the Army, FM 3-07, *Stability Operations* (Washington, DC: Government Printing Office, 2008), 2-5.

After documenting the doctrinal requirement for SO and stability tasks as described by FM 3-07, *Stability Operations* proceeds to provide guidance for planning SO. FM 3-07 addresses SO planning as a means to reduce complexity and “foster decisive and effective action in the midst of uncertainty” (FM 3-07 2008, 4-1). SO require a different mindset than used in the geographically linear type of missions typically associated with offensive or defensive operations. As in other operations, commanders support the planning process through “understanding, commander’s intent and planning guidance, and a concept of operations” (FM 3-07 2008, 4-4). FM 3-07 specifically recommends using LOE for SO (FM 3-07 2008, 4-9 – 4-11).

To achieve the desired end state, stability operations capitalize on coordination, cooperation, integration, and synchronization among military and nonmilitary organizations. These civil-military efforts aim to strengthen legitimate governance, restore rule of law, support economic and infrastructure development, reform institutions to achieve sustainable peace and security, foster a sense of national unity, and create the conditions that enable the host-nation government to reassume civic responsibilities. (FM 3-07 2008, 4-7)

In order to achieve the desired endstate, LOE are essential because “the human dimension typically becomes the focus of force, lines of effort often work best to link tasks, effects, conditions, and the end state . . . showing how individual actions relate to one other and

to achieving the desired end state” (FM 3-07 2008, 4-9). Next, this section deals with evolving doctrinal concepts from non-doctrinal sources.

This part of the subsection describes the use of LOE using non-doctrine sources and an additional use of MOP and MOE not included in current doctrine. As previously stated, both terms, LLOO and LOE, in the context of this thesis describe the same concept with different names because of different sources and are interchangeable. LOE are evolving as a doctrinal concept. There are different definitions and applications between Joint and U. S. Army definitions as well as NATO procedures. The evolution process requires discussing LOE sources from doctrinal sources, *Campaign Planning: Tools of the Trade*, a monograph by Dr. Jack D. Kem, and recent blog entries.

The JP 3-0, *Joint Operations*, definition for LOE is, “A logical line that connects actions on nodes and/or decisive points related in time and purpose with an objective(s)” (JP 3-0 2006, GL-19). This is similar to the FM 3-0, *Operations*, definition for LOE, “A line that links multiple tasks and missions using the logic of purpose--cause and effect--to focus efforts toward establishing operational and strategic conditions” (FM 3-0 2008, Glossary-9). The similarities between the definitions include connecting things to an objective or condition. The difference is whether to connect decisive points or tasks and missions leading to objectives or conditions. In the example shown in Figure 1 from FM 3-0, the lines include tasks leading to conditions or the desired endstate.

Dr Kem’s monograph, *Campaign Planning: Tools of the Trade*, dedicates a chapter discussing LOE. The discussion focuses on what should make LOE. He extends the LOE concept to address operational objectives leading to the center of gravity (Kem

2006, 34-35). This differs from the example shown in Figure 1 because the lines conclude with the desired condition or endstate.

Since *Campaign Planning: Tools of the Trade* was published, Dr. Jack Kem has discussed LOE in several Blog entries, one of these Blog entries stated,

I believe that a logical line of operation (or line of effort) should be a framework that groups multiple objectives in a logical fashion – enabling the integration of all means available to lead to the Center of Gravity and ultimately to the end state. Logical lines of operation, or lines of effort provide the ways to apply the means to achieve the ends. (Dr Jack, The US Army Combined Arms Center Blog Library, comment posted on November 17, 2008)

To clarify this statement the definitions of ends, ways, and means are:

Ends. The purpose for the Campaign

Ways. The methods, or how you will achieve the ends

Means. The resources available to achieve the ways (Kem 2006, 13)

Based on this definition, LOE “help to communicate the intent of the commander and to help focus efforts” (Dr Jack, The US Army Combined Arms Center Blog Library, comment posted December 5, 2008) and “the construct of lines of operations can help all involved see how their part fits into the whole” (Dr Jack, The US Army Combined Arms Center Blog Library, comment posted December 5, 2008). However, when looking at LOE, remember that the specified events are neither linear nor sequential even though that relationship might appear to exist due to appearing on a line. To help an effort remain on track, a commander can appoint LOE managers who are responsible to know how everything taking place in the operation effects their respective lines (Dr Jack, The US Army Combined Arms Center Blog Library, comment posted December 5, 2008).

Additionally, in a conversation on December 9, 2008, Dr Tom Clark mentioned that MOP and MOE could be determined for each line or node on the LOE. Reporting on



the line or node specific MOP and MOE would provide an objective basis for the statement that the line is progressing well or not and provide a tool to display the status of the situation. Finally, all participants, but especially the LOE managers, should consider the affects of all actions to their lines during wargaming (Dr Jack, The US Army Combined Arms Center Blog Library, comment posted December 5, 2008).

Figure 1 is a LOE with lines of stability tasks leading to the desired conditions at the end state. For instance, the stability task of “restore essential services” has a desired end condition of having the essential services restored. There are several ways along the essential services line to achieve the endstate such as having sewage treatment plants, trash disposal, and electrical power restored to an acceptable level. The LOE managers would be able to comment on how different actions directly or indirectly affect their lines. An example of using LOE managers while planning is developing a high value target list. Pilots wanting to stop an enemy’s air defenses, might propose eliminating the electrical power to the air defense facility by destroying a power plant and distribution center while another stakeholder could propose destroying an early warning radar capability. The Essential Services LOE manager would state destroying the power plant might be the easier target, minimizing risk, but destroying the radar site would not leave anything requiring reconstruction. However, the power plant’s capability to produce electrical power would need to be generated prior to reaching the desired endstate of essential services restored if the power plant was destroyed.

Besides assisting in planning by communicating commander’s guidance, LOE assist tracking SO operations. By developing MOP and MOE specifically to measure the conditions of the lines, a valuable briefing and tracking tool is available to the LOE

managers. A stoplight type chart could be part of update briefs presented as required to help maintain visibility on progress. Additionally, after plotting the data points as a function of time, the resulting graph provides trend analysis. Chapter 4 contains examples of MOP and MOE developed for the Iraq War case study. The next part of the subsection deals with the steps of the MDMP.

Next, this subsection will briefly review the MDMP as it applies to SO as defined in FM 5-0, *Army Planning and Orders Production*, and FM 3-0, *Operations* as the U. S. Army analytical problem solving method. Table 1 summarizes the steps of the MDMP from FM 5-0, the U. S. Army publication guiding the MDMP. The MDMP process begins when a U. S. Army unit receives a mission. The first step is the unit receives a mission order to conduct SO. Next, the unit would conduct mission analysis. During this step, the unit determines the problem and develops understanding about the current and expected situations. As the unit frames the problem and refines the mission, planners begin developing initial LOE with specific objectives and conditions. The next step involves developing evaluation criteria and courses of action (COA). Units usually develop multiple COAs to allow the commander to choose from different ways to address the problem and to help the staff thoroughly examine the problem. LOE are refined and adapted as planners gain deeper understanding of the factors bearing on a particular situation. After refining each COA to the required level of detail, the unit analyzes the COAs by conducting wargames. During a wargame, each COA is studied throughout the operation's expected duration, geographical location, and enemy COAs to determine performance against evaluation criteria. During each wargame, LOE managers provide feedback on how different actions/counteractions affect their LOE achieving objectives,

as well as second and third order effects on conditions the line is to achieve. After completing wargames on each COA, the next step of MDMP is to conduct a comparison of how each COA performed against evaluation criteria to assist selecting the desired COA. Additionally, to subjectively assist the decision process, LOE managers discuss the strengths and weaknesses of each COA along their designated line. The final step of the MDMP process is to produce an order with specific instructions for subordinate units. The next part of the subsection describes Tactical Conflict Assessment Framework (TCAF), a U. S. Agency for International Development (USAID) method of planning, tracking, and decision-making that support SO.

Table 1 lists the steps of TCAF allowing comparison with other methods of planning, tracking, and decision-making that support SO. USAID developed TCAF for identifying instability/conflict, determining which programs to initiate, and measuring program impact (USAID 2007, slide 4). TCAF provides USAID a method to systematically determine the situation and decide which actions to initiate. Additionally, TCAF allows USAID to track progress of SO similar to U. S. Army MOP and MOE (USAID 2007, slide 4).

Table 1. Planning Method Steps Comparison

Step	MDMP	TCAF	CPM
1	Receipt of Mission	Assess	Determine activities and events
2	Mission Analysis	Identify causes of IN/CON	Determine interrelationships
3	COA Development	Identify and prioritize objectives (Effects)	Number activities
4	COA Analysis (War Game)	Determine impact indicators (MOE)	Develop the project network
5	COA Comparison	Choose monitoring methods	Develop time estimates
6	COA Approval	Identify Activities (Tasks)	Calculate the estimated project duration and critical path
7	Orders Production	Determine output indicators (MOP)	
8		Choose monitoring methods	
9		Implement Activity	
10		Measure Impact	

Source: U. S. Joint Chiefs of Staffs, JP 5-0, *Joint Operation Planning* (Washington, DC: Government Printing Office, 2006), IV-2; U. S. Department of the Army, FM 5-0, *Army Planning And Orders Production* (Washington, DC: Government Printing Office, 2005), 3-3; U. S. Department of State, n.d., slide 25; , Clifford F.Gray, *Essentials Of Project Management* (Princeton, NJ: Petrocelli Books, Inc., 1981), 17-31.

The TCAF begins with a questionnaire (an example is provided in Appendix B) for the host nation followed by analysis of the responses. The questionnaire can be tailored to village, town, city, providence, region, etc. as the situation dictates. This framework relies on interaction with a cooperating public providing insightful answers to challenging questions. By analyzing these answers, planners attempt to identify the root cause or causes of the insurrection, allowing them to address the cause versus the symptoms. FM 3-07, *Stability Operations* calls this process tactical conflict assessment and planning framework process and describes the process as following a continuous cycle of see-understand-act-measure (FM 3-07 2008, D-10). The USAID ability to assist mission analysis and develop MOP and MOE coupled with the DoD ability to assist implementing desired programs due to available manpower, a whole of government approach could leverage the strengths of both Agencies as directed in NPSD-44.

One method to integrate DoD and DoS efforts is the interagency management system (IMS). IMS is a new management structure developed to coordinate the desired whole of government approach to SO. IMS consists of three elements: a country reconstruction and stabilization group, an integration-planning cell, and an advance civilian team (FM 3-07 2008, B1-B2). These groups operate, respectively, from Washington, DC, combatant commander's headquarters, and in the country where the SO is taking place. IMS is designed to accommodate both immediate crisis response as well as long-term operations (FM 3-07 2008, B3). Details of this system had an expected release date in October 2008; however, at the information cutoff date for this project, further details were not available. Next, is a discussion on a proposed method for planning, tracking, and decision-making that support SO.

