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Achieving Total Asset Visibility*

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**Boyd, Keenan B. *Assessing the Army's Movement Control Capability as it Relates to Achieving Total Asset Visibility***

**Abstract**

The purpose of this paper was to identify and assess the role of Army Movement Control organizations as it relates to providing Total Asset Visibility of supplies and equipment traversing the battlefield. Movement control is defined as the dual process of committing allocated transportation assets and regulating movements according to command priorities to synchronize the distribution flow over lines of communication to sustain land forces Total asset visibility is achieved through the integration of Joint and Army sustainment processes and in-transit visibility systems. Army Movement Control organizations lack a critical capability needed to achieve total asset visibility in an operational environment. The automated information technology systems employed by these organizations lack interoperability and interconnectivity to attain total asset visibility of personnel and equipment moving across the battlespace. The Capability Based Assessment process was used to analyze the current Movement Control capability of the Army to identify any lack of operational capability and how it would affect the overall operation.

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## Chapter I: Introduction

The art of projecting combat forces into a theater of operation requires a complex blend of people, organizations, and systems. For sustainment and logistics operations it means ensuring the correct amount of combat power arrives on time, intact, and at the right place of employment. While getting to the fight can be difficult, the continuous movement of people, material, and equipment across the battlefield is a daunting and challenging task. Forecasting, prioritizing, and coordinating movement within an area of operations is equally critical to ensure equipment, personnel, and supplies are allocated at the right time, place, and can traverse the battle space quickly and without incident. Army Movement Control Battalions and Movement Control Teams have the responsibility of forecasting, prioritizing, and coordinating movement of all forces on the battlefield.

Movement control is defined as the dual process of committing allocated transportation assets and regulating movements according to command priorities to synchronize the distribution flow over lines of communication to sustain land forces (Headquarters Department of the Army, 2013). Movement control organizations perform a dynamic role in establishing the theater distribution network. At the theater level, centralized movement control coordinates the movement of forces, materials, and supplies within the theater of operations. Movement control, as a secondary transportation function, provides commanders a tool to synchronize movements for deployment, redeployment, and distribution operations. Strategically, movement control provides a more detailed situational understanding of the flow of forces and supplies within their area of responsibility (Headquarters Department of the Army, 2013).

The act of planning, allocating, and coordinating movement across various lines of communication, requires commanders can track and identify the status and location of cargo and



supplies from their point of origin to their point of destination. The conglomeration and aggregation of information containing movement data for the entirety of all forces and organizations with the area of operations is total asset visibility. Total asset visibility is achieved through the integration of Joint and Army sustainment processes and in-transit visibility systems. These systems and methods aggregate information and data to create and display a battlefield Common Operating Picture, used by brigade level and higher unit commanders. Currently, the systems and processes the Department of Defense employs to track equipment and cargo moving from the continental United States to supply support activities in a theater are disjointed and lack the common infrastructure needed to provide total asset visibility.

Movement Control Teams at the tactical level do an excellent job of ensuring cargo arrives at the proper destination using fixed interrogators, radio frequency identification tags, and other Department of Defense transportation automated information systems. Total asset visibility is more than knowing when cargo departs and arrives at a destination. It is a complement of software and hardware that paint a complete logistics common operating picture. The issue of total asset visibility is of most significant concern at the strategic levels of Corps and Division. The lack of connectivity between critical in-transit visibility systems is a hindrance to the creation of a theater-wide logistics common operating picture used by Division and Corps elements. The Logistics Common Operating Picture is the means by which commanders forecast, plan, and coordinate sustainment within their area of responsibility in order to gain or maintain the operational advantage.

### **Statement of the Problem**

Army Movement Control organizations lack a critical capability needed to achieve total asset visibility in an operational environment. The automated information technology systems

employed by these organizations lack interoperability and interconnectivity to attain total asset visibility of personnel and equipment moving across the battlespace.

### **Purpose of this Study**

The purpose of this study was to analyze the systems, organizations, and doctrinal methods that comprise Movement Control within the Department of the Defense and their role in providing total asset visibility. This study included identifying capability gaps in, organizations, organizational structure, systems, and training related specifically to achieve total asset visibility in an operational environment. It was essential to understand the relationship between total asset visibility and movement control. The lack of effective in-transit visibility at all levels, in a joint environment, implied that the current movement control capability within the Department of Defense was not postured to support military operations as directed by the Geographical Combatant Commander. For this reason, a capability-based assessment was performed to determine if there existed capability gaps related to movement control.

The capability-based assessment examined the current force structure of movement control organizations, doctrine, related training, automated information systems, and the risk associated with maintaining the status quo. The information derived from this study will influence the development of improved automated information systems, additional force structure, training, and doctrine related to achieving total asset visibility.

### **Assumptions**

The recognized assumptions regarding this study were: the area of operation is non-specific when measuring the overall capabilities of organizations conducting movement control, all movement control organizations possess the same level of capability, individuals within the organizations were not a part of the study, and the numerical designation of military units are not

mentioned. Additionally, the organizations and units that comprise the Department of Defense's movement control capability were not delineated based upon service affiliation such as Active Army, Army National Guard or U.S. Army Reserve components. Lastly, the systems procured to perform in-transit visibility were functioning correctly and deployed within the guidelines prescribed in Joint and Army publications.

### **Definition of Terms**

This section includes a list of unique terms and definitions specific to military operations.

**In-transit visibility.** Are cargo and supply tracking capability that uses Radio Frequency /Automatic Identification Technology to provide the logistics customer with visibility and near real-time status on the movement of all classes of supply. (United States Army, 2017).

**Logistics common operating picture.** Provides shared, common visibility of requirements and capabilities beyond the point of need that increases the ability to provide coordinated and synchronized support. (Chairman of the Joint Chiefs of Staff , 2013)

**Movement control battalion.** Highest echelon organization within the Army that Commands between four and ten Teams, plans and schedules movements, and provides in-transit status reporting of unit and convoy movements. (Headquarters Department of the Army, 2013)

**Movement control team.** Lowest echelon subordinate element of Battalion. Functions at aerial and seaports of debarkation, distribution hubs, and other critical nodes to expedite port clearance and provide for the uninterrupted flow of resources and capabilities. (Chairman of the Joint Chiefs of Staff , 2013)

**Operational.** The level of war concerned with employing military forces in a theater of war or theater of operations to obtain an advantage over the enemy and thereby attain a strategic advantage. (USAF College of Aerospace Doctrine, Research and Education (CADRE), 1997).

**Strategic.** The level of war concerned with defining and supporting national policy and relates directly to the overall outcome of the war. (CADRE, 1997).

**Tactical.** The level of war concerned with translating potential combat power into success in battles and engagements through decisions and actions that create advantages when in contact with or in proximity to the enemy. (CADRE, 1997).

### **Limitations of the Study**

This study was limited to data collected from the Center for Army Lessons Learned, The United States Army Combined Arms Support Command, the United States Army Office of the Chief of the Transportation Corps and School, the Army Logistics University, and the Government Auditing Office. All the information contained within this document was unclassified.

### **Methodology**

The study analyzed the process, systems, and doctrine associated with achieving total asset visibility as it related to the transportation function of movement control. The study focused on historical information, automated systems, force structure, and training related to movement control and total asset visibility. This study analyzed the process of how movement data was transmitted between organizations at the tactical, operational, and strategic level. The information flow was examined to ascertain whether the current systems and force structure involved with this process can create a logistics common operating picture capable of providing total asset visibility to the commander. The study also examined the organizations comprising the movement control capability of the Army and the doctrine by which they are employed. The initial evaluation revealed a lack of capability and situational awareness at the Corps and Division level. Commanders at the theater level did not have a short line of communication to

affect planning and resource allocation at the tactical level. The study highlighted the lack of a theater-level executive agent in charge of movement control operations at Corps and Division. Furthermore, theater-level sustainment commands lacked trained personnel within their formations to address this shortfall. Additionally, current doctrine will have to be reviewed to reflect any changes in movement control capability, training and force structure.

