

A Context Analysis of the Movement Control Domain for the Army Tactical Command and Control System (ATCCS)

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A Context Analysis of the Movement Control Domain for the Army Tactical Command and Control System (ATCCS)

Abstract: This report describes the results of the first phase of a domain analysis performed by the SEI's Domain Analysis Project. The report establishes the context and scope of the *movement control* domain within command and control (C²) systems and in particular, ATCCS. It discusses the purpose of a domain analysis and presents an overview of the method being used to perform the analysis. The report describes both the Army's use of ATCCS in achieving the Army mission and the ATCCS software development strategy. A brief description of Army C² systems lays a foundation for defining movement control and its context in the ATCCS structure. Within this context, the report identifies the key areas within movement control that will be explored during the remainder of the domain analysis. The report also describes the approach for performing the analysis and includes appendices providing additional information about ATCCS, relevant terms, and acronyms.

1. Introduction

1.1. Audience for this Report

This report is intended for Army and contractor personnel associated with the ATCCS program. It will provide the Army groups with an understanding of the application of a specific domain analysis method. The report is also directed towards individuals generally interested in the application of domain analysis methods. It provides an example of the application of a specific domain analysis method in the command and control (C²) area.

1.2. Purpose of Domain Analysis

Domain analysis is "the process of identifying, collecting, organizing, and representing the relevant information in a domain based upon the study of existing systems and their development histories, knowledge captured from domain experts, underlying theory, and emerging technology within the domain" [FODA 90]. Domain analysis enables the systematic discovery and exploitation of commonality across related software systems. Domain analysis can also propose a set of architectural approaches for the implementation of new systems in a domain. This process is a fundamental technical requirement for achieving successful software reuse and can provide a reference model for understanding and describing an application domain.

The Feature-Oriented Domain Analysis (FODA) method was developed at the SEI to find and document the commonality in domains. This report documents, in part, the results of performing the first phase of domain analysis on a specific area within the class of C² systems using the FODA method. An overview of this and the other two phases in the method are given in the following sections.

1.3. Overview of The FODA Method

FODA defines a process for domain analysis and establishes specific products for later use. Three basic phases characterize the FODA process:

1. *Context Analysis*: defining the extent (or bounds) of a domain for analysis
2. *Domain Modeling*: providing a description of the problem space in the domain that is addressed by software
3. *Architecture Modeling*: creating the software architecture(s) that implement solutions to the problems in the domain

1.3.1. Context Analysis

The purpose of *context analysis* is to define the scope of a domain that is likely to yield exploitable domain products. During context analysis, the relationships between the candidate domain and the elements external to the domain are analyzed. The variability of the relationships are examined and the external conditions are evaluated (for example, different applications in the domain and their data requirements, different operating environments, etc.). The results of the context analysis, along with other factors such as availability of domain expertise, domain data, and project constraints are used to scope the domain.

The final results of the context analysis are documented in a *context model*. This model includes one or more structure diagrams and the context diagram. A structure diagram is an informal block diagram in which the target domain is placed relative to higher, lower, and peer-level domains. Higher level domains are those of which the target domain is a part or applications that are part of top-level domains. Lower level domains (or subdomains) are those within the scope of the target domain, but which are well understood. Previous domain analysis results or standards are available and, therefore, they will not be included in the analysis. Any other domains that interface with the target domain (i.e. peer domains) must also be included in the diagram.

The context diagram is a data-flow diagram showing data-flows between the target domain and all other entities with which the target domain communicates. One thing that differentiates the use of data-flow diagrams in domain analysis from other typical uses is that the variability of the data-flows across the domain boundary must be accounted for with either a set of diagrams or text describing the differences.

1.3.2. Domain Modeling

Domain modeling addresses the commonalities and differences of the problems of the domain and the applications within it. The domain model applies to the scope established during context analysis. A number of models representing different aspects of the problems are produced. The domain modeling phase consists of three major activities:

1. *Feature Analysis*: the capture of the end-user's understanding of the general capabilities of applications in a domain. The commonalities and differences of a domain of interest to end-users are designated as features. These features generalize and parameterize the other models produced later in the domain analysis.

2. *Entity-Relationship Modeling*: the capture and definition of domain knowledge that is essential for implementing applications in the domain. This knowledge is typically contextual information which gets lost after a development, or is deeply embedded in the software and is often difficult to trace. Those who maintain or reuse software need this information in order to understand the problems the domain addresses.
3. *Functional Analysis*: the identification of functional commonalities and differences of the applications in a domain. This model abstracts and structures the common functions in a model from which application-specific functional models can be instantiated or derived with appropriate adaptation. Common features and ER model entities form the basis for the abstract functional model.