#### Proposed Method to Plan and Track SO

The purpose of this subsection is to introduce CPM as a possible method for planning, tracking, and decision-making that support SO. This subsection contains two parts. The first part contains a historical review of CPM including examples of successful implementation for project management. The second part provides detailed steps required to use CPM as defined in Chapter 1 to manage either a project or a SO.

This subsection describes the development of the CPM and several successful applications. DuPont and the Navy Special Projects Office developed the CPM during 1958 (Gray 1981, 4-10). Successful applications of the CPM include several civilian/government projects involving significant amounts of uncertainty and risk, such as man landing on the moon and designing the space shuttle. Other civilian successes using the CPM include developing new business enterprises, overhauling jet engines, and

designing automobiles (Gray 1981, 4-10). The CPM appears to provide a method for keeping organizations on track toward completing complex projects independent of project type or the specific technical skill set required. The next part of the subsection describes the steps required to use the CPM for planning, tracking, and decision-making that support SO.

This subsection contains two parts. The first part describes the steps for using the CPM as adapted from Gray, *Essentials of Project Management*, as listed in Table 1, focusing on the steps required to generate a network diagram to calculate the critical path of a project. The second part of this subsection discusses the possible benefits of including the CPM in the planning, tracking and decision-making that support SO.

As shown in Table 1, the first step is to determine the activities and events. A shape on the network diagram represents an activity that consumes time and cannot begin until its preceding activities are completed (Gray 1981, 17). Rectangles represent activities in network diagrams depicted in this study. Arrows represent events on a network diagram. Events indicate the start or finish of one or more activity and represent a specific accomplishment at an identifiable time (Gray 1981, 17). A staff using the MDMP for planning a SO could generate the initial list of activities and events during mission analysis and further refine them during COA development and adjust as required during the wargame step of the MDMP.

The next step is to determine interrelationships between activities. Gray proposes three questions be answered for each activity to determine their interrelationships.

1. What activities can take place concurrently with this activity? Or, what activities can be worked on at the same time this one is performed?

2. What activities precede this activity? That is, what other activities must be completed before this activity can be started?
3. What activities follow this activity? Or, what activities cannot be started until this activity is completed? (Gray 1981, 20)

The answers to the questions determine the interrelationships between activities. To aid understanding, Figure 5 graphically depicts the different relationships between activities. The different relationships include finish to start situation (a), start to start situation (b), finish to finish situation (c), and start to finish situation (d) (Gray 1981, 55). Specifically, for situation (a) the start of B depends on the completion of A, for situation (b) the start of B depends on the start of A, for situation (c) the finish of B depends on the finish of A, and for situation (d) the completion of B depends on the start of A. The dependence could mean completed or partially completed, for instance in a start to finish, situation (a), B either cannot start until A is completed or a designated time period after A is completed. An example of this delay situation occurs is if a component was painted or glued and cure time was required prior to starting the next activity with the component.

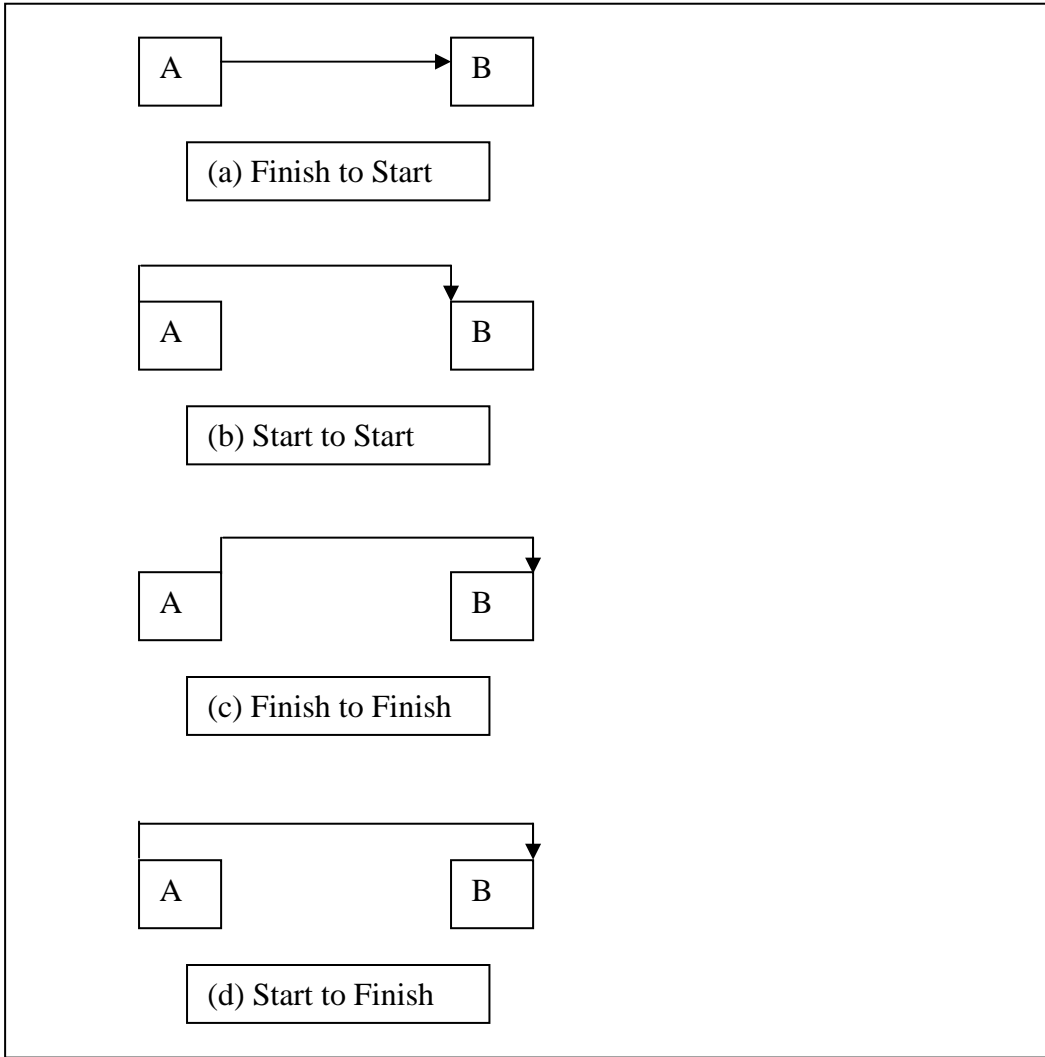


Figure 5. Precedence Diagram Options

Source: Clifford F.Gray, *Essentials of Project Management* (Princeton, NJ: Petrocelli Books, Inc., 1981), 55.

After determining each activity's interrelationships, assign a number to each activity. Ensure that prerequisite activities have a lower number than subsequent activities. This keeps the network from being stuck in a loop and sequencing the activities to progress forward in time (Gray 1981, 18).



Connecting activities in the order of their interrelationships creates a network diagram. Lower numbered activities must always come before higher numbered activities with prerequisite tasks before subsequent tasks. Next, determine the time estimates for each activity. The more accurate time estimates provide the best results for the CPM (Gray 1981, 28-29). Once specified, the time estimates represent planning assumptions for the MDMP, and are refined as the process progresses. After assigning an estimated duration for each activity, calculate the time to complete each discrete path through the network, the longest time through the network becomes the critical path. Table 2 contains the duration of each path of the network diagram in Figure 2. The longest duration for a path (1, 2, 3, 7, 8, 9, 10) is the critical path. The shortest time to complete the project is 16 days (Gray 1981, 30). Next is a summary of the review of literature.

Table 2. Path Durations

Path	Duration (days)
1, 2, 3, 5, 9, 10	12
1, 2, 3, 7, 8, 9, 10	16 (critical path)
1, 2, 3, 4, 5, 9, 10	14
1, 2, 3, 4, 6, 9, 10	13
1, 2, 4, 5, 9, 10	9
1, 2, 4, 6, 9, 10	9

#### Summary of the Review of Literature

In summary, this chapter contained three sections. The first section discussed the requirement for a whole of government approach to SO. The requirement originates from

the guidance of the President of the United States and supplemented by guidance of both the Secretary of State and Secretary of Defense, as well as from their subordinate organizations including S/CRCS, USAID, JCS, and the U. S. Army. Each echelon's guidance nests with higher, lower, and adjacent levels of the USG.

The U.S. GAO report on the progress of implementing the guidance originally dictated in NSPD-44 states that the USG still requires effort to achieve the Presidentially directed endstate (GAO-08-28T 2007, 8-16). Specifically, the framework developed by S/CRS for U. S. Agencies to plan and coordinate SO currently has two of three elements approved. The IMS and procedures for initiating the process have been approved; however, S/CRS has not completed a handbook or guide for SO (GAO-08-28T 2007, 2-3). The report also states that the DoD has made positive progress through the release of DoDD 3000.05 and including SO in doctrine; however the DoD requires additional work using lessons learned from previous SO in future contingency plans (GAO-08-28T 2007, 3-4).

The second section provided a baseline by describing the current methods used by both the DoD and DoS for planning, tracking, and decision-making that support SO. Next, resulting from the gap identified by the US GAO report discussed above, the second section introduced a different method, the CPM, for inclusion in planning, tracking, and decision-making that support SO. This study proposed investigating the CPM because the CPM been successfully implemented in both civilian and civilian-government projects. The next chapter outlines the research methodology to test the hypothesis that, "The application of LOE and the CPM will aid in planning, tracking, and decision-making that support SO."

## CHAPTER 3

### RESEARCH METHODOLOGY

The purpose of this chapter is to provide the research methodology used to answer the question, “Does LOE and the CPM aid planning, tracking, and decision-making that support SO?” This chapter has three sections. The first section describes the analytical wargame as a framework to compare subjective rationale. The second section describes the data source for the case study. The last section is a summary of the research methodology.

#### Analytical Wargame

This section discusses the analytical wargame method used in this thesis. This section contains four subsections. The first subsection introduces the analytical wargame including the three conditions used for this thesis. The second subsection discusses the operational processes used to evaluate the strengths and weaknesses of each condition. The third section discusses the list of possible strengths and weaknesses used in this thesis. The fourth subsection contains the steps used to complete the wargame. Following is an introduction of the analytical wargame.