The methodology of the work was completed using historical information, available through the Center for Army Lessons Learned, the Army Logistics University, and direct observations of the capability-based assessment process. The capability-based assessment process was used to identify gaps in capability to develop material and non-material solutions to mitigate the proposed gap. In this case, a lack of total asset visibility as it related to movement control operations. The capability-based assessment took into consideration current force structure, automated systems, army and joint doctrine, and current training principles. The capability-based assessment process identified shortfalls or gaps within this area and provided the information to formulate a viable solution. A capability gap is an inability to execute a specific course of action. The gap may be the result of a missing capability, lack of proficiency or sufficiency in a present capability, or the need to replace a current capability solution. The solutions were either material or non-material. A non-material solution directly related to changes made to training and doctrine. Material solutions were more encompassing and related to additional force structure and the procurement of new systems to mitigate the gap in capability.

### **Summary**

The supply chain was critical in determining success on the battlefield. Given the importance of logistics in all areas of operations, the Department of Defense has invested

significant resources in its supply chain. In 2005, with the encouragement of the Office of Management and Budget, the Department of Defense prepared an improvement plan to address systemic weaknesses in supply chain management and total asset visibility (United States Government Accountability Office, 1997).

Total asset visibility was cited in several Department of Defense planning documents as a critical initiative for improving logistics. Military operations in Iraq and Afghanistan highlighted the need for improvements in the Department of Defense's supply chain management processes as it relates to modern warfare. The demands of the combatant commander meter department of Defense supply chain management systems and processes, this was especially true of movement control. Movement control balances movement requirements against capabilities and integrates military, host nation, and commercial transportation to ensure a seamless transition from the strategic through the tactical level of operation. Including providing visibility of primary and alternates lines of communication and who or what was traveling on them. (Headquarters Department of the Army, 2013)

Movement control is the sole proprietor of in-transit visibility, a critical component in the conceptualization of total asset visibility. Effective Movement control systems and processes are necessary to achieve and maintain total asset visibility of equipment and supplies moving throughout the battlefield. Total asset visibility provides decision makers with the information to effectively guide logistics efforts and the ability to determine if these efforts are achieving the desired results within the battlespace (United States Government Accountability Office, 1997). Currently, movement control organizations cannot centralize movement planning, resource allocation, and the ability to achieve total asset visibility from the tactical to strategic level.

The supply chain was critical in determining success on the battlefield in Iraq and Afghanistan. Given the importance of logistics in all areas of operations, the Department of Defense has invested significant resources in its supply chain. In 2005, with the encouragement of the Office of Management and Budget, the Department of Defense prepared an improvement plan to address systemic weaknesses in supply chain management and total asset visibility (United States Government Accountability Office, 1997).

In the next chapter, the literature associated with this study will be reviewed, including the methodology used to evaluate movement control and total asset visibility. Chapter II will further elaborate on the capability-based assessment process and how it is used to assist the joint warfighter in closing gaps in capability.

## **Chapter II: Literature Review**

The success of military operations is often judged based upon the sum of its parts. Realistically, a considerable amount of planning and coordination takes place to achieve the desired results on the battlefield. Before and after every operation, existing quantitative and qualitative data to evaluate the risk and effectiveness of the action that took place. Transportation and sustainment activities are the means by which the military projects and supplies its forces. For this system to work effectively, decision-makers must have timely and accurate information to guide logistics efforts, and the ability to determine if their efforts are achieving the desired results. This chapter focuses on the importance of in-transit visibility and total asset visibility in a theater of operations. Also, this chapter highlights the risk associated with a lack of in-transit visibility. The literature review included the following topics: What are the current automated information technology systems used for in-transit visibility? What is the present posture of the Army's movement control capability? The literature review addressed the advantages of total asset visibility and the need for movement control at all levels of the operation. Finally, the capability-based assessment process is explained, including how it was used to validate and mitigate capability gaps.

### **Total Asset Visibility**

Total Asset Visibility is the ability of the Department of Defense logistics system to gather current information about the condition, location, movement, quantity, and status of assets anywhere in the logistics system to improve the logistics process (Office of the Inspector General, 1996). As early as 1992 the Department of the Army expressed the need for a single integrated logistics platform. This need was born from the idea that, the Army and the Department of Defense were transitioning to a distribution-based logistics system. The large,



overstocked supply depots hindered by long lines of communication were becoming a thing of the past. The proposed system needed to be interconnected and interoperable. Not only with Army-owned tactical information systems but also joint and commercial systems. The goal was to create a responsive distribution network that would be able to respond to the needs of the warfighter at the point of need. This network would also be sensitive enough to shift priorities on the fly, monitor current inventory, and predict future requirements. An effective distribution based logistics system relies heavily on an automated information system capable of providing total asset visibility.

Total asset visibility is essential to a distribution based logistics system. The Army must have visibility of assets in the supply chain, as well as the ability to move those assets where threats and priorities dictate. Total asset visibility tracks sustainment via a logical network and through various nodes along the distribution pipeline. Total asset visibility provides the warfighter and logistics planners the status of equipment and supplies moving across supply lines of communication. In-transit visibility coupled with total asset visibility supports decisions by material and transportation managers too; redirect shipments and transportation assets, redistribute assets, and to update changing unit locations and requirements.

### **Automated Information Technology**

Automated Information Technology is a unique suite of technologies that enables the user to capture source data, for transmission to automatic information systems. These systems are used to enhance the end-users ability to identify, track, document, and control forces, equipment, personnel, and cargo moving through the defense distribution network.

**In-transit visibility.** In-transit visibility is the ability to identify and track the movement of personnel, supplies, and equipment from its origin to its destination. In-transit visibility

provides information to support movement control and sustainment operations in wartime, contingencies, and peacetime. Dependable communication is vital to in-transit visibility data management. Visibility of assets within the Defense Distribution Network has consistently been a challenge for the Department of Defense (Miller, 1996). Currently, units place a radio frequency identification tag on individual pieces of cargo to track their last known location. Military shipping labels are affixed to particular shipment to identify whom the cargo belongs too, its origin and destination. The transportation movement data specific to the load is aggregated in one of several automated information management systems, none of which are interconnected. In-transit visibility is the in motion/movement tracking portion of total asset visibility (United States Army Combined Arms Support Command, 2006). Total asset visibility is an assimilation of data used to influence transportation and sustainment operations. Total asset visibility is accomplished when the component systems used for in-transit visibility can identify: where the cargo is, who has it, where is it going and who signed for it?

**Advantages.** Total asset visibility provides complete visibility of all Army assets by the organization, location, quantity, and readiness status. Total asset visibility improves the management of existing inventories, redistributes in-storage assets, diverts in-transit assets, and avoids unnecessary procurements. In-transit visibility enhances the effectiveness of logistics support provided to soldiers in the field, by integrating the transportation and sustainment process into a seamless logistics system. Logistics planners will be able to support the combat commander's planning and execution with timely proactive logistics (United States Army Combined Arms Support Command, 2006).

**Shortfalls.** The Army must field integrated automated information and communications systems that have common operating systems. Personnel must be trained in how to obtain

accurate information quickly; Leaders must learn how to gather and analyze movement data and incorporate that data into their decision-making processes. They must also learn how to evaluate the effectiveness and efficiency of total asset visibility and in-transit visibility related systems (Butera, 2003).

**Risk.** The lack of effective in-transit visibility can directly affect inventory management processes. As stated above, in-transit visibility is total asset visibility in motion. In-transit visibility and automated information systems allow logisticians to plan and coordinate movement along various supply lines of communication. Conversely, total asset visibility seeks to reduce excess inventory, provide finality of the status and location of cargo and equipment, and decrease bottlenecks along supply lines and at nodes (Headquarters Department of the Army, 2013).

### **Functional Movement Control**

Movement control is a critical job in both garrison and combat operations (Blanding, 2014). Movement control provides logisticians and warfighters with in-transit visibility of cargo, equipment, and personnel along the lines of supply in and out of the theater of operation (Blanding, 2014). Movement Control Battalions usually maintain command and control of up to 10 Movement Control Teams within an area of operations. Movement Control Battalions and Teams are responsible for providing area support to units assigned within their area of responsibility, including providing in-transit visibility of equipment and cargo as it passes through nodes along the distribution pipeline.