1.3.3. Architectural Modeling

Architectural modeling provides a software solution to the problems defined in the domain modeling phase. An architectural model (also known as a design reference model) is developed in this phase and from this, detailed design and component construction can be done. This architectural model is a high-level design for applications in a domain. It focuses on identifying concurrent processes and domain-oriented common modules and on allocating the features, functions and data objects defined in the domain models to the processes and modules.

1.4. The ATCCS Movement Control Domain Analysis

The Domain Analysis Project at the SEI has completed the context analysis phase of a domain analysis of the ATCCS movement control domain. This effort is sponsored by the Program Executive Office, Command and Control Systems (PEO-CCS). This report summarizes our understanding and knowledge of the movement control domain given the domain information we have in hand. The remainder of this report is organized as follows:

- Chapter 2 is a synopsis of our understanding of ATCCS as a whole and where it fits in an overall view of the U.S. Army organization and mission.
- Chapter 3 is an overview of the scope of the movement control domain and its applicability within ATCCS and its nodes.
- Chapter 4 is concerned with the effect of the context analysis phase on planning the rest of the domain analysis process.

Two appendices are also included in the report. Appendix A is a description of the five Battlefield Functional Areas (BFAs) that constitute ATCCS; Appendix B is the domain dictionary of acronyms and terms. (This dictionary will evolve as the domain analysis continues.) Appendix C provides the key acronyms of the domain.

2. Definition of ATCCS and Its Role in Army C²

In order to best understand the scope of a domain, we must first have a basic knowledge about the higher level domain(s) of which the target domain is a part. Also, an understanding of the domain's applications and its users is useful in knowing how the target domain interfaces with its peers. We know that movement control is one domain within ATCCS which itself is an application of the higher level C² domain. In this chapter, we describe in brief:

- the overall mission and structure of the Army
- why C² applications, ATCCS in particular, are needed
- where movement control fits in the C² domain and its applications

This chapter currently contains information on the entire Army command structure and ATCCS. The purpose of the context analysis phase of domain analysis is to limit the scope of movement control. As we narrow the scope of the domain to the areas to be focused upon, the scope of the material in this chapter will narrow accordingly.

2.1. What Do the Words in ATCCS Mean?

Several of the words embedded within the phrase Army Tactical Command and Control System must be properly defined to understand the scope of ATCCS and where it fits in the overall structure of the United States Army.

tactical	pertaining to the employment of units in combat
command	A specifically designated linetype organization with direct line authority from the next higher commander or the Chief of Staff, United States Army. It must have a clearly identifiable headquarters and organizational structure composed of a variety of units
control	authority or ability to direct or regulate

These words and their definitions are taken from the domain terminology dictionary being compiled as part of the movement control domain analysis. A complete listing of the dictionary to date is included in Appendix B.

The word 'tactical', in particular, shows that tactics are dictated by strategy. Thus we need to know where in the Army unit hierarchy the split occurs between commands that are strategic vs. those involved in tactics.

2.2. An Overview of the US Army's Missions and Structures

2.2.1. Army Missions

When viewed from the broadest possible scope, the Army has two missions. The primary mission is to ensure that the Army can defend the areas assigned to it and according to [Army 87] "to deter wars before they start, to control wars if they do start, and to terminate wars on terms favorable to U.S. interests." The ability to perform this mission involves determining and propagating strategy and is appropriate for only the highest echelons or levels of the Army command structure. These levels are known as the *Echelons Above Corps* (EAC).

The other mission type noted is tactical. As stated in Section 2.1, the role of tactics is to attain the goals designated by strategy. Tactics are implemented by the units in the *Echelons Corps and Below* (ECB).

2.2.2. The Army's Need for Command and Control Systems

Both the strategic and tactical mission types share the need for a C² system to collect and utilize information that allows these missions to be performed more effectively by the units involved. For example, the strategic mission has the World Wide Military Command and Control System (WWMCCS). Together with other strategic systems, WWMCCS connects the Army EAC commands with each other as well as with the high level commands of the other US armed services. As part of WWMCCS, the Army provides access to high level status information to EAC commands through the Army WWMCCS Information System (AWIS).

For handling the tactical mission(s), the Army is building ATCCS. ATCCS provides its users, commanders and staff at varying levels of the chain of command, with access to a computer connected to other computers in a logical, if not physical, network. The computers provide some level of automated assistance in retrieving information useful for planning and for dissemination of orders and status information to other users in the network. The network provides the ability to achieve high levels of coordination, thus increasing a force's fighting ability or effectiveness, i.e., its combat multiplier.

Figure 2-1 shows how the Army's combat organizations are split up to deal with both strategic and tactical missions.