#### Analytical Wargame Introduction

This subsection introduces the analytical wargame process and the three conditions used in this thesis. The analytical wargame introduced by Haywood provides a mechanism to compare various situations and possible outcomes (Haywood 1954, 365-385). This study uses three conditions of a case study using the current war in Iraq to compare SO planning, tracking, and decision-making methods that support SO.

Condition 1 use LOE, condition 2 uses the CPM, and condition 3 uses LOE and the CPM for planning, tracking, and decision-making that support SO. For grading categories, this study uses the U. S. Army operational process of “plan”, “prepare”, “execute” and “assess”. The next subsection discusses the use of U. S. Army operational process as grading criteria.

### Operational Process

The U. S. Army operations process provides the grading criteria for each condition. Specifically, the criteria are: “plan,” “prepare,” “execute,” and “assess” as defined in 2008 FM 3-0, *Operations*. “Assessment is the continuous monitoring and evaluation of the current situation (FM 3-0 2008, 5-16). “Planning is the process by which commanders (and staff, if available) translate the commanders’ visualization into a specific course of action for preparation and execution, focusing on the expected results” (FM 3-0 2008, 5-17 – 5-18). “Preparation consists of activities performed by units to improve their ability to execute an operation” (FM 3-0 2008, 5-18). “Execution is putting a plan into action by applying combat power to accomplish the mission and using situational understanding to assess progress and make execution and adjustment decisions” (FM 3-0 2008, 5-19). The process categorizes when the strengths and weaknesses affect each condition. The next section discusses the list of possible strengths and weaknesses for this thesis.

### Strength and Weakness Set

This subsection describes the set of evaluation criteria for evaluating each condition by the phases of the operational process. Table 3 will be filled out for each

condition. A “Yes” answer to the question indicates a strength (recorded as “S”), and a “No” answer indicates a weakness (recorded as “W”).

- a. Format. Does the format of products produced by the condition assist planning, tracking, and decision-making? Is the format easily understood by all stakeholders?
- b. Objective prioritization/resource allocation. Does the method allow objective prioritization of tasks to assist resource allocation?
- c. Subjective prioritization/resource allocation. Does the method allow subjective prioritization of tasks to assist resource allocation?
- d. Develop operational timeline. Does the method provide a mechanism for determining an overall timeline for the operation?
- e. Report percent complete. This evaluation criteria only applies to “execute” and “assess” parts of the operational process. Does the method provide a mechanism for reporting the percent complete.
- f. Effort required to create and maintain. Does the method require effort to create and maintain through the operational process?
- g. Structured, systematic method to implement. Is there a structured, systematic method for this method which could be applied to multiple operations?
- h. Determine trends or changes in operating environment. Does the method possess a process to determine if there are trends or cyclic forces action on the operation or is there a significant change in the operating environment?

Next is a description of the wargame results record matrix required to complete the analytical wargame.

Table 3. Evaluation Criteria

Condition	Plan	Prepare	Execute	Asses
Format				
Objective prioritization/resource allocation				
Subjective prioritization/resource allocation				
Develop operational timeline				
Report % complete				
Effort required to create and maintain				
Structured, systematic method to implement				
Determine trends or changes in operating environment				
Number of Strengths				
Number of Weaknesses				
S = Strength W = Weakness N/A = Not Applicable				

### Analytical Wargame Process

The first step for each turn of the wargame is to determine which of the possible strengths and weaknesses from Table 3 apply to each condition for each part or the operational process. The second step used this data to populate a table similar to Table 3 for each condition as well as a narration describing the different strengths and weaknesses. The third step is determining the success or failure of each part of the operational process for the condition. Using the number and significance of the strengths and weaknesses, the success or failure of each part of the operational processes will be determined for each condition and recorded in Figure 6 using the process described

below. To aid filling out Figure 6, Table 4 contains the grading rubric used in the analytical wargame.

The data generated by completing the analytical wargame will provide the basis for the Chapter 4's discussion on the findings. The findings supported development of the conclusions and recommendations discussed in Chapter 5. Research questions provide the basis for findings, conclusions, and recommendations. Next is the source for the data used for the Iraq Case Study.

### Iraq SO Case Study

Condition	Plan	Prepare	Execute	Assess	Overall
(1) LOE					
(2) CPM					
(3) LOE and CPM					

overwhelming success	↑↑	Failure	↓↑
Success	↑↓	Catastrophic failure	↓↓

Figure 6. Blank Wargame Chart

Table 4. Comparison Rubric

Rating	Symbol	Description
Overwhelming success	↑↑	Clear example of exemplary performance or best practice in this domain; no weaknesses. Extremely helpful
Success	↑↓	Very good or excellent performance on virtually all aspects; strong overall but not exemplary; no weakness of any real consequences. Moderately helpful.
Failure	↓↑	Fair performance; some serious (but nonfatal) weaknesses on a few aspects. Mild hindrance.
Catastrophic Failure	↓↓	Clear evidence of unsatisfactory functioning; serious weakness across the board or on crucial aspects. Extreme hindrance.

Source: E. J. Davidson, *Evaluation Methodology Basics: The Nuts And Bolts Of Sound Evaluation*. (Thousand Oaks, CA: Sage Publications, Inc., 2005), 137

#### Iraq Case Study Data Source

The data source for the Iraq case study is from the final report dated March 06, 2007 of the Command and General Staff College (CGSC) Section 07 from class 2007-01. The Iraq Study Group (ISG) consisted of 64 students and 13 instructors as part of the Advanced Operational Warfare Course (CGSC Section 7 2007, 7). As part of the curriculum, the students considered two COAs for 18 months of operations in Iraq, to include creating LOE as part of the MDMP supporting the different COAs. The COAs used guidance delivered in the January 10, 2007 State of the Union Address (CGSC Section 7 2007, 1). The LOE from ISG COA 2 phase 4 is the basis of the LOE and the CPM network diagram. Chapter 4 includes a description of the LOE. Next is the summary of research methodology.



### Summary of Research Methodology

This chapter described the research methodology used to determine if using the LOE, the CPM or the combined LOE and CPM benefit the MDMP for planning, tracking, and decision-making that support SO. This chapter had three sections. The first section described the analytical wargame as a framework for objectively comparing the results of the two conditions. Additionally, the first section described the method of using a common list of possible strengths and weaknesses to determine the success or failure of each condition. The second section introduced the data source for the case study. The COA 2 phase 4 LOE originated with the ISG, CGSC Section 7 from class 2007-01. Finally, the third section summarized the chapter. Next, Chapter 4 provides the results of analysis of the data generated to answer the question, “Does applying LOE and the CPM aid planning, tracking, and decision-making that support SO?”

## CHAPTER 4

### ANALYSIS

The purpose of this chapter is to provide results and findings from the analysis of data to answer the question, “Does applying LOE and the CPM aid planning, tracking, and decision-making that support SO?” Chapter 4 contains three sections. The first section contains historical information for the Iraq case study and a discussion on the LOE and the CPM created from the ISG report. The second section contains the wargame results. The wargame results use the strengths and weaknesses of each condition to determine the success or failure of the each condition. Finally, the third section contains the findings of each research question. Next is a discussion on the Iraq case study.

#### Iraq Case Study

This section contains three subsections. The first subsection contains a brief overview the data used to support the case study. The case study covers the war in Iraq providing a basis for the LOE and CPM used in the analytical wargame. The second subsection contains a detailed description of the LOE for analysis. The third subsection contains a detailed description of the CPM for analysis. Next is the Iraq case study situation overview.

#### Iraq Case Situation Overview

This subsection provides a frame of reference for the situation in Iraq and purpose of the ISG and the data used in this study. The ISG’s data provided the LOE used to create the CPM used in this study. The source document was finalized on March 06,

2007 by the Command General Staff College Section 07, which formed the ISG. The ISG studied two COAs that focused on future operations in Iraq implementing guidance from the January 10, 2007 State of the Union Address (CGSC Section 7 2007, 7).

For the three previous years, the U. S. attempted to build the Iraq Security Forces (ISF) and a democratic government. The maturing ISF appeared unable to stop the increasing violence fueled by ideological racism, sectarian cleavages, and the disenchantment of domestic and regional actors aggravated by the Coalition's presence in Iraq. During the State of the Union Address, President Bush announced the deployment of an additional 20,000 combat troops to Iraq as part of a surge effort. As a limitation of their study, the ISG only studied 18 months of proposed operations. The ISG recommended their COA 2 be implemented for the mid and long term advantages of COA 2 over COA 1 (CGSC Section 7 2007, 1-4). This study used ISG COA 2 to generate the base data supporting the case study for this project. Through extensive wargaming, the ISG recommended "the MNF-I commander should initially commit additional U.S. combat brigades to Baghdad but rapidly shift responsibility for 'holding and building' to ISF, redeploying two of the 'surge' brigades to shaping operations elsewhere in Iraq" (CGSC Section 7 2007, 4).

Figure 7 depicts the 5 phases the ISG chose for COA 2 as well as anticipated duration of each case. The COA statements describing each phase are as follows:

Phase 1, Deploy: Five additional U.S. BCTs deploy in support of Iraqi Security Forces (ISF) operations to secure Baghdad. Two BCTs integrate with the 4th IZ DIV in support of population security operations in Baghdad. One BCT assumes former 4th IZ DIV area of operations security mission. One BCT conducts border security NW of Baghdad. Final BCT, located in Al Anbar province, serves as mobile reserve. (CGSC Section 7 2007, 5-65)

Phase 2, Integrate/Shaping: Begins as soon as each BCT is complete with RSOI, but is planned to occur during the months of May and June 2007. This phase ends with the two BCT's integrated with their supported Iraqi units and a multi-national combined exercise/rehearsal completed, the RCT conducting operations with USMC in al Anbar, a BCT conducting border security and interdiction missions along the Syrian border, and the mobile reserve in place. (CGSC Section 7 2007, 5-68)

Phase 3, Dominate: Dominate, begins no later than (NLT) 01 July 2007. This phase includes combat operations in support of Iraqi Security Forces conducting operations to secure the populace of Baghdad. (CGSC Section 7 2007, 5-69)

Phase 4, Stabilize: The ISF is taking the lead and conducting unilateral security operations. Primary roles and responsibilities of U.S. units are to provide U.S. advisor support to ISF units to facilitate planning coordination, and operations; provide air support for ISF operations; and provide QRF support. The majority of U.S. units will be postured for re-deployment back to home station or positioned in Kuwait in preparation for possible contingency operations. (CGSC Section 7 2007, 5-71)

Phase 5, Transition: The endstate for Phase V is the ISF in control of internal Iraqi security and U.S. forces deterring external aggression. Iraqi ministries performing full spectrum of government functions. Reduction in U.S. presence down to three divisions by NOV 08. By JAN 2010 two divisions remain until JAN 2015 when U.S. presence is limited to one division. (CGSC Section 7 2007, 5-72 5-73)