**Theater level responsibility.** Doctrinally, Movement Control Battalions are generally assigned to a Theater Sustainment Command or an Expeditionary Sustainment Command to regulate the movement of personnel, supplies, and equipment on primary and alternate supply routes (Blanding, 2014). Non-doctrinally, Movement Control Battalions, and Teams have been

tasked to perform missions outside the scope of their current force structure (Headquarters Department of the Army, 2013). The doctrinal role of these organizations is at the operational and tactical level. Since the beginning of the War on Terrorism, Movement Control Battalions and Teams have been tasked to augment a theater-level movement-planning staff or coordinate movement control operations for the entire theater. Despite these additional duties, Movement Control Battalions are still required to maintain operational control of 10 or more Movement Control Teams within their area of responsibility (Headquarters Department of the Army, 2013). Keeping command and control of these units would not be an issue, if not for the fact that movement control at the theater level mandates a senior level command to interface with the Joint Force's Commander and Host Nation representatives.

In 1998 the Army divested itself of the only Theater Army Movement Control Agency within its organizational structure. Doctrinally, the Movement Control Battalion may report directly to either the Theater Sustainment Command or the Expeditionary Sustainment Command. However, Theater Army Movement Control Agency was the headquarters element responsible for direct reporting to either the Theater or Expeditionary Sustainment Command (Headquarters Department of the Army, 2013). This command relationship allowed the Movement Control Battalion to have constant oversight of Movement Control Teams within the area of having to provide a theater-level liaison to the Joint Force's Commander and the Host Nation. The duties and responsibility of the Theater Army Movement Control Agency included but was not limited to; participating with task force staffs to provide a theater-wide movement control system and assisting corps and division staffs in movement planning and execution. The Theater Army Movement Control Agency also coordinated and interacted with NATO, the United Nations, and other non-governmental organizations (Blanding, 2014). The Theater Army

Movement Control Agency was also responsible for providing theater-wide in-transit visibility for the Joint Forces Commander and Army service component commander.

### **Relationship**

In-transit visibility and total asset visibility are often viewed as if they are interchangeable. Both concepts assert the ability to track and identify the location of equipment and supplies via automated information systems and technology. The actual differences between them lie in the level of detailed information provided, and the options given to the end-user once this information is received. The goal of sustainment operations is to support the warfighter by creating a timely and responsive distribution network (Headquarters Department of the Army, 2012). Distribution based logistics requires the right mixture of sustainment forces and equipment to execute the intent of the geographical combatant commander. The purpose of this study was to discuss the relationship between total asset visibility and movement control. The association exists within the systems employed to achieve total asset visibility and the organizations that use them.

The Department of Defense has several unclassified in-transit visibility systems, accessible via the world-wide-web. Anyone with the requisite credentials to access this information can do so at will. The problem is that data is worthless without the knowledge and understanding to put it to good use. Effective knowledge management is the byproduct of having the right organizational structure to analyze and process relevant data to achieve strategic objectives. The current movement control force structure does not have a theater level executive agent. This process is further hindered due to the lack of a single logistics system of record, capable of providing total asset visibility. The for mentioned issues are at the root of the Army

and Department of Defense's inability to accomplish total asset visibility and is by definition, a gap in capability.

### **Capability Gap**

The Chairman of the Joints Chiefs of Staff Instruction, CJCSI 3170.01I, defines a gap in capability as; The inability to meet or exceed a capability requirement, resulting in an associated operational risk until closed or mitigated (Chairman of the Joint Chiefs of Staff, 2015). The gap may be the result of a missing capability, lack of expertise or adequacy in existing capacity, or the need to replace a capability to prevent a future gap (Chairman of the Joint Chiefs of Staff, 2015).

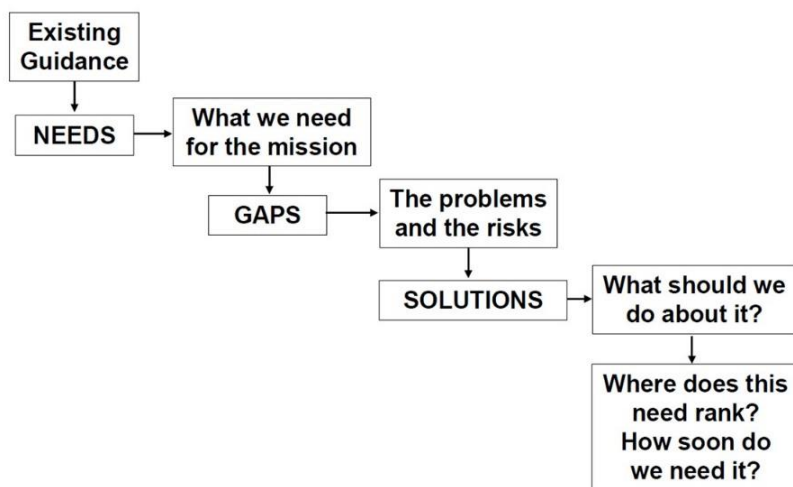
### **Capability Based Assessment**

Capability Based Assessments are performed to identify and document capability gaps. Capability Based Assessments determine the characteristics of a capability or combination of capabilities, and non-material and material solutions to resolve said gaps. Capability requirements must be traceable to an organization's operational role, mission, and described regarding tasks, standards, and conditions. Capability Based Assessments have three phases: Functional Area Analysis, Functional Needs Analysis, and the Functional Solutions Analysis. The Capability Based Assessment process cannot eliminate or evaluate all the uncertainties that may arise during the gap analysis process. The process does not consider changes in national strategy, global and intercontinental threats, budgets, emerging technology, future missions, or related program outcomes (Department of Defense, 2009).

Capability Based Assessments cover a broad range and are conducted based on operational shortcomings, a perceived future need, to provide a unified look at a mission area, to

examine a proposed operational concept, to explore a functional area, and to recommend actions on focused issues with extremely compressed timelines (Department of Defense, 2009).

A Capability Based Assessment is based on a perceived need, as stated in this study, requires extensive work to define. The fact that the requirements are forecasted, and not demonstrated, indicates that there is still some question about the exact nature of the problem, its scope, or whether the stated problem is a problem. The objective of the Capabilities Based Assessment is to validate capability gaps based on mission requirements, the risk associated with a lack of operational capability, and non-material, and material solutions. Figure 1 illustrates the logical flow of the Capability Based Assessment process in a simplified form, with inputs and outputs.



*Figure 1.* Capability based assessment.

## Summary

Total asset visibility is divided into two sub-elements, asset visibility, and in-transit visibility. In-transit visibility is the tagging and nodal monitoring capability that enhances Total Asset Visibility, and timely logistics support. In transit visibility is the movement data component of total asset visibility. Total asset visibility identifies and locates all classes of

supply as they move within the logistics pipeline, and is a comprehensive capability that improves the visibility of Army assets. Total asset visibility is an integral part of distribution-based logistics and uses information collected from several automated systems to provide the user with the location, status, and quantity of a commodity or piece of equipment. Total asset visibility and in-transit visibility are continually expanding to incorporate new technology, enabling leaders to make better informed, responsible decisions. The next chapter will examine the methods used to evaluate the proposed lack in movement control capability and the need for enhanced automated information technology systems to accomplish total asset visibility.



### **Chapter III: Methodology**

Army Movement Control organizations lack a critical capability needed to achieve Total Asset Visibility in an operational environment. The automated information technology systems employed by these organizations lack interoperability and interconnectivity. Such functionality is imperative to attain Total Asset Visibility of personnel and equipment moving across the battlespace. Total Asset Visibility has been the focus of this study as well as its relationship to Movement Control. Total Asset Visibility provides decision makers with the information to effectively guide logistics efforts and to determine if their efforts are achieving the desired results. The purpose of this study was to analyze the systems, organizations and doctrinal methods that comprise Movement Control and their role in providing Total Asset Visibility. Performance goals, programs, milestones, and metrics were scrutinized to find problems and capability gaps related to Movement Control elements accomplishing Total Asset Visibility.