The figure is depicted in the form of an Entity Relationship Diagram (ERD). As denoted by its name, the purpose of the ERD is to show the various entities that make up a system and the relationships among those entities. The technique is used primarily to model complex data structure relationships in systems, but we have found it useful in modeling domains at a high level. See Section 5.2 of [FODA 90] for a more detailed discussion of the usage and interpretation of this diagram.

Army Operations

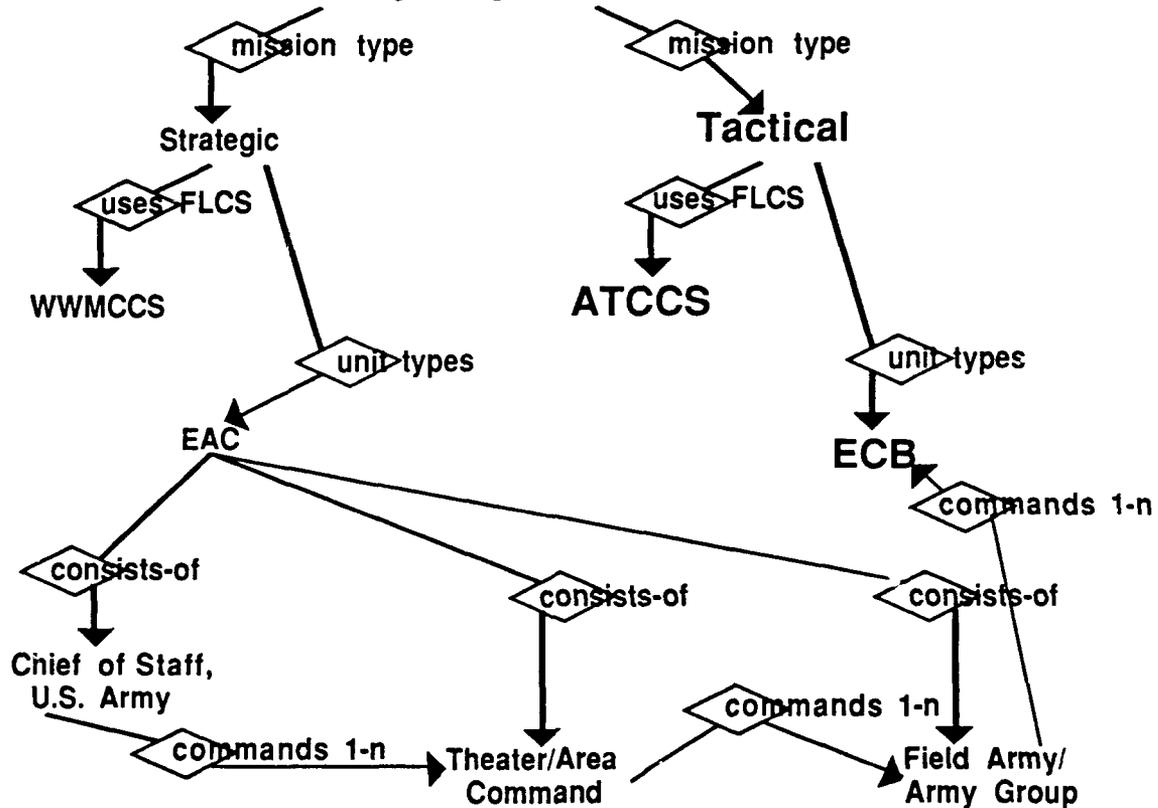


Figure 2-1: The Army Organization Entity-Relationship Diagram

Note the division between the strategic and tactical units discussed previously. The figure shows that only the top levels of the Army chain of command deal with strategic planning. The Army Chief of Staff, headquartered at the Pentagon in Washington, D.C., supervises and controls the various theater or area commands which, in turn, each supervise one or more field armies (army groups are necessary only in wartime). Each field army commands one or more ECB units which are given the responsibility of implementing the strategies selected by the EAC commands.