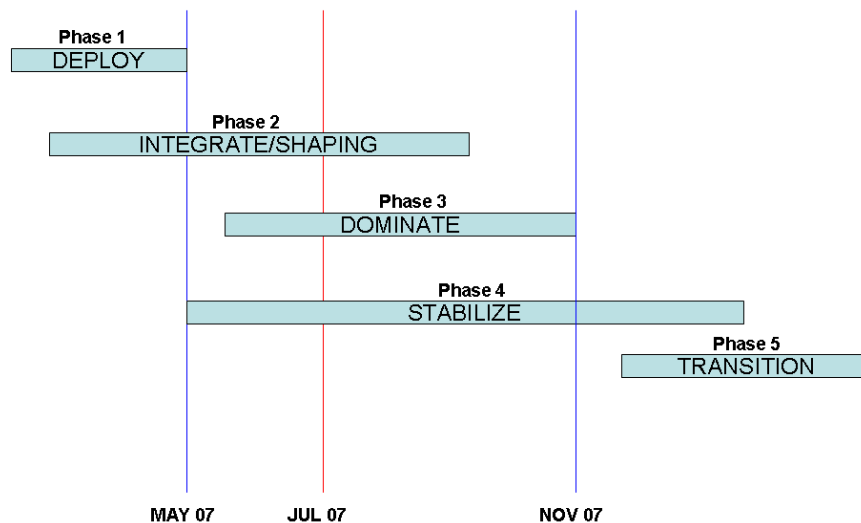


Figure 7. COA 2 Phasing

Source: CGSC Section 7, *Operational Level Iraq Campaign Plan Study Group Report* (Fort Leavenworth, KS: U. S. Army Command and General Staff College, 2007), 5-61.

Due to planning an ongoing operation, these phases differ from the doctrinal notional phases of shape, deter, seize the initiative, dominate, stabilize, and enable civil authority (FM 3-0 2008, 3-21). The COA 2 phase 4 LOE is the basis of condition 1. Additionally, the CPM used in condition 2 uses COA 2 phase 4 as the source of required tasks. As shown in Figure 7, the expected timeline had COA 2 phase 4 starting in May 2007 and lasting approximately 18 months. The next subsection describes LOE used for the Iraq case study.

### LOE Description

This subsection consists of two parts. The first describes the expected beginning and expected endstate for the ISG COA 2 phase 4. The second part describes the specifics of the LOE shown in Figure 8.

As discussed in the previous subsection, this study concentrates on the ISG's COA 2 phase 4 LOE. At the start of this phase the ISF are securing the populace of Baghdad (CGSC Section 7 2007, 5-69). The endstate for this phase includes ISF leading coalition operations and conducting independent operations. U. S. forces not re-deploying from Iraq will advise ISF units as well as provide quick reaction forces and air support as required (CGSC Section 7, 2007 5-71).

Figure 8 shows the LOE developed by the ISG. The ISG COA 2 group chose six lines of effort, specifically: conduct combat operations/civil support operations, train and employ host nation security forces, establish or restore public services, empower government, support economic development, and conduct information operations. The specific tasks or nodes correlating to each line are in Table 5 and Appendix A.

Numerous tasks from each operational objective such as those in the secure the populace

operational objective are along several lines such as conduct combat operations/civil support operations, train and employ host nation security forces, establish or restore public services, empower government, and conduct information operations. For example, increase police/security presence is on both conduct combat ops / civil support operations and train and employ host nation security forces. This shows each effort can affect multiple lines providing discussion points between LOE managers. Similar interactions occur for the other lines, operational objectives, and tasks.

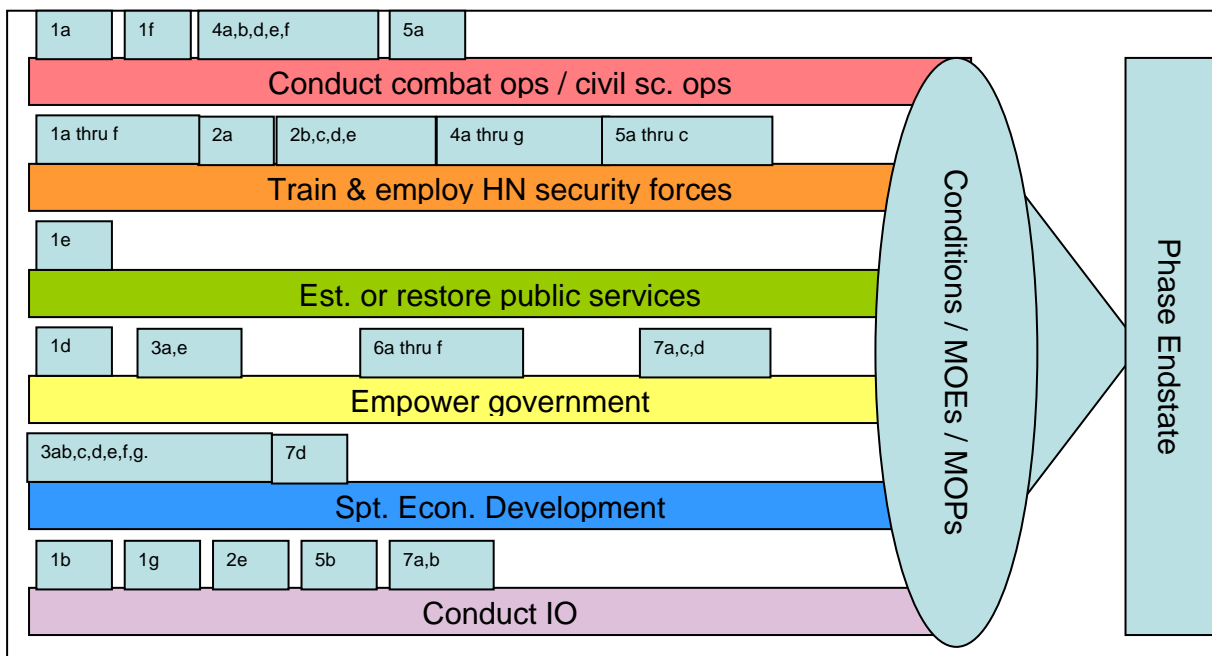


Figure 8. COA 2 Phase IV LOE

Source: CGSC Section 7, *Operational Level Iraq Campaign Plan Study Group Report* (Fort Leavenworth, KS: U. S. Army Command and General Staff College, 2007), 5-71.

Table 5. LOE Task Key

Objective	Task	Description
1	Secure the Populace	
	a	Increase Police/Security Presence
	b	Communicate Goals of Campaign
	c	Establish Quality Controls on Law Enforcement
	d	Establish Quality Controls on Law Enforcement and Judicial Officers
	e	Increase local emergency services
	f	Improve security at key economic centers
	g	Counter IS (PSYOP)
2	Enhance and improve ISF	
	a	Build Sustainment capabilities
	b	Improve C4I
	c	Improve regeneration capability
	d	Improve consistency in standards of training across ISF
	e	Build popular confidence in the ISF
3	Establish a sound economy	
	a	Improve fiscal management and transparency
	b	Encourage pro-market reform and the achievement of a stable macroeconomic environment
	c	Support the development and implementation of laws and institutions that encourage sustained economic growth
	d	Encourage the removal of regulations and termination of practices that obstruct private sector growth
	e	Provide technical assistance to aid the rapid improvement of Iraq's business climate and Iraq's accession to the World Trade Organization
	f	Support revitalization of agriculture and other productive sectors to diversify a single resource-based economy
	g	Support the increase of oil production, exportation and oil refinery in Iraq
4	Destroy terrorist C2 and infrastructure	
	a	Deny enemy safe havens
	b	Disarm militant groups
	c	Continue to develop and build Iraq CT capability
	d	Interdict LOCs
	e	Increase rewards program
	f	Collect information on threat personnel and activities
	g	Share information between units/agencies
5	Limit negative foreign influence	
	a	Secure border to infiltration routes
	b	Target IO to undermine foreign fighter influence
	c	Execute rewards program focused on smuggling and cross border violations
6	Develop government institutions	
	a	Peaceful transition of power
	b	Improve confidence in national government
	c	Establish transparency
	d	Integrate Interagency teams into key ministries
	e	Bring Sunni leaders to the political table (open lines of communication)
	f	Synchronize and coordinate reconstruction with interagencies
7	Build Iraqi national identity	
	a	Communicate GOI goals
	b	Use multiple media sources (newspaper, TV, Billboards, etc) to depict Iraqi national unity
	c	Promote multi-ethnic success
	d	Encourage multi-ethnic privatization of businesses

Table 6 contains the ISG’s MOE and MOP for each line of the COA2 phase 4 LOE. These provide an objective measure of the progress toward the desired condition and endstate. For instance, on the train and employ host nation security forces the desired condition is for the ISF to conduct unilateral security operations. The MOE is 80% of ISF assuming security operations and the MOP is the number of missions conducted without direct U. S. assistance. Therefore, positive progress is identified as the increase in the percentage of ISF unilateral security operations and as increases in the number of ISF missions without U. S. assistance. The next subsection deals with describing the CPM used for condition 2.

Table 6. MOE/MOP To Measure Progress Toward Desired Conditions

LLOs	Conditions	MOEs	MOPs
Conduct cbt ops / civil sec. ops	Level of security that allows a reduction in U.S. presence.	50% reduction in violent attacks.	Number of reported attacks.
Train and employ HN security forces	ISF conducting unilateral security operations	80% of ISF assuming security operations	Number of missions conducted without direct U.S. assistance
Est. or restore public service	Essential services are functioning fully under Iraqi lead. Capacity building projects identified/initiated and resourced IAW GOI priorities.	10% increase of programs/projects initiated. Reduction of response time for first time responders	Number of projects completed.
Empower government	Representative Gov't Strengthen Rule of Law Linkage between local and national govts established.	10% increase of PRTs at local level. 20% increase of due process efficiency.	20% of ministries working with local govt.
Spt. Econ. development	Growing market economy at the local level	3 month steady reversal of negative economic trends	Inflation/unemployment/exc hange rates
Conduct IO	IZ govt has communicated secure and stable communities.	50% increase of local population in local functions.	Number of population receiving humanitarian assistance, participating in local activities.

Source: CGSC Section 7, *Operational Level Iraq Campaign Plan Study Group Report*. (Fort Leavenworth, KS: U. S. Army Command and General Staff College, 2007), 5-72.



## CPM Description

This subsection consists of two parts. The first part discusses the origination of the CPM network diagram used in condition 2. The second part discusses specific details of this CPM process.