This chapter includes the data collection and methodology used to validate the capability gap mentioned in Chapter II. The goal of this assessment is to develop actionable solutions to accomplish Total Asset Visibility. A Capability Based Assessment for Movement Control was on-going during this study, which identified several gaps in Movement Control, In-transit Visibility, and Total Asset Visibility.

#### **Problem**

An initial problem statement was developed to begin evaluating the present capability of Army Movement Control elements and their role in Total Asset Visibility. Understanding the problem involved reviewing the doctrine that covered the role, responsibilities, and capabilities of Movement Control elements. This review was used to verify if Total Asset Visibility was a function of Movement Control. If so, why was this task so difficult to accomplish? If not, what

capability is needed to achieve this task? The Center for Army Lessons is the Army's repository for gathering information and developing lessons learned through the Collection and Analysis Team Program. Research conducted via the Center for Army Lessons learned revealed a common trend. Movement Control organizations reported the need for a standard Army Information Management system to properly facilitate Total Asset Visibility. Units also reported that the present manning and equipment configuration of Army Movement Control organizations are ill-equipped and trained to facilitate Total Asset Visibility (Akin, 2006). The information gathered from the Center of Army Lessons learn was used to begin a Capability Based Assessment. Capability Based Assessments can be technical but are not meant to be highly complex. The future is uncertain, so not a lot of time was devoted to what-ifs or other speculative variables. The Capability Based Assessment did take into consideration some uncertainties, but focused on the defined problem, and did not include any loosely associated issues. Figure 2 illustrates the Capability Assessment task flow.

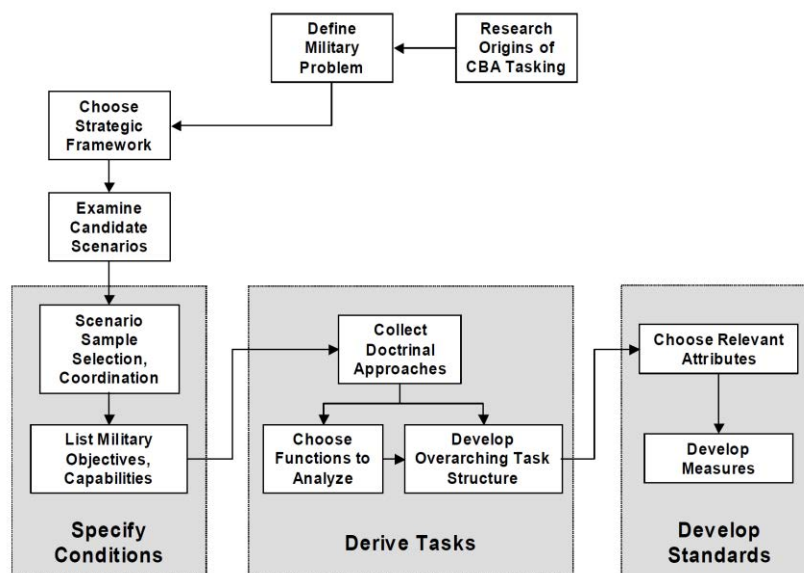


Figure 2. Capability based assessment task flow.

The next step was to define the parameters and conditions to analyze the problem.

## **Assumptions and Constraints**

Some assumptions related to this chapter include; A Capability Based Assessment may have been conducted by the Army to address this gap prior to the completion of this study. Current changes to force structure, doctrine or automated information systems may have been procured but are not a part of the current operations foot print. Some constraints include the amount of time needed to truly complete a Capability Based Assessment is much longer than the time allotted for this study. Multiple subject matter experts were unavailable to contribute to the overall assessment. Empirical data and some information related to this subject is limited due to security classification protocols. Organizations with the Army force structure that have movement control as a subsidiary task were not discussed.

## **Conditions**

The Capability Based Assessment was initiated based upon the determination of capability gaps related to Total Asset Visibility and Movement Control. Historically, Movement Control elements have been tasked to support the Joint Force by maximizing throughput, provide near-real-time visibility and provide time-definite delivery of equipment and supplies. Data collected by the Center for Army Lessons Learned suggests. Movement Control elements have been successful in accomplishing their doctrinal mission, but struggle to accomplish Total Asset Visibility (Akin, 2006).

It was necessary to review the Mission Essential Task List for Movement Control elements to assess the validity of this claim. Mission Essential tasks are taskings that units must be able to complete in combat. The Missions Essential Task List for a Movement Control Battalion revealed the following task: Analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules. Furthermore, the Mission

Essential Task list for a Movement Control Team stated; Provide In-Transit Visibility. Figure 3 is a list of mission essential task for both movement control elements.

Movement Control Battalion
<ol style="list-style-type: none"> <li>1. Plans, Programs and Operations Section conducts a mission analysis to establish guidance to support the commander's intent for coordinating support and maintaining the status of transportation activities throughout the entire theater area. <ol style="list-style-type: none"> <li>a. Develop and implements the theater movement program based on movement requirements submitted by Theater and Expeditionary Sustainment Commands Support Operations branch.</li> <li>b. Coordinate and monitors the status of inbound and outbound movements from the Theater area.</li> <li>c. Maintain liaison with theater, joint, combined, and adjacent movement control activities.</li> <li>d. Develop a program to maintain In-Transit Visibility of shipments and diverts, re-consigns, or holds cargo in transit.</li> <li>e. Analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules.</li> <li>f. Analyze Total Asset Visibility/In-Transit Visibility distribution information to determine if the distribution system meets the needs of the unit.</li> </ol> </li> </ol>
Movement Control Team
<ol style="list-style-type: none"> <li>1. Manage Common User Transportation Assets During Offense, Defense, Stability and Defense of Civil Authorities Operations <ol style="list-style-type: none"> <li>a. Synchronize Movement of Cargo</li> <li>b. Provide In-Transit Visibility</li> <li>c. Synchronize Movements Along the Main Supply Route</li> </ol> </li> </ol>

*Figure 3.* Mission essential task list.

Mission Essential Tasks list served as the baseline by which the organizations would be evaluated and were used to develop the exercise performance measures.

### **Exercise Scenario**

Exercise scenarios were used to simulate strategic objectives within a limited period. Notional units provided the necessary force structure, scope, and detail to the operation. The scenario location was not chosen for any particular reason, nor to add additional complexity to the assessment. The exercise scenario only served as the venue to assess the capability gap

between the present and desired capabilities. The exercise scenario provided a backdrop for subject matter experts to analyze the problem, discuss options, and prioritize solutions.

**Objective.** A mission was given to a notional Movement Control Element to provide support and in-transit visibility of personnel, equipment, and supplies, moving via all modes of transportation, over air and surface lines of communication throughout the supported area of operation. Each mission had a primary task to accomplish. Tasks are the results or effects the commander wants to achieve. Conditions framed the problem and the expectation of the Movement Control element. Standards established the benchmark for success, based upon the capability of the organization. Figure 4 outlines the mission objective for the Elements being evaluated.

Task	Provide in-transit visibility
Condition	Unit commanders were inquiring on the location of their shipment and the projected delivery date the shipment will arrive, and the movement control element will provide in-transit visibility to consignees.
Standard	The movement control element manages movement information for processing unit's equipment, personnel, and supplies for onward movement and delivery to consignees. The movement control element manages relevant information to track convoy operations, movement of supplies, redirect cargo and provide in-transit visibility to consignees in accordance with the commander's guidance.

*Figure 4.* Mission objective.

It is fundamental to analyze operational objectives, effects, and tasks, within the given scenarios to determine operational needs. Capability gaps have already been identified but must be validated within the scenario to develop solutions. Capability gaps are the by-product of a Capability Needs Assessment. The information gathered from the Center for Army Lessons Learned Collection and Analysis Teams, is shared with the proponent office that owns that operational function. In this case the U.S. Army Transportations Corp. The information was

further analyzed by subject matter experts within this career field to identify what are the operational gaps related to tasks, and how will they be mitigated to accomplish the desired effects. Figure 5 shows the relationship between objectives, effects, and tasks. Moreover, how they equate to capabilities.

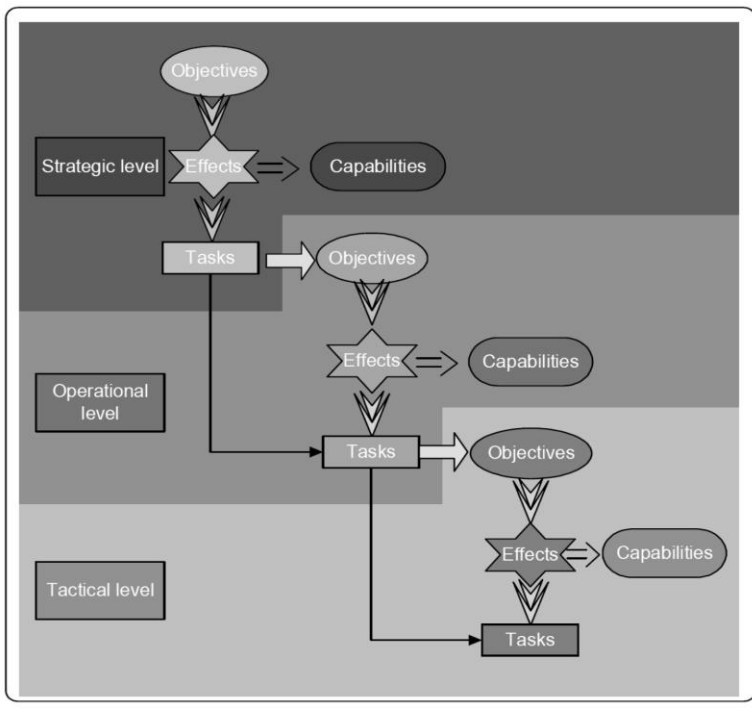


Figure 5. Objectives, effects, and tasks relationship.

Movement Control Elements were expected to complete various Performance Measures related to their Mission Essential Task List. The unit received a Pass or Fail based upon if the task or sub-task was accomplished. The results of the mission were then analyzed to validate the unit's capability.

Figure 6 illustrates an example of the performance measures used to analyze Movement Control capabilities.

Performance Measures	Pass	Fail
1. The transportation element maintains visibility of transportation assets, personnel, and supplies required to support theater operations.	X	
2. Obtain statistics on the last known location of unit (s) shipment through transportation automation system (s) reports and local programs.		X
2a. Analyze movement information.	X	

*Figure 6.* Performance measures.

Multiple Performance Measures were used to evaluate the capability of Movement Control Elements. Performance Measures that were not accomplished required further analysis. Failure's indicated a lack of capability. Each Performance Measure that received a Failure was examined to find the correlation between doctrine, force structure, and information systems. The results were captured for further use in the Needs Development portion of the Capability Based Assessment. Figure 7 illustrates the task flow of Capability Based Assessment with regard to scenario results analysis. The next step in the process would be to review the results of the exercise scenario to identify capability gaps and develop mitigating solutions.

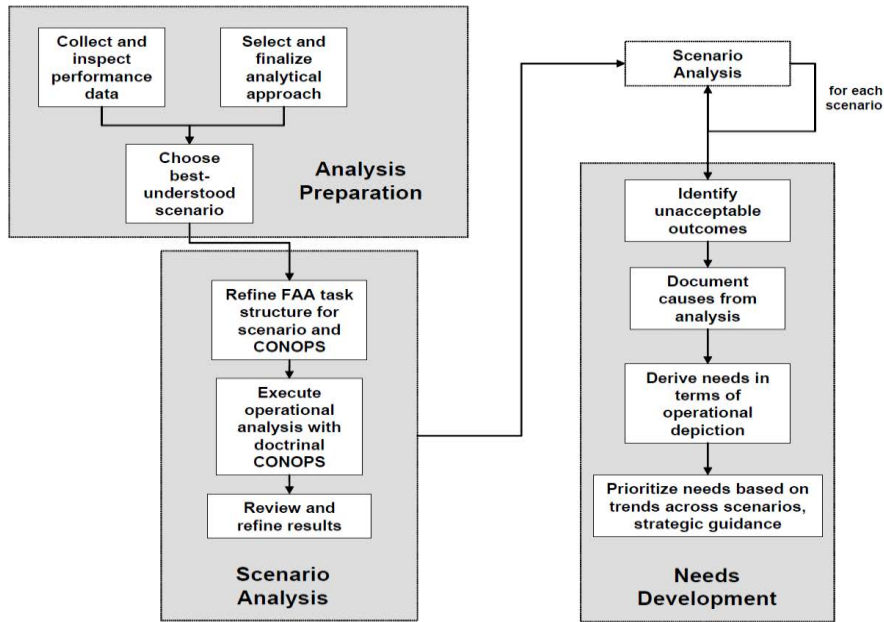


Figure 7. Scenario analysis task flow.

**Results.** The desired operational effects are related to capabilities and decomposed tasks and are linked with capability elements such as equipment, training, doctrine, and personnel. Going forward, the risk of this lack of capability will be evaluated to ascertain how this gap will affect the mission capability of sustainment forces if it is not mitigated.

**Risk.** Continuing with the Capability Based Assessment process. It was necessary to analyze the results to consider what risk is associated with each gap. Risk is inherent in conducting military operations. The amount of risk associated with achieving an operational objective must be weighed against the tasks required to complete the objective. In this case, it was necessary to derive how this lack of capability affected the missions, supported forces, resources and effects employed to achieve the objective?

Figure 8 displays the effect of each hazard, based upon the level of severity, Critical being the most severe. Negligible represents the lowest risk to operational effectiveness and is thereby the lowest level of priority for solution development.



Risk Assessment Matrix				Probability			
				Frequency of Occurrence Over Time			
				Likely	Probable	May	Unlikely
Severity	Effect of Hazard	I	Loss of Mission Capability, Unit Readiness or Asset; Death	1	1	2	3
		II	Significantly Degraded Mission Capability or Unit Readiness; Severe Injury or Damage	1	2	3	4
		III	Degraded Mission Capability or Unit Readiness; Minor Injury or Damage	2	3	4	5
		IV	Likely or No Impact to Mission Capability or Unit Readiness; Minimal Injury or Damage	3	4	5	5
		V	No Impact to Mission Capability or Unit Readiness; No injury or Damage	4	5	5	5
		Risk Assessment Codes 1- Critical 2- Serious 3- Moderate 4- Minor 5- Negligible					

Figure 8. Capability risk assessment matrix.

An unlikely risk should require the least amount of resources per solution and resolved quickly. In contrast, any capability gap that would result in Loss of Mission Capability, Unit Readiness or Asset; Death received the highest priority and resources to mitigate. During the final stage of the Capability Based Assessment process. Solutions were developed to mitigate each gap and categorized as either material or non-material.

## Summary

A 2017 Government Accountability Office report stated that in September 2015 the Department of Defense managed about 4.9 million inventory items, such as spare parts, with a reported value of \$91.7 billion. Effective and efficient supply chain management was critical for supporting the readiness and capabilities of the force, and for helping to ensure the Department of Defense avoids spending resources on unneeded inventory that could be better applied to other defense and national priorities (United States Government Accountability Office, 1997). The Department of Defense has experienced weaknesses in the management of its supply chain, particularly in inventory management, material distribution, and asset visibility.

This chapter focused on the Capability Based Assessment process. The goal of this process was to validate capability gaps and potential solutions and to close or mitigate the lack of operational capability. The Capability Based assessment focused on three areas within this study; Automated Information Systems, Doctrine and Force Structure. The next chapter will discuss the results of the Capability Based Assessment more in-depth.

## Chapter IV: Results

Army Movement Control organizations lack a critical capability needed to achieve total asset visibility in an operational environment. The automated information technology systems employed by these organizations require interoperability and interconnectivity to attain Total Asset Visibility of personnel and equipment moving across the battlespace. Total asset visibility has been the focus of this study, as well as how it provides decision makers with the information to effectively guide logistics efforts and to determine if their efforts are achieving the desired results.

The purpose of this study was to analyze the systems, organizations and doctrinal methods that comprise Movement Control and their role in providing Total Asset Visibility. Performance goals, programs, milestones, and metrics were scrutinized to find problems and identify capability gaps related to accomplishing this task. Chapter III discussed the data collection and methodology used to validate the problem statement in Chapter I. The operational capability of Army Movement Control organizations were assessed to identify and confirm any deficiencies related to accomplishing Total Asset Visibility. This portion of the Capability Based Assessment is primarily composed of the Capability Needs Assessment and gap analysis.