This part of the subsection discusses the origin of the Iraq CPM data. The Iraq CPM network diagram originated from the ISG LOE analysis shown in Figure 8. Due to the scope of the study, the CPM model was limited to tasks for the operational objectives of enhance and improve ISF, destroy terrorist command and control and infrastructure, and limit negative foreign influence. These operation objectives have tasks that are in the following lines of effort: conduct combat operations/civil support operations, train and employ host nation security forces, and conduct information operations. Details for the tasks are found in Table 7 and Appendix A, for instance, task 2d (improve regeneration capability) under the operational objective of enhance and improve the ISF.

Figure 11 contains the estimated times and interrelationships for each of the tasks are found in their respective row. For instance, the critical path task 4d (interdict LOCs) for the operational objective of destroy terrorist command and control and infrastructure has an expected duration of 17 weeks and has a finish to start relationship with tasks 4e (increase awards program), 2a (build sustainment capabilities), 4f (collect information on threat personnel and activities), 2c (improve regeneration capability), 2b (improve C4I) and a start to start relationship including a 5 week delay with 5a (secure border infiltration routes). The 5 week delays means 4d can start no earlier than five weeks before task 5 starts. Task 5b (target information operations to undermine foreign fighter influence) occurs during the entire operation, therefore is not connected to the other tasks.

As long as the critical path tasks are completed in less time than expected durations shown in Figure 11, phase 4 will be completed by November 2008, or 17 months after the start of phase 4. The next section discusses the wargame results.

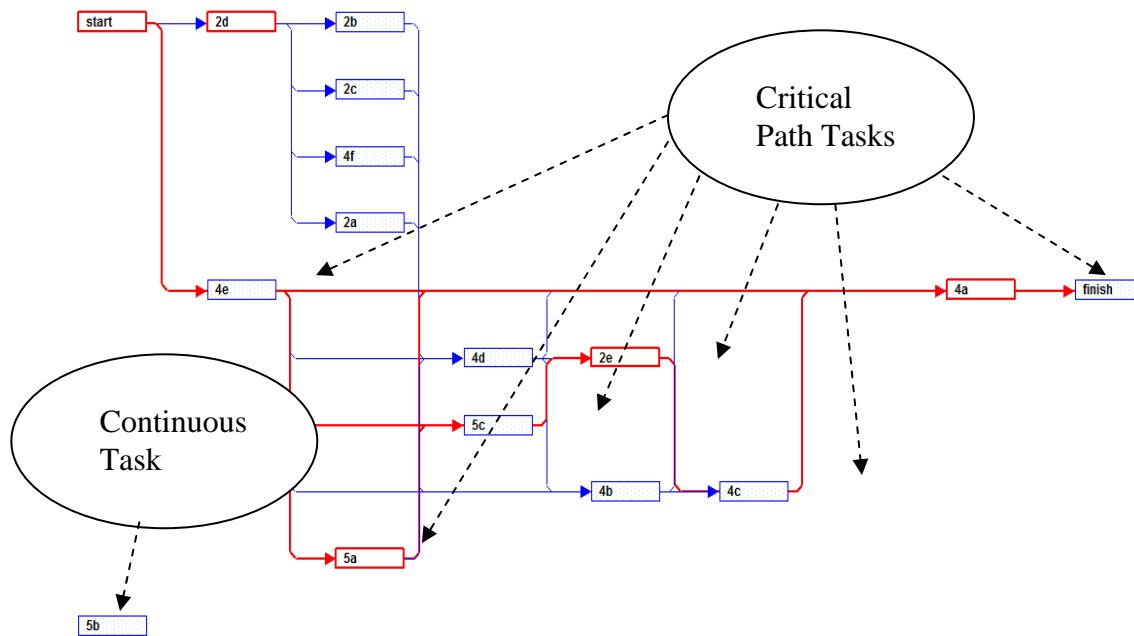


Figure 10. Iraq CPM

Table 7. The Iraq CPM Task Key

1	Secure the Populace	
	a	Increase Police/Security Presence
	b	Communicate Goals of Campaign
	c	Establish Quality Controls on Law Enforcement
	d	Establish Quality Controls on Law Enforcement and Judicial Officers
	e	Increase local emergency services
	f	Improve security at key economic centers
	g	Counter IS (PSYOP)
4	Destroy terrorist C2 and infrastructure	
	a	Deny enemy safe havens
	b	Disarm militant groups
	c	Continue to develop and build Iraq CT capability
	d	Interdict LOCs
	e	Increase rewards program
	g	Share information between units/agencies
5	Limit negative foreign influence	
	a	Secure border to infiltration routes
	b	Target IO to undermine foreign fighter influence
	c	Execute rewards program focused on smuggling and cross border violations

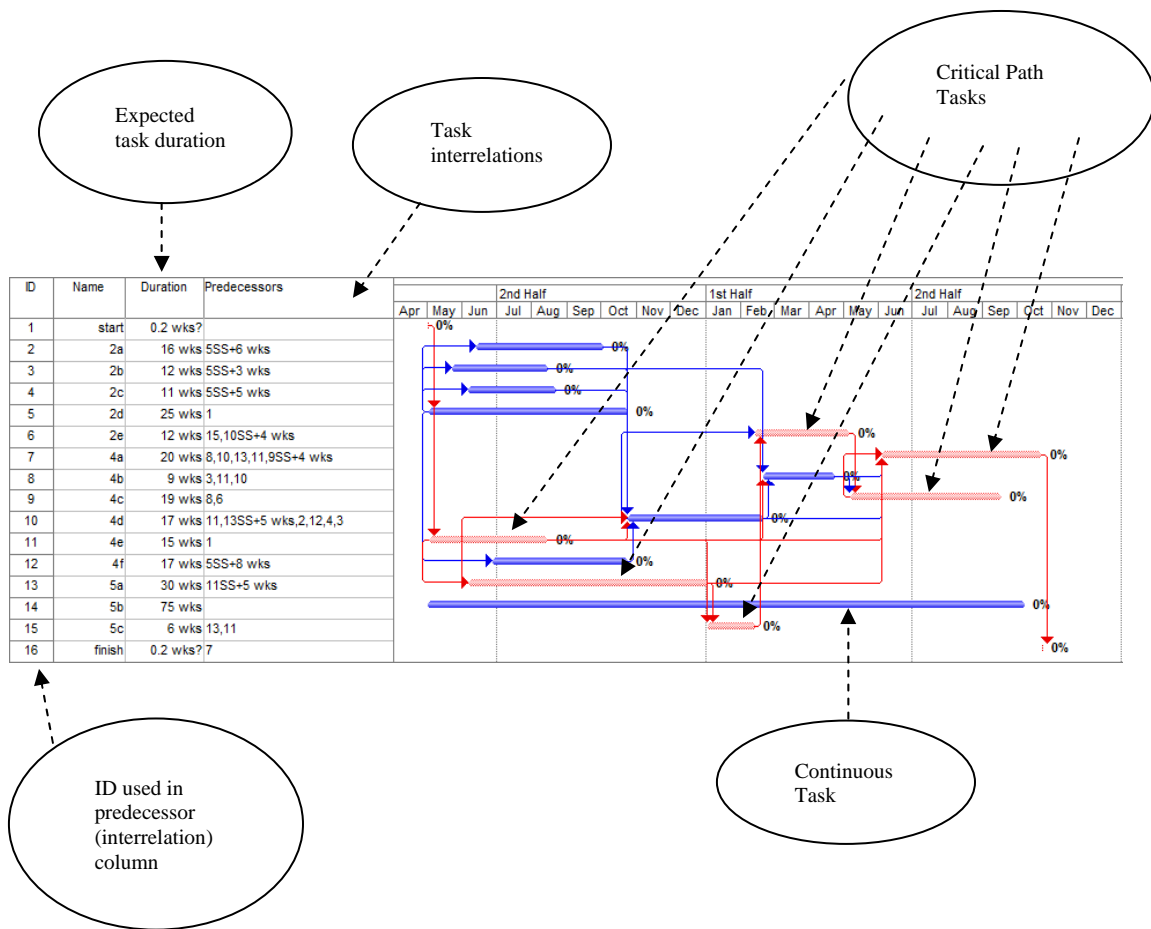


Figure 11. Iraq CPM Gantt

## Wargame Results

This section contains three subsections discussing wargame results. The first subsection discusses the condition 1 (LOE) condition strengths, weaknesses, and results of the wargame turn. The second discusses condition 2 (CPM) strengths, weaknesses, and wargame turn. The final subsection discusses condition 3 (combined LOE and CPM) strengths, weaknesses, and results of the wargame turn.

### Condition 1 (LOE) Wargame Results

Table 8 summarizes the strengths and weaknesses of condition 1 (LOE). Following is a narrative discussing the development of Table 8 using the method introduced in Chapter 3.

Table 8. Condition 1 (LOE) Strengths and Weaknesses

Condition 1 (LOE)	Plan	Prepare	Execute	Asses
Format	W	S	S	S
Objective prioritization/resource allocation	W	W	W	W
Subjective prioritization/resource allocation	S	S	S	S
Develop operational timeline	W	W	W	W
Report % complete	N/A	N/A	W	W
Effort required to create and maintain	W	S	S	S
Structured, systematic method to implement	W	S	S	S
Determine trends or changes in operating environment	N/A	N/A	N/A	S
Number of Strengths	1	4	4	5
Number of Weaknesses	5	2	3	3
See Table 4. Comparison Rubric, p. 36	F	S	S	S

- a. Format. During “plan” there is no standardized format for the LOE.  
Therefore, the usefulness of the LOE depends on those developing the LOE. However, once the LOE are developed and finalized they form a one page summary of the operation. As shown by both the LOE examples in this thesis (Figures 1 & 8), the LOE efficiently provide significant amount of information and guidance on a single sheet of paper. Because each operation requires a different LOE, “plan” was graded as a weakness. However, as long as a satisfactory LOE was created, Staff members can post copies of the LOE where they “prepare”, “execute”, and “assess” the operation making it a strength for “prepare”, “execute”, and “assess” parts of the operational process.
- b. Objective prioritization/resource allocation. There is not a mechanism with the LOE for objective prioritization making it a weakness for all parts of the operational process.
- c. Subjective prioritization/resource allocation. This condition has strengths for all parts of the operational process for this evaluation criterion. The LOE managers provide input advising the commander which tasks are the most important. Resources are allocated by assigning resources for higher priority tasks.
- d. Develop operational timeline. The LOE do not have a mechanism to assist developing the operational timeline. While this can be accomplished during the planning process, the LOE guide what needs to be done.