### **Problem**

The overarching problem stated in Chapter 1 and research conducted by the Center for Army Lessons learned was the basis of the exercise. Movement Control organizations reported the need for a standard Army Information Management system to properly facilitate Total Asset Visibility. Units also stated that the present manning and equipment configuration of Army Movement Control organizations are ill-equipped and trained to facilitate Total Asset Visibility. As stated in Chapter III, the Mission essential task list is the documented baseline capability of

every Army organization. The Mission Essential Task List for a Movement Control Brigade states the brigade will; Analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules and Analyze Total Asset Visibility/In-Transit Visibility distribution information to determine if the distribution system meets the needs of the unit. The exercise assessment was used to validate the Mission Essential Task stated above and the problem statement.

### **Conditions**

Conditions, attributes, measures, and standards were used to assess the capability requirements of the organization. Providing Total Asset Visibility was the primary task these organizations were expected to perform under certain conditions. The function of providing Total Asset Visibility was expected to be completed accurately, effectively and as efficient as possible so as not degrade mission capability or the overall operation. Appendix A shows the capability requirements statements and the assessment parameters related to each statement. The problem statement was used to develop the capability requirements statement, as it was the overall basis of the exercise. A sub-task related to the overall task was required to be performed within the exercise to validate the baseline capability of the Movement Control element and if necessary, identify a lack of capability. Attributes, measures, metrics, and standards were used to set the expectation of the results. In this case, the expectation was that the organization would be able to provide the desired information, accurately, within a timely manner, at least 99% of the time when requested. The standards justification was derived from the Army Movement Control training publication.

## Exercise Scenario

The exercise scenario only served as the venue to evaluate the capability requirement and provided a backdrop for subject matter experts to analyze the problem, discuss options, and prioritize solutions.

**Objective.** A mission was given to a notional Movement Control element to provide Total Asset Visibility. Performance measures were used to evaluate the ability of Movement Control element to complete the assigned task. Figure 9 shows the task condition and standard for the mission. A short synopsis of the exercise was provided to the subject matter experts taking part in the discussion. This short narrative was used to inform the evaluation audience of what task was being analyzed, under what conditions and to what operational standard.

Task	Provide total asset visibility
Condition	Given a notional Movement Control Battalion, Exercise Scenario, enablers and a supported brigade combat team.
Standard	The movement control element will provide users with timely and accurate information on the location, movement, status, and identity of units, personnel, equipment, material, and supplies. The movement control element manages movement information for processing unit's equipment, personnel, and supplies for onward movement and delivery to consignees. The movement control element manages relevant information to track convoy operations, movement of supplies, redirect cargo and provide in-transit visibility to consignees in accordance with the commander's guidance.

*Figure 9.* Mission objective.

## Results

Discussion templates were used to capture the data provided by the subject matter experts during the discussion of each task. Participants were asked to fill out the template based on their understanding of the task as it related to accomplishing Total Asset Visibility. Tasks that were unable to be accomplished by the Movement Control element was the only tasks that required further discussion. Each performance measure was annotated appropriately with either a Pass or

Fail, based upon if the task was accomplished or not. Success could only be achieved with the with the current equipment, training, doctrine, and personnel within the organization. The failure to complete the task did not represent a complete lack of capability. Depending upon the task, a failure could be related to a lack of sufficiency or proficiency associated with accomplishing the task. Figure 10 is an example of the discussion template used during the evaluation. Appendix B illustrates the performance measures used to analyze and discuss the capability of the organization.

Organization: Movement Control Battalion			
Performance Measure/Issue (Select all that apply)	<input type="checkbox"/> Doctrine <input checked="" type="checkbox"/> Organization <input type="checkbox"/> Training	<input checked="" type="checkbox"/> Material <input type="checkbox"/> Leadership & Education <input type="checkbox"/> Personnel	<input type="checkbox"/> Facilities <input type="checkbox"/> Policy <input type="checkbox"/> Culture
<input checked="" type="checkbox"/> Other issue not listed: Host Nation			
Problem/Issue: Lack of the theater level Movement Control Organization			
Major Discussion Points: Movement control planning and execution at the theater level mandates an organization with the force structure and systems to interface with the host nation and joint service component commanders at the strategic level of operations.			
Recommendation: Develop Theater Movement Control element			

*Figure 10.* Discussion template.

Incomplete performance measures were highlighted for further evaluation and discussion. Appendix C is an example of a capability gap that has been identified. The analysis concluded that the movement control element would not be able to perform the task within the necessary threshold. The information captured on the discussion template was to identify the reasons that the Movement Control element was unable to complete the task. The first block of the discussion template lists the nine non-material elements used to solving warfighting capability gaps. Unaccomplished tasks were characterized based upon the non-material elements listed on the discussion template. The elements served as a guide to identify the root of the problem. In this

case, the lack of capability was due to a lack of existing capability such as an automated information system. The second task was unable to be accomplished due to a lack of sufficient training to accomplish to the mission. Figure 11 shows a gap statement and the justifications statement for why the task could not be accomplished. The Justification statements were required due to the subjective nature of the analysis and stated why this task represents a shortfall in capability.

<p>Capability Requirement Statement: Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules.</p> <p>Task: Obtain statistics on the last known location of unit (s) shipment through transportation automation system (s) reports and local programs.</p>	
Due To:	Justification
Lack of existing capability	Army Movement Control organizations require timely and accurate information of the location, condition, and identity of equipment and supplies at any point from origin to destination.
<p>Capability Requirement Statement: Army Movement control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to determine if the distribution system meets the needs of the unit</p> <p>Task: The transportation element conducts research to respond to shipment inquiries, discrepancies, and routine movements transactions.</p>	
Due To:	Justification
Lack of sufficiency	Army Movement Control organizations require an institutional training program to develop Soldiers capable of analyzing the location of assets, supplies, units, and the ability to use this information to create a common logistics operating picture.

*Figure 11. Gap statements.*

## **Risk**

Risk assessments were conducted to determine the effect the lack of capability would have on the Mission, Resources and Supported Forces within the exercise. The risk assessment was broken down into three categories. High, Moderate and Low. A High rating illustrated a severe risk to either the mission, force or resources. Moderate indicated a slight risk and Low posed little to no risk to either the mission, force or resources employed. Risks that would have a

severe impact on operations would receive the highest priority during the solutions development portion of the Capability Based Analysis. If a cost-benefit analysis were conducted, the severity of the risk and the cost to mitigate the risk would be considered in the overall cost of mitigating the gap. Figure 12 shows the risk assessment results for each capability gap and how they were evaluated as a threat to the operation if not mitigated. The overall risk is based on the average rating of each category.

Capability Requirement Statement: Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules.		
Task: Obtain statistics on the last known location of unit (s) shipment through transportation automation system (s) reports and local programs.		
Risk to:	Rating	Justification
Mission	High	Provide timely and accurate information of the location, condition, and identity of equipment and supplies at any point from origin to destination.
Force	High	
Resources	Moderate	
Overall Risk: High		
Capability Requirement Statement: Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to determine if the distribution system meets the needs of the unit		
Task: The transportation element conducts research to respond to shipment inquiries, discrepancies, and routine movements transactions.		
Risk to:	Rating	Justification
Mission	High	Army Movement Control organizations require an institutional training program to develop Soldiers capable of analyzing the location of assets, supplies, units, and the ability to use this information to create a common logistics operating picture.
Force	Moderate	
Resources	Moderate	
Overall Risk: Moderate		

Figure 12. Risk assessment.

### Prioritization

Gap priority was assigned based upon the results of the risk assessment. Capability gaps that presented a severe risk to military operations received the highest priority for solution development.



Figure 13 illustrates the priority of each gap and the justification. The rating was based upon the results of the risk assessment. The justification further stressed the importance of finding a solution to mitigating the gap due to the effect this lack of capability would have on the operation.

<p>Capability Requirement Statement: Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules.</p> <p>Task: Obtain statistics on the last known location of unit (s) shipment through transportation automation system (s) reports and local programs.</p>	
Rating	Justification
<p>1 - Severe impact on operational effectiveness; moderate operational risk if not mitigated.</p>	<p>This capability gap impacts the ability of the Movement Control element to efficiently coordinate, plan and execute sustainment operations throughout the area of operation. Solutions to address this capability should address shortfalls within the current suite of automated information management systems, force structure, training, and doctrine associated with these elements. Failure to mitigate this gap will result in the increased degradation of the Combatant Commanders ability to provide sufficient logistics support to the warfighter and continue to hinder sustainment planning at the theater level.</p>
<p>Capability Requirement Statement: Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to determine if the distribution system meets the needs of the unit.</p> <p>Task: The transportation element conducts research to respond to shipment inquiries, discrepancies, and routine movements transactions.</p>	
Rating	Justification
<p>2 - Moderate impact on operational effectiveness; moderate operational risk if not mitigated.</p>	<p>This capability gap impacts the ability of Movement Control organizations to monitor and assess the effectiveness of the distribution network within the area of operation. This gap also impacts the ability of movement control organizations to provide time-definite information on the locations of assets and supplies traversing supplies lines of communication and the ability to convey this information at all levels of war. Solutions to address this capability should address shortfalls within the current suite of automated information management systems, force structure, training, and doctrine associated with these elements. Failure to mitigate this gap will result in the increased degradation of the Combatant Commanders ability to provide sufficient logistics support to the warfighter.</p>

Figure 13. Gap priority.

## Summary

The goal of this process was to validate capability requirements within the confines of an exercise the scenarios. The purpose was to identify a lack of capability related to the Mission Essential Task list and the problem statement. The Capability Based Assessment focused on three areas within this study; Automated Information Systems, Doctrine and Force Structure. Based upon their Mission Essential Task List, Movement Control Teams are not required to perform Total Asset Visibility and represent a lack of operational capability at the tactical level. Movement Control Teams were recognized as not having the appropriate force structure, equipment and training to accomplish Total Asset Visibility. Movement Control Teams are subordinate to Movement Control Battalions and cannot perform this task. Movement Control Battalions are comprised of a robust staff of senior transportation and logistics professionals, capable of coordinating and providing oversight of joint distribution operations at the theater level. Movement Control battalions are considerably more capable organization than a Movement Control Team. However, the Battalion relies heavily on the Team to maintain in-transit visibility of equipment and supplies moving across the battlespace. Movement Control Battalions are expected to analyze Total Asset and In-transit visibility information. The term analyze does not suggest the organization is supposed to perform this task but must be able to interpret the data and provide planning and execution guidance to higher, and was at the focal point of the exercise scenario. Movement Control Battalions and the systems they employ lack the interoperability and interconnectivity to perform Total Asset Visibility. The next chapter will discuss the solutions of the Capability Based Assessment and what material and non-material solutions can be developed to mitigate this capability gap.

## **Chapter V: Discussion, Conclusion and Recommendation**

Total Asset Visibility is critical to providing an efficient and responsive supply chain network to support the warfighter. Army Movement Control organizations lack a critical capability needed to achieve total asset visibility in an operational environment. The automated information technology systems employed by these organizations lack interoperability and interconnectivity to attain total asset visibility of personnel and equipment moving across the battlespace. The purpose of this study was to analyze the systems, organizations, and doctrinal methods that comprise Movement Control within the Department of the Defense and their role in providing total asset visibility.

Chapter I provided the initial groundwork for the study with the problem statement and the overall purpose. Before the study could begin, it was essential to understand the relationship between Total Asset Visibility and Movement Control. The lack of effective In-Transit Visibility at all levels, in a joint environment, implied that the current Movement Control capability within the Department of Defense was not postured to support military operations as directed by the Geographical Combatant Commander. Similar reports submitted to the Center for Army Lessons Learned suggested the same problem. A Capability Based Assessment was performed to determine if there existed capability gaps related to Movement Control. Historical information, available through the Center for Army Lessons Learned, the Army Logistics University, was used to identify gaps in capability and to discuss solutions to mitigate the proposed gap. The gap may be the result of a missing capability, lack of proficiency or sufficiency in a present capability, or the need to replace a current capability solution. Numerous terms were introduced during this chapter to enable the reader to understand some the unique terms and concepts related explicitly to the Army and the Department of Defense.

Chapter II outlined what Total Asset Visibility was and why it was essential to a distribution based logistics system. The Army must have visibility of assets in the supply chain, as well as the ability to move those assets where threats and priorities dictate. Total Asset Visibility tracks sustainment via a logical network and through various nodes along the distribution pipeline. In-Transit Visibility coupled with Total Asset Visibility supports decisions by material and transportation managers too; redirect shipments and transportation assets, redistribute assets, and to update changing unit locations and requirements. The lack of effective In-Transit Visibility can directly affect inventory management processes. In-Transit Visibility and automated information systems allow logisticians to plan and coordinate movement along various supply lines of communication. Conversely, Total Asset Visibility seeks to reduce excess inventory, provide finality of the status and location of cargo and equipment, and decrease bottlenecks along supply lines and at nodes (Headquarters Department of the Army, 2013). Chapter II also outlined the Capability Based Assessment process. Capability Based Assessments are used to determine the characteristics of a capability or combination of capabilities, and non-material and material solutions to resolve said gaps.

Chapter III mainly involved the methodology and how the study was conducted. The primary focus of the study was to evaluate Army Movement Control organizations and their present capability related to accomplishing Total Asset Visibility in an operational environment. The Center for Army Lessons is the Army's repository for gathering information and developing lessons learned through the Collection and Analysis Team Program. Research conducted via the Center for Army Lessons learned revealed a common trend. The automated information technology systems employed by these organizations lack interoperability and interconnectivity. Movement Control organizations reported the need for a standard Army Information

Management system to properly facilitate Total Asset Visibility. Units also reported that the present manning and equipment configuration of Army Movement Control organizations are ill-equipped and trained to facilitate Total Asset Visibility (Akin, 2006). This review was used to verify if Total Asset Visibility was a function of Army Movement Control elements, and if so? Why was this task so difficult to accomplish? If providing Total Asset Visibility was not a function of these organizations, what capability would the Army need to achieve this task?

Chapter IV resented the results of this study. An exercise scenario was used to validate the problem statement and identify any gaps in capability related to the Army's Movement Control capability, and their role in providing Total Asset Visibility. The scenario provided the backdrop, size, and scope to allow subject matter experts to discuss the problem in depth, and develop actionable solutions to mitigate any foreseeable capability gaps. Discussion templates were used to capture the information provided by the participants relevant to any performance measures that were unable to be accomplished. It was necessary to reference the mission essential task for a Movement Control Battalion to provide the baseline capability of the organization. The mission essential task list dictates what critical task they supposed to be able to perform. This list was used to validate the capability of Movement Control Battalion's in the Army and identified and a shortfall in the capability of Movement Control Teams. The information collected during the exercise was used to develop recommendations to mitigate the lack of capability.

### **Limitations**

This study was limited to data collected from the Center for Army Lessons Learned, The United States Army Combined Arms Support Command, the United States Army Office of the Chief of the Transportation Corps and School, the Army Logistics University, and the

Government Auditing Office. All the information contained within this document was unclassified. Current changes to force structure, doctrine or automated information systems may have been procured but are not a part of the current operations footprint. Some constraints included the amount of time needed to complete a Capability Based Assessment, which is usually much longer than what was allotted for this study. Multiple subject matter experts were unavailable to contribute to the overall assessment. Some empirical data and information related to this subject were limited due to security classification protocols. Organizations within the Army force structure that have Movement Control as a subsidiary task were not discussed.

### **Conclusion**

The results of the Capability Based Assessment revealed a lack of operational capability within the Movement Control Capability of the U.S. Army. Based on the assessment, the current Movement Control force structure is unequipped to accomplish this task effectively. The Army and the Department of Defense have invested many resources in technology to improve the In-Transit Visibility of equipment and supplies throughout the battlefield. Unfortunately, a great many of these systems are not interconnected. Much of this issue is do in part to the Army using different vendors to provide different systems.