- e. Report percent complete. Due to not assisting in creating the operational timeline, the LOE do not have a mechanism to report percent complete. However, with sufficient MOP and MOE it is possible to determine the progress of an operation.
- f. Effort required to create and maintain. The LOE require a significant effort to develop resulting in a weakness for “plan”. Once finalized, the LOE will not change unless the operating environment or scope of the operation changes. If MOP and MOE were assigned as discussed in Chapter 2 to measure progress toward the desired endstate there would be a requirement to collect and evaluate data during “execute” for use in “assess”. This relatively minor effort compared to the rest of “prepare”, “execute”, and “assess” rates a strength for the LOE.
- g. Structured, systematic method to implement. There is not a systematic method to develop the LOE. Therefore, it rates a weakness for “plan”. The LOE managers provide a subjective method to use the LOE throughout the remainder of the operational cycle.
- h. Determine trends or changes in operating environment. Using the LOE with MOP and MOE proved a method to track trends or changes in the operating environment. When the MOP and MOE are evaluated as a function of time, they reveal cycles and trends in the environment.

Next is a discussion on the success or failure of condition 1 (LOE) for each part of the operational process based on Table 4. Comparison Rubric, page 36.

- a. “Plan.” Due to having one strength and five weaknesses condition 1 (LOE) is a failure for “plan”. The largest deterrent is the fact that there is not a standard methodology to create the LOE. Without standard procedures, the LOE become a non-standard portion of the MDMP, an analytical problems solving method with standard steps to aiding the process.
- b. “Prepare.” Due to having four strengths and two weaknesses condition 1 (LOE) is a success for “prepare”. The portable and understandable format assists staffs interpret their commander’s intent. While not directly based on any timeline, the LOE assist putting timelines together through wargaming synch matrixes. Also by this part of the operational process, the LOE are complete and do not require updating unless the circumstances or understanding of the situation changes. The use of LOE managers and MOP and MOE provide a straightforward use of the LOE.
- c. “Execute.” Due to having four strengths and three weaknesses condition 1 (LOE) is a success for “execute”. The strengths and weaknesses for “execute” are similar to “prepare”. Basically, the LOE provide a strong mechanism for subjective decisions and describing commander’s intent. By using LOE managers, individuals maintain focus on their lines. MOP and MOE provide a mechanism to determine how well the efforts are progressing toward the endstate. The weaknesses result from the lack of an objective method to determine task prioritization and no method to optimize the operational timeline.

- d. “Assess.” Due to having five strengths and three weaknesses condition 1 (LOE) is a success for “assess”. Once again combining the one page format with MOP and MOE provide a great opportunity for a stoplight type chart tracking progress toward the desired endstate. However, similar to the other parts of the operational process there isn’t a mechanism to determine the status of the operational timeline and when the operation is expected to finish. By analyzing the MOP and MOE as functions of time, the LOE can indicate trends or changes in the operating environment. For instance, the MOP and MOE could indicate a specific action is more likely to occur on a recurring day of the week. Commanders and planners could use this information to modify plans assuring as favorable situations as possible.
- e. “Overall.” Due to having three success and one failure condition 1 (LOE) is an overall success.

The next subsection is a discussion on Condition 2 (CPM) wargame results.

#### Condition 2 (CPM) Wargame Results

Table 9 summarizes the strengths and weaknesses of condition 2 (CPM).

Following is a narrative discussing the development of Table 9 using the method introduced in Chapter 3.



Table 9. Condition 2 (CPM) Strengths and Weaknesses

Condition 2 (CPM)	Plan	Prepare	Execute	Asses
Format	W	W	W	W
Objective prioritization/resource allocation	S	S	S	S
Subjective prioritization/resource allocation	W	W	W	W
Develop operational timeline	W	S	S	S
Report % complete	N/A	N/A	S	S
Effort required to create and maintain	W	W	W	W
Structured, systematic method to implement	S	S	S	S
Determine trends or changes in operating environment	N/A	N/A	N/A	W
Number of Strengths	2	3	4	4
Number of Weaknesses	4	3	3	4
See Table 4. Comparison Rubric, p. 36	F	F	S	S

- a. Format. The format for the CPM can be difficult to display if there are numerous tasks. The more complex the operation, with more tasks and interrelationships, the more it causes the network diagram to become a large and complex visual display. This fact makes it difficult for the network diagram to be sized small enough to be included in a figure on one sheet of paper limited the number of tasks available for this study. With large operations, the size of the resulting network diagram would likely necessitate to use a specialized computer program. Using a specialized program would incur additional cost and require additional training. The difficulty of producing representative products is a weakness across “plan”, “prepare”, “execute”, and “assess.”
- b. Objective prioritization/resource allocation. After finalized the network diagram the CPM provides an objective method to prioritize task and guide resource allocation. Knowing how much slop time a task has allows

decision-makers a tool throughout the entire operational process to determine whether completing or deferring a task affects the overall timeline. Knowing the ramifications of delaying a task assist “plan”, “prepare”, “execute”, and “assess”.

- c. Subjective prioritization/resource allocation. The only subjectivity for the CPM is by the commander to direct something other than the data indicates. There could be numerous reasons for choosing not to follow the objective data including: prior experience with similar situations, guidance received from higher headquarters, or creating a positive image as determined by public opinion.
- d. Develop operational timeline. Creating an optimal operational timeline is a key strength of the CPM. By completing the CPM process each task with assigned resources are given an estimated execution time. The effort required to compute the operation timeline occurs in “plan”. The additional effort required to complete the CPM results in the only weakness for this evaluation criterion.
- e. Report percent complete. Maintaining the current status of each task allows the calculation of the percentage of the operation remaining. This is a strength for executing and allocating resources by providing information on which tasks are behind schedule. While assessing there is a straightforward method to determine how the operation is following the operational timeline.

- f. Effort required to create and maintain. The CPM requires effort throughout the entire operational process. The majority of the effort takes place during “plan” however, as tasks are completed ahead or behind schedule the entire network diagram must be updated. These updates reveal if the critical path has changed. Knowing the current status of the operation assists “prepare”, “execute”, and “assess” functions.
- g. Structured, systematic method to implement. The mechanics for completing the CPM remain consistent for various operations. The effort required to develop the network diagram would increase the understanding of the situation (mission analysis) as well as ensure the COAs were complete.
- h. Determine trends or changes in operating environment. The CPM does not show trends other than whether the operation is ahead or behind schedule.

Next is a discussion on the success or failure of condition 2 (CPM) in each category of the operational process based on Table 4. Comparison Rubric, page 36.

- a. “Plan.” Due to having two strengths and four weaknesses condition 2 (CPM) is a failure for “plan”. While the CPM is a great asset in planning it requires additional effort. The rest of the operational process determines if this additional effort benefits the rest of the process.
- b. “Prepare.” Due to having three strengths and four weaknesses condition 2 (CPM) is a failure for “prepare”. The part of the operational process was almost a strength due to the format being a mild weakness. Computer

programs can mitigate this weakness. The ability to determine which tasks to resource is very important to “prepare”. Finally, the ability to create the operational timeline assists “prepare” and provides a valuable method to estimate logistical requirements such as sustainment.

- c. “Execute.” Due to having four strengths and three weaknesses condition 2 (CPM) is a success for “execute”. Similar to the other parts of the operational process the weakness of the format for the CPM is overcome by using a computer based project management program.
- d. “Assess.” Due to having four strengths and four weaknesses condition 2 (CPM) is a success for “assess”. Similar to “execute” the format weakness can be overcome by using a computer based project management program. The weakness of only a subjective prioritization is limited to the commander and staff experience levels. There is built in methods to determine the operational timeline and as long as the network diagram is updated the CPM can report the % the operation is completed.
- e. “Overall.” Due to having two successes and two failures condition 2 (CPM) is an overall success. The additional effort required during “plan” and updating the percent complete provides benefit by allowing objective prioritization and the structured, systematic implementation.

The next subsection discusses Condition 3 (combined LOE and CPM) wargame results.

#### Condition 3 (combined LOE and CPM) Wargame Results

Table 10 summarizes the strengths and weaknesses of condition 3 (combined LOE and CPM). Condition 3 (combined LOE and CPM) contains the strengths for

condition 1 (LOE) and condition 2 (CPM). Following is a narrative discussing the development of Table 10 using the method introduced in Chapter 3.

Table 10. Condition 3 (combined LOE and CPM) Strengths and Weaknesses

Condition 3 (LOE and CPM)	Plan	Prepare	Execute	Asses
Format	W	S	S	S
Objective prioritization/resource allocation	S	S	S	S
Subjective prioritization/resource allocation	S	S	S	S
Develop operational timeline	W	S	S	S
Report % complete	N/A	N/A	S	S
Effort required to create and maintain	W	S	S	S
Structured, systematic method to implement	S	S	S	S
Determine trends or changes in operating environment	N/A	N/A	N/A	S
Number of Strengths	3	6	7	8
Number of Weaknesses	3	0	0	0
See Table 4. Comparison Rubric, p. 36	F	O	O	O

By combining the steps each of the strengths of the other conditions apply. The only negative aspect of completing both methods is the additional effort required. Next is a discussion on the success or failure of condition 3 (combined LOE and CPM) in each category of the operational process.

- a. “Plan.” Due to having three successes and three failures condition 3 (combined LOE and CPM) is a failure for “plan”.
- b. “Prepare.” Due to having six successes condition 3 (combined LOE and CPM) is an overwhelming success for “prepare”.
- c. “Execute.” Due to having seven successes condition 3 (LOE and CPM) is an overwhelming success for “execute”.

- d. "Assess." Due to having eight successes condition 3 (LOE and CPM) is an overall overwhelming success

### Wargame Summary

This section contains four subsections discussing wargame results. The first subsection discussed condition 1 (LOE) strengths, weaknesses and the resulting wargame turn result. The second subsection discussed condition 2 (CPM) strengths, weaknesses, and the resulting wargame turn result. The third subsection discussed condition 3 (combined LOE and CPM) strengths, weaknesses, and the resulting wargame turn result. The final part summarized this section and described Figure 12.

## Iraq SO Case Study

Condition	Plan	Prepare	Execute	Assess	Overall
(1) LOE	↓↑	↑↓	↑↓	↑↓	↑↓
(2) CPM	↓↑	↓↑	↑↓	↑↓	↑↓
(3) LOE and CPM	↓↑	↑↑	↑↑	↑↑	↑↓

overwhelming success	↑↑	Failure	↓↑
Success	↑↓	Catastrophic failure	↓↓

Figure 12. Wargame Summary

Figure 12 shows the data revealed condition 3 (combined LOE and CPM) is an overall success. The implications of condition 3 (combined LOE and CPM) being an overall success is discussed in chapter 5. The data generated by the wargame is substantiates the findings.