Information classification and security is another issue. Some information related to Total asset and In-Transit Visibility of supplies and equipment does not need to be classified as sensitive. Nor does this information require any special security requirements for access via the internet. Conversely, the battle command systems used to display troop movements and locations on the battlefield is very much classified, and not accessible via the internet. These systems are connected to a classified internet network that is inaccessible to everyone that does not have the requisite credentials to gain access.

This issue of accomplishing Total Asset Visibility is not explicitly confined to the automated information systems used to achieve this task. The organizations that comprise the sustainment forces of the Army do not possess the force structure to complete this task effectively. Operational Movement Control as a function is conducted at every level of war. The Army has created a Movement Control executive agent, at the theater level, before the completion of this study, to fill the capability gap at the theater level. Unfortunately, an integrated and interoperable in-transit and asset visibility system are still non-existent.

### **Recommendations**

The Department of Defense and the Army are always working to improve the manner in which wars are fought on the battlefield. Logistics support is key to the readiness and survivability of the forces deployed to defend this nation. Movement Control operations are continually evolving to include the systems and training designed to support this task. The information gathered during this study can be used to examine further the training, force structure and automated information systems used to conduct Movement Control and Sustainment operations within the Army. Trained and ready personnel have always been a vital resource to the success of the military. The caveat to that statement is that new and emerging technology will significantly influence the manner in which wars are fought in the future.

Autonomous technology has given way to drones and self-driving vehicles of various sizes and capacity. The challenges facing the Army relating to this task will become less of a people and systems-centric issue and more of a systems-centric issue. The automated information management systems and technology used today to provide In-transit Visibility must evolve into more of a command and control system. Total Asset Visibility can be achieved because many of the assets used to supply forces on the battlefield will be robots, controlled from a central location that will

likely be nowhere near the threat or supported organization. With the advent of a Theater Movement Control Element, Movement Control planning and execution can begin at the strategic level with guidance being relayed down to the Battalions and Teams at the operational level. This same concept can be applied as the Army moves towards autonomous cargo vehicles and supply lines. The only potential lack in capability that will have to be mitigated is with the technical training needed to maintain the network, and the decision makers provide vital sustainment to the forces in the field.



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### Appendix A: Capability Requirements Statements

<p>Capability Requirement Statement: Army Movement Control elements provide Total Asset Visibility of the condition, location, movement, quantity, and status of assets anywhere in the logistics system to improve the logistics process.</p> <p>Task: Obtain statistics on the last known location of unit (s) shipment through transportation automation system (s) reports and local programs.</p> <p>Conditions: OCONUS Operational Environment</p>				
Attribute	Measure	Metric	Standard	Standards Justification
Accurate, Efficient	Availability and accuracy of information/data.	Percent	<p>Threshold: <math>\geq 99\%</math> of users will have access to accurate, and timely information relevant to the location of assets and supplies traversing the defense distribution network.</p> <p>Objective = Threshold</p>	<p>Movement Control forces require a Common Operating Picture (COP) to allow material managers to identify, cross-level, and redirect assets throughout the joint distribution network. Failing to mitigate this gap will result in future forces being unable to leverage Army distribution capabilities and will require the use of the less efficient distribution management processes.</p> <p>Sources: (Headquarters Department of the Army, 2013)</p>

Capability Requirement Statement: Army Movement Control elements provide Total Asset Visibility of the condition, location, movement, quantity, and status of assets anywhere in the logistics system to improve the logistics process.

Task: Provide Army Movement control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to determine if the distribution system meets the needs of the unit

Conditions: OCONUS Operational Environment

Attribute	Measure	Metric	Standard	Standards Justification
Accurate, Effective	Availability and accuracy of information/data.	Percent	<p>Threshold: <math>\geq 99\%</math> of users will have access to accurate, and timely information relevant to conducting asset and inventory management within the defense distribution network.</p> <p>Objective = Threshold</p>	<p>Movement Control forces require the necessary force structure to analyze and advise the Geographical Combatant Commander on the responsiveness and effectiveness of the logistics network. Failing to mitigate this gap will result in future forces being unable to leverage Army distribution capabilities and will require the use of the less efficient distribution management processes.</p> <p>Sources: (Headquarters Department of the Army, 2013)</p>

### Appendix B: Performance Measures

Performance Measures	Pass	Failed
1. Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules.	X	
a. The transportation element maintains visibility of transportation assets, personnel, and supplies required to support theater operations.	X	
b. Control implementation and operation of theater unique transportation automation system (s) and telecommunications that supports movement control management functions within the assigned area of operations.	X	
c. Closely monitor the flow of personnel, equipment, and cargo moving within and out of the assigned area of operation	X	
d. Ensure requests for cargo visibility are processed accurately.		X
e. Obtain statistics on the last known location of unit (s) shipment through transportation automation system (s) reports and local programs.		X
f. Analyze movement information.	X	
2. Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to determine if the distribution system meets the needs of the unit		X
a. Continue to monitor and track movements to ensure timely delivery consistent with established priorities and required delivery date (s).	X	
b. The transportation element conducts research to respond to shipment inquiries, discrepancies, and routine movements transactions.		X
c. Review the database to determine the last known location of unit (s) equipment, materiel, and supplies or diverted based upon changes in priority and destination.		X
d. Track movement information and update the appropriate system.		X
e. The movement specialist or automated data operator performs specialized transportation support for the element.	X	
f. Monitor movements schedules and programs.	X	

### Appendix C: Capability Gap Identification

<p>Capability Requirement Statement: Army Movement Control elements provide Total Asset Visibility of the condition, location, movement, quantity, and status of assets anywhere in the logistics system to improve the logistics process.</p> <p>Task: Obtain statistics on the last known location of unit (s) shipment through transportation automation system (s) reports and local programs.</p> <p>Conditions: OCONUS Operational Environment</p>				
Attribute	Measure	Metric	Standard	Standards Justification
Accurate, Efficient	Availability and accuracy of information/data.	Percent	<p>Threshold: <math>\geq 99\%</math> of users will have access to accurate, and timely information relevant to the location of assets and supplies traversing the defense distribution network.</p> <p>Objective = Threshold</p>	<p>Movement Control forces require a Common Operating Picture (COP) to allow material managers to identify, cross-level, and redirect assets throughout the joint distribution network. Failing to mitigate this gap will result in future forces being unable to leverage Army distribution capabilities and will require the use of the less efficient distribution management processes.</p> <p>Sources: (Headquarters Department of the Army, 2013)</p>
<p>Baseline Capability: Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules.</p>				
<p>Assessment: Does not meet the threshold standard</p>				
<p>Justification: Based on historical information (Akin, 2006). Movement Control elements lack the capability to provide a common operating picture of assets and supplies moving along the lines of supply from the point of origin to the destination.</p>				

Capability Requirement Statement: Army Movement Control elements provide Total Asset Visibility of the condition, location, movement, quantity, and status of assets anywhere in the logistics system to improve the logistics process.

Task: Provide Army Movement control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to determine if the distribution system meets the needs of the unit

Conditions: OCONUS Operational Environment

Attribute	Measure	Metric	Standard	Standards Justification
Accurate, Effective	Availability and accuracy of information/data.	Percent	<p>Threshold: <math>\geq 99\%</math> of users will have access to accurate, and timely information relevant to conducting asset and inventory management within the defense distribution network.</p> <p>Objective = Threshold</p>	<p>Movement Control forces require the necessary force structure to analyze and advise the Geographical Combatant Commander on the responsiveness and effectiveness of the logistics network. Failing to mitigate this gap will result in future forces being unable to leverage Army distribution capabilities and will require the use of the less efficient distribution management processes.</p> <p>Sources: (Headquarters Department of the Army, 2013)</p>

Baseline Capability: Army Movement Control elements analyze Total Asset Visibility/In-Transit Visibility distribution information to monitor time-definite delivery schedules.

Assessment: Forces lack trained and experienced personnel

Justification: Based on current force management data. Movement Control elements lack the necessary force structure to provide the planning, execution, and guidance of the effectiveness of the defense distribution network.