### Findings

This section will consist of five subsections, a subsection for each of the five research questions. Each of the subsections will include the answer of the research question and a discussion of the finding.

#### Findings for Question 1.

Analysis indicates that creating LOE provide a beneficial process to efficiently plan and report progress for planners, operators, and commanders. A discussion of this finding follows.

Planners: LOE provide a good tool for planning. Specifically, LOE assist understanding the problem and framing required actions enabling a unity of effort toward mission accomplishment. Utilizing LOE managers greatly enhance this benefit. These positions are responsible for knowing how any action or inaction internal or external to the unit affects their line. This helps ensure an action desired by one group does not inadvertently have a negative or unintended effect on another line.

Operators: LOE provide a one-page summary from which operators can understand how their individual task affects the overall mission. A one-page visual of a campaign increases understanding how efforts fit the overall plan and how actions or inactions could positively or negatively affect numerous aspects of the operation.

Commanders: LOE provide a useful tool to distribute intent and the required guidance for operation. LOE typically fit on one sheet of paper or briefing slide making then outstanding summaries of the required efforts. The LOE can be posted or briefed to remind the staff of the commander's desires

#### Findings for Question 2.

Analysis indicates that LOE aid decision-making and resource allocation. A discussion of this answer follows.

Decision making: LOE managers as described in Chapter 2 can be a great asset in decision-making and resource allocation. By focusing on their line, LOE managers provide opinions on how a proposed action or inaction would affect their line. By knowing how an action might affect numerous lines it would assist decision makers make decisions. The LOE managers' opinions provide a basis for subjective prioritization.

Resource allocation: Each LOE manager's analysis provides a subjective prioritization for the commander to prioritize between competing requirements. For example, if all other things were equal and one action had a positive benefit to three lines and another action had a positive benefit for all 6 lines of LOE, then the commander would likely choose the action that benefits all 6 lines. Without an objective procedure, the commander's and staff's previous experiences become the only major influence on the decision.



### Findings for Question 3.

Analysis indicates that applying the critical path methodology provides planners a beneficial process to efficiently plan and report progress for planners, operators, and commanders. A discussion of this answer follows.

Planners: Completing the systematic CPM process assists by ensuring the planners have considered what tasks are required, how long each task is expected to take and task interrelationships. Determining an expected timeline allows planners to effectively report on the progress of the operation. Determining the critical path provides decision makers an objective method to prioritize in a resource-constrained environment.

Operators: An operator would know the effect of not completing a task on time has on the overall mission timeline. For instance, if the operator knew if they fell behind schedule completing an assigned critical task the entire operation would fall behind schedule. The operator could request additional resources as required to complete the critical task on schedule. The operators would report the data tracking the progress of the operation therefore informing the commander if the operation is ahead or behind schedule.

Commanders: CPM provides the commander an additional tool to ensure the planners systematically plan the operation. The CPM provides an objective method to prioritize asset allocation, thus giving the commander a tool to determine which task to complete first in a resource-constrained environment. Additionally, the CPM could prove to be a valuable tool for conducting “what if” analysis to help optimize available resources for the quickest mission completion for the minimal risk.

#### Findings for Question 4.

Analysis indicates that knowing the critical path aids decision-making and resource allocation. A discussion on this answer follows.

Decision making: Through the CPM process the interrelationship between tasks are considered. This and knowing the estimated time to complete each task are two essential pieces of information to calculating the critical path. Knowing the critical path assists making decisions and setting priorities that will keep the operation on the most efficient timeline. By knowing the expected results of different resourcing options, the optimal COA can be chosen.

Resource allocation: Knowing the critical path assists asset allocation by providing an objective means of determining the affect individual tasks have on the overall operations timeline. By knowing the affects of delaying or expediting individual tasks, optimally allocating resources is possible within allowable risk.

#### Findings for Question 5.

Analysis indicates that the same operation can use both LOE and the CPM for planning, tracking, and decision-making that support SO. A discussion on this answer follows.

Both LOE and the CPM benefit the overall planning, tracking, and decision-making process. LOE are similar to MOE in the fact LOE guide the process to doing the right things. The CPM is similar to MOP because they provide a method to determine if the right things are progressing properly. Next is the summary of analysis.

### Summary of Analysis

In summary, the analysis of the data indicates that creating LOE provide a beneficial process to efficiently plan and report progress for planners, operators, and commanders. LOE provide a good tool to describe the problem and required efforts. LOE aid decision-making and resource allocation. LOE provide a subjective tool to make decisions and allocate resources by keeping the affects of each action on the overall operation. Applying the critical path methodology provide planners a beneficial process to efficiently plan and report progress for planners, operators, and commanders. LOE provide a valuable method to describe a problem and how to evaluate different actions and counteractions affect the overall situation. The CPM provides an objective tool to keep the operation on schedule. By knowing the critical path it aids decision-making and resource allocation. The CPM provides an objective method to determine the order to complete tasks providing the shortest overall duration with the available resources. The same operation can use both LOE and CPM for planning, tracking, and decision-making that support SO. The next chapter provides conclusions and recommendations based on the research question, “Does applying LOE and the CPM aid planning, tracking, and decision-making that support SO.”

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to provide conclusions and recommendations based on the research conducted to answer the question, “Does applying the LOE and the CPM aid planning, tracking, and decision-making that support SO? Chapter 5 contains four sections. The first section contains conclusions grouped by research questions. The second section contains recommendations grouped by research questions. The third section contains recommendations for future research. The final section is a summary.

This paper initially introduced the research question, “Does applying LOE and the CPM aid planning, tracking, and decision-making that support SO?” Next, a study of literature provided the requirement for continued SO as well as current and proposed methods for planning, tracking, and decision-making that support SO. Chapter 3 provided the research methodology to study the research question. Chapter 4 provided specific information on the Iraq Case study followed by the results of the wargame and the findings. The data originated from the ISG, a group of 64 students and 13 instructors from CGSC. Next are the conclusions of the study.

#### Conclusions

##### Question 1

Analysis indicated that creating LOE provide a beneficial process to efficiently plan and report progress for planners, operators, and commanders. LOE managers provide understanding of how actions, inactions, or counteractions affect each line. The LOE provide commanders a succinct format to provide guidance for the entire operation.

The guidance allows subordinate commanders to understand how their specific mission nests with the overall operational plan. Using MOP and MOE in coordination with LOE provides a useful tool to track progress towards operational objectives. However, selection of the correct MOP and MOE is critical for accurate reporting. Additionally, LOE do not consider chronological time. Without considering the time, it is difficult to determine if the operation is ahead or behind schedule. LOE provide a subjective mechanism for objective prioritization between tasks competing for the same resources. However, once finalized the LOE remain constant throughout the operation. This assists keeping the entire operational effort proceeding along the commander's intent and guidance.

#### Question 2

Analysis indicated that LOE aid decision-making and resource allocation. LOE managers assist decision-makers by discussing the affect of their decisions based on each of the lines. However, LOE aid resource allocation by utilizing the general guidance and intent of the commander and the LOE managers analyze by subjective methods.

#### Question 3

Analysis indicated that applying the critical path methodology provides planners a beneficial process to efficiently plan and report progress for planners, operators, and commanders. The CPM process helps ensure the developed plan is complete. The CPM considers takes the expected time to complete tasks as well as interrelationships between tasks. Through time estimates and task interrelationships, the CPM allows calculations to determine how individual tasks affect the overall operational timeline. The CPM requires

effort to maintain an accurate assessment of the critical path during the operation. The CPM provides an outstanding method to report the progress of the status of the operational schedule through changes in the overall schedule. Additionally, the CPM provides an objective tool to prioritize between tasks competing for the same resources. The CPM allows decision-makers to determine which tasks to complete first while maintaining the operational schedule with available recourses and acceptable risk. Finally, the CPM provides useful “what if” planning tool to demonstrate what affect changing the order of task completion has on the overall operational timeline.

#### Question 4

Analysis indicated that knowing the critical path aids decision-making and resource allocation. The critical path identifies tasks that could cause a delay in the operational schedule. The CPM provides objective data showing ho long non-critical delays can affect the overall operational timeline. Additionally, knowing the estimated time for each task could help ensure assigning the correct unit the correct task and providing assistance when unable to maintain the schedule.

#### Question 5

Analysis indicated that the same operation can use both LOE and the CM for planning, tracking, and decision-making that support SO. By utilizing both methods, the process benefits from the concise intent and guidance provided by LOE and understand provided by LOE managers and the scheduling and asset allocation benefits of the CPM. Combined, the methods guide staffs and commanders to optimizing scarce resources through both subjective judgment and objective data.

### Recommendations

Based on the results of this study, my recommendation is to incorporate both LOE and the CPM as complementary tools for planning, tracking, and decision-making that support SO. Both methods have advantages for planning, tracking, and decision-making that support SO. LOE provide good guidance to keep the operation focused and consider the effect of individual actions or inactions on the operation as a whole. However, LOE do not consider time or interrelationships between tasks limiting the ability to prioritize between tasks to subjective methods. Using MOP and MOE allows reporting on progress toward mission accomplishment but does not provide knowledge of whether the operation is ahead or behind the optimal timeline.

CPM is beneficial because it considers the time required for task completion and interrelationships between tasks while optimizing the operational timeline. It provides an objective prioritization between tasks when resources are constrained keeping the operation on schedule with acceptable risk.

### Recommendation for Future Research

Integrate the CPM for a SO command post and field training exercises to validate this research. Simulated operations provide an opportunity for units to practice new methods before Soldiers' lives are at stake.

Investigate program evaluation review technique (PERT) analysis to aid planning, tracking, and decision-making that support SO. PERT is a method that uses statistics to augment time estimates when determining the overall operational timeline. While the CPM and PERT are similar, PERT uses statistics to account for uncertainty in time estimates.

This thesis used one case study of rebuilding a nation after war and regime change. Further research should be conducted to verify whether CPM would be beneficial to humanitarian assistance/disaster relief SO missions such as the Tsunami relief efforts of 2007/2008 and civil support operations such as hurricane Katrina relief type of operations.

### Summary

Based on answering the research questions using both LOE and the CPM combined would benefit planning, tracking, and decision-making that support SO. As outlined in Chapters 4 and 5, both LOE and the CPM provide benefits throughout the entire SO process and do not duplicate efforts or contradict each other. By combining both processes, the advantages overcome some of the disadvantages and shortcomings of the other. The combination would provide an effective method of describing the conduct of SO.



## GLOSSARY

**Activity.** An element in the project that consumes time for the purposes of this thesis will also equate to a SO task (Gray 1981, 17).

**Assessment.** “the continuous monitoring and evaluation of the current situation” (FM 3-0 2008, 5-16).

**Critical path method.** “the process of employing network techniques to optimize the use of scarce project resources” (Gray 1981, 7).

**Event.** The start and completion of an activity, a specific accomplishment in the project that occurs at an identifiable instant in time, the Start or finish of one or more activities (Gray 1981, 17).

**Execution.** “putting a plan into action by applying combat power to accomplish the mission and using situational understand to assess progress and make execution and adjustment decisions” (FM 3-0 2008, 5-19).

**Full spectrum operations.** The Army’s operational concept: Army forces combine offensive, defensive, and stability or civil support operations simultaneously as part of an interdependent joint force to seize, retain, and exploit the initiative, accepting prudent risk to create opportunities to achieve decisive results. They employ synchronized action--lethal and nonlethal--proportional to the mission and informed by a thorough understanding of all variables of the operational environment. Mission command that conveys intent and an appreciation of all aspects of the situation guides the adaptive use of Army forces (FM 3-0, Glossary-13).

**Lines of effort.** link multiple tasks and missions using the logic of purpose – cause and effect – to focus efforts toward establishing operational and strategic conditions (FM 3-0, 6-13).

**Measure of effectiveness.** (joint) A criterion used to assess changes in system behavior, capability, or operational environment that is tied to measuring the attainment of an end state, achievement of an objective, or creation of an effect. (JP 3-0) (FM 3-0 2008, Glossary-9)

**Measure of performance.** (joint) A criterion used to assess friendly actions that is tied to measuring task accomplishment. (JP 3-0) (FM 3-0 2008, Glossary-9)

**Military decision making process.** A planning tool that establishes procedures for analyzing a mission, developing, analyzing, and comparing courses of action against criteria of success and each other, selecting the optimum course of action, and producing a plan or order (FM 5-0, Glossary-13).

Network diagram. The graphical flow diagram of the interrelationships, interdependencies, and sequence of all activities and events that must be accomplished to complete the project (Gray 1981, 17).

Planning. “the process by which commanders (and staff, if available) translate the commanders’ visualization into a specific course of action for preparation and execution, focusing on the expected results” (FM 3-0 2008, 5-17 – 5-18).

Preparation. “activities performed by units to improve their ability to execute an operation” (FM 3-0 2008, 5-18).

Stability operations. An overarching term encompassing various military missions, tasks, and activities conducted outside the United States in coordination with other instruments of national power to maintain or reestablish a safe and secure environment, provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief (JP 3-0, GL-25).

Strengths. Analysis describing single step advantage for the solution approach.

Weakness. Analysis describing single step disadvantage for the solution approach.

## APPENDIX A

### ISG COA 2 OPERATIONAL OBJECTIVES AND TASKS

#### Operational Objectives and Tasks

1. Secure the populace
  - a. Increase Police/Security Presence
  - b. Communicate Goals of Campaign
  - c. Isolate high threat/ target areas
  - d. Establish Quality Controls on Law Enforcement and Judicial Officers
  - e. Increase local emergency services
  - f. Improve security at key economic centers
  - g. Counter IO (PYSOP)
2. Enhance and improve the ISF
  - a. Build Sustainment capabilities.
  - b. Improve C4I
  - c. Improve regeneration capability
  - d. Improve consistency in standards of training across ISF
  - e. Build popular confidence in the ISF
3. Establish a sound economy
  - a. Improve fiscal management and transparency
  - b. Encourage pro-market reform and the achievement of a stable macroeconomic environment

- c. Support the development and implementation of laws and institutions that encourage sustained economic growth
  - d. Encourage the removal of regulations and termination of practices that obstruct private sector growth
  - e. Provide technical assistance to aid the rapid improvement of Iraq's business climate and Iraq's accession to the World Trade Organization
  - f. Support revitalization of agriculture and other productive sectors to diversify a single resource-based economy.
  - g. Support the increase of oil production, exportation and oil refinery in Iraq.
  - h. Increase allocation of CERP funds for commanders
4. Destroy terrorist C2 and infrastructure
- a. Deny enemy safe havens
  - b. Disarm militant groups
  - c. Continue to develop and build Iraqi CT capability
  - d. Interdict LOCs
  - e. Increase rewards program
  - f. Collect information on threat personnel and activities
  - g. Share information between units/agencies
5. Limit negative foreign influence
- a. Secure border infiltration routes
  - b. Target IO to undermine foreign fighter influence

- c. Execute rewards program focused on smuggling and cross border violations
6. Develop government institutions
- a. Peaceful transition of power
  - b. Improve confidence in national government
  - c. Establish transparency
  - d. Integrate Interagency teams into key ministries
  - e. Bring Sunni leaders to the political table (open lines of communication)
  - f. Synchronize and coordinate reconstruction with interagencies
7. Build Iraqi national identity
- a. Communicate GOI goals
  - b. Use multiple media sources (newspaper, TV, Billboards, etc) to depict Iraqi national unity
  - c. Promote multi-ethnic success
  - d. Encourage multi-ethnic privatization of businesses
  - e. Promote ethnic diversity in government hiring practices

*Source: CGSC Section 7, Operational Level Iraq Campaign Plan Study Group Report (Fort Leavenworth, KS: U. S. Army Command and General Staff College, 2007), 5-61 – 5-64*

## APPENDIX B

### TCAF BRIEF EXCERPT

Source: U. S. Department of State. n.d.



### TCAF Questionnaire

TCAF Questionnaire	
Province	Date
District	GPS Reference
Village	Population
Interviewer Name	Interviewee
Interviewer Title	
<p>Have there been changes in the village population in the last year? Why?                      آبادده کسې د خلکو په سطحه کې په تړکان کې کوم تغیرات راغلي دي؟ او څرنگه دي؟</p>	
<p>What are the most important problems facing the village?                      دغه کلي د کومو عمده مشکلاتو سره مخامخ کېږي؟</p>	
<p>Who do you believe can solve your problems?                      په کلي کې په کومه طبقه مشرانو باندې زيات اعتبار کېږي؟</p>	
<p>What should be done first to help the village?                      ددغه کلي لپاره بايد څه شي اول وکول شي پدې کومو کارونو د لاسنيش وکولای شو؟</p>	

“Village” can be replaced by “district” “province,” any other level depending upon the HQs’ focus.

REMEMBER, ALWAYS ASK “WHY?”

1

### TCAF Basic Assessment

Microsoft Excel - TCAF Worksheet1.xls

	A	B	C	D	E	F	G
		Province	Date	Why	Major Problems	Institutions of Trust	
1							
2							
3	1	Kandahar	15-Jan-07	Taliban Raids	Lack of paid work opportunities	Courts	
4	2	Oruzgan	15-Jan-07		Access to health care	Municipal/Local Government	
5	3	Nimruz	15-Jan-07	No Jobs	Limited Essential Services	Courts	
6	4	Daykondi	16-Jan-07	Security	Limited Essential Services	Religious leaders	
7	5	Zabol	17-Jan-07	No road	Lack of shelter	Local Police	
8	6	Daykondi	17-Jan-07		Access To Education	Provincial Government	
9	7	Helmand	18-Jan-07	Schools	Access To Education	Local Government	
10	8	Nimruz	18-Jan-07	Schools	Access To Education	Courts	
11	9	Helmand	18-Jan-07	Lack Of Paid Work	Lack Of Paid Work	Local Police	
12	10	Zabol	19-Jan-07		Lack Of Shelter	National Army	
13	11	Nimruz	19-Jan-07		Limited Essential Services	International Forces	
14	12	Helmand	20-Jan-07	Access To Health	Limited Essential Services	Tribal leaders	
15	13	Zabol	21-Jan-07		Limited Essential Services	Religious leaders	
16	14	Helmand	21-Jan-07		Lack Of Shelter	National Army	
17	15	Daykondi	21-Jan-07	Security	Access To Education	National Government	
18	16	Kandahar	21-Jan-07		Access To Health Care	Religious leaders	

# Successful Programming Checklist

## Every Activity must:

- ✓ *Increase support for the government*
- ✓ *Decrease support for the insurgents*
- ✓ *Increase government capacity*

1. Fit into the local political and cultural **context**?
2. Include the **local government** and **population** in the design process?
3. Allow the local government and population **implement** it?
4. **Erode** existing governmental or civil society capacity?
5. Focus on activities that provide **flexibility**?
6. Support **OGAs, IGOs** and **NGOs** programs?
7. Strengthen government **accountability** and **transparency**?
8. Take you closer to the **long-term** objectives?
9. Allow for a quick response to **unforeseen** crises (violence, natural disasters, etc.)

4

## Things to Remember

1. “Good deeds” are not the same as effectively targeted CMO programming. Take away the extremists’ “talking points.”
2. Individual **projects** *MUST* add up to a coherent **program** that decreases IN/CON in your AO.
- 3. Do’s
  - respond to priority issues of **local** population
  - focus on cross-cutting issues as they are usually bottlenecks
  - Example: ***Corruption can affect political, economic, and security lines of operation***
  - support key actors early to set the stage for later collaboration
- 4. Don’ts
  - “Westernize” the activity
  - focus on quantity over quality of activities

5

## Example

Cause of IN/CON	Program Objective	Impact Indicators	Monitoring Methods	Activities	Output Indicators	Monitoring Methods
Perception the Afghan National Police (ANP) is corrupt.	Decrease perception that the ANP is corrupt.  Decrease ANP corruption if it exists.	Improved public perception  Population Provides more Actionable intel to ANP  Increased ANP Interaction with the population	Public Surveys		# of TCAF responses	<ul style="list-style-type: none"> <li>• TCAFs</li> <li>• Public Surveys</li> <li>• Patrol Reports</li> <li>• Financial records</li> <li>• Interviews</li> <li>• Assessments</li> </ul>
			Survey of Jingle truck drivers		# of joint patrols	
			Decrease in illegal checkpoints	Combined CF/ANP ops	% of ANP who receive their full salary on time	
			Increased intel from the population fosters ANP ops	Interview ANP at all levels MP/ANP joint Site Assessments	# of ANP interviews	
			ANP increases intel to CF/ANA		# of corrupt ANP officers removed	
			Increased, sustained police presence in formerly limited presence areas	Evaluate ANP compensation	# of MP/ANP Joint assessments conducted	
			Interviews with ANP			

Source: U. S. Department of State, *Tactical Conflict Assessment Framework (TCAF)*, [http://www.carlisle.army.mil/ietcop/2007\\_workshop/tcaf%20counterinsurgency.ppt](http://www.carlisle.army.mil/ietcop/2007_workshop/tcaf%20counterinsurgency.ppt) (accessed 29 November 2008).



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