2.2.3. The Army Corps: Its Form and Function

Figure 2-2 is another ERD concentrating on the ECB entity. This ERD:

- expands and defines the ECB concept into the units of the Army it encompasses
- portrays the hierarchy of the units involved
- introduces some generalizations about the units
- provides some information about some of the specific units that comprise an Army corps

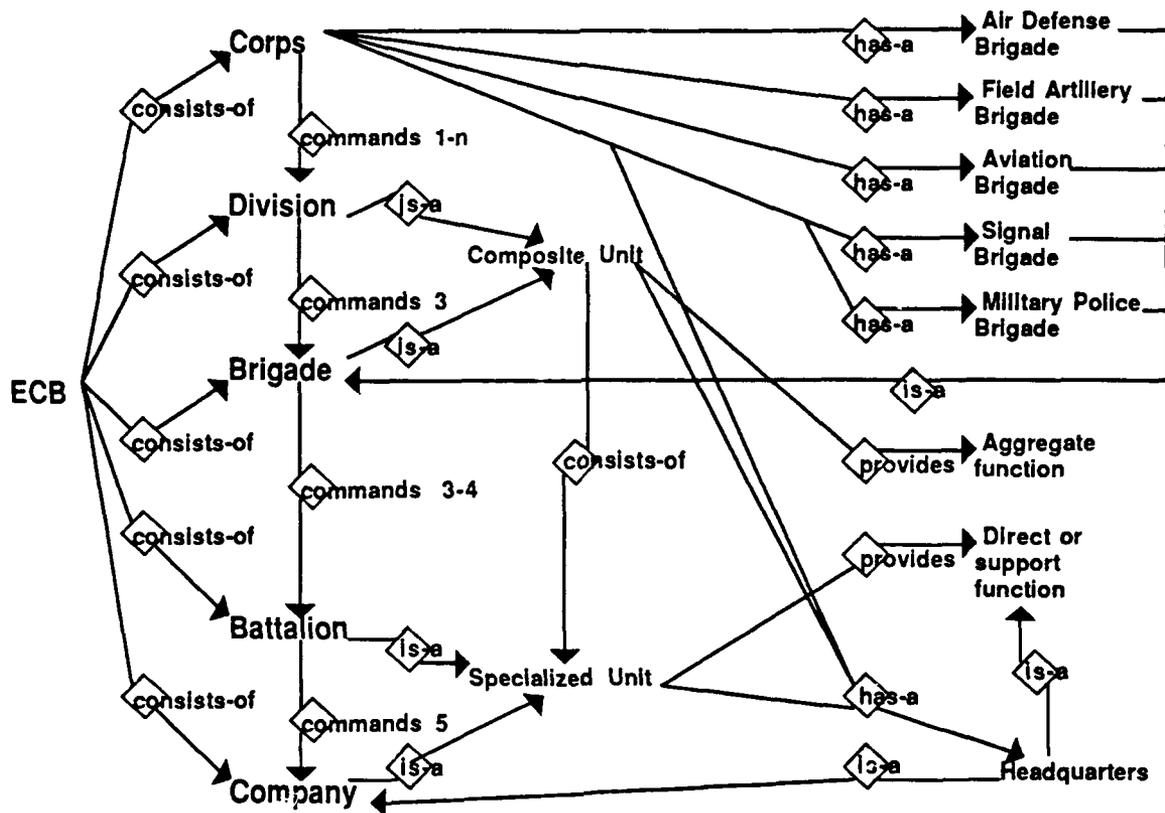


Figure 2-2: The Echelons Corps and Below Entity Relationship Diagram

The corps is the Army's largest tactical organization [Army 87]. It is the primary instrument for achieving operational objectives. The chain of command goes from the corps down to the divisions and brigades under its command. These large (3,000+ man) *composite units* perform some *aggregate function*. Some of the types of aggregate functions are seen in the brigades that are attached to the corps as illustrated in Figure 2-2. Some other aggregate functions define the kind of firepower and mobility that the division and brigades have (for example, infantry, armored, light infantry, airborne, air cavalry, or mechanized infantry) or a particular terrain suitability (for example, mountain).

Both divisions and brigades have some number of battalions and companies in their compositional structure [Army FM 100-5 86]. The number and types of these lower level units, and the equipment they have, serve to provide the appropriate assets to the composite units so that they can perform their aggregate function. The battalion is the largest Army *specialized unit*, whose purpose and makeup serve to do one particular function of the many potentially needed within a larger composite unit. These functions include the well-understood and visible *direct functions* such as infantry, artillery, tank and engineers, as well as more diverse *specialized or support functions* such as headquarters, signal, chemical, transport, military police, medical, aviation, maintenance and electronic warfare. Battalions are composed of companies (or batteries in artillery units), which are the smallest administrative unit in the Army. Below the company level, units such as platoons and squads are formed with the appropriate number of personnel on a more ad-hoc than formal assignment basis.

Figure 2-3 shows how the division between the strategic and tactical missions affects the hierarchy of Army units all the way down to the individual soldier. The figure also shows the present ATCCS scope that integrates information for use at the brigade, division, and corps levels of command. Planned enhancements will incorporate the battalion commands directly into ATCCS. The additional boxes around the various command levels show the strategic and tactical units and the composite and specialized or single purpose units as discussed earlier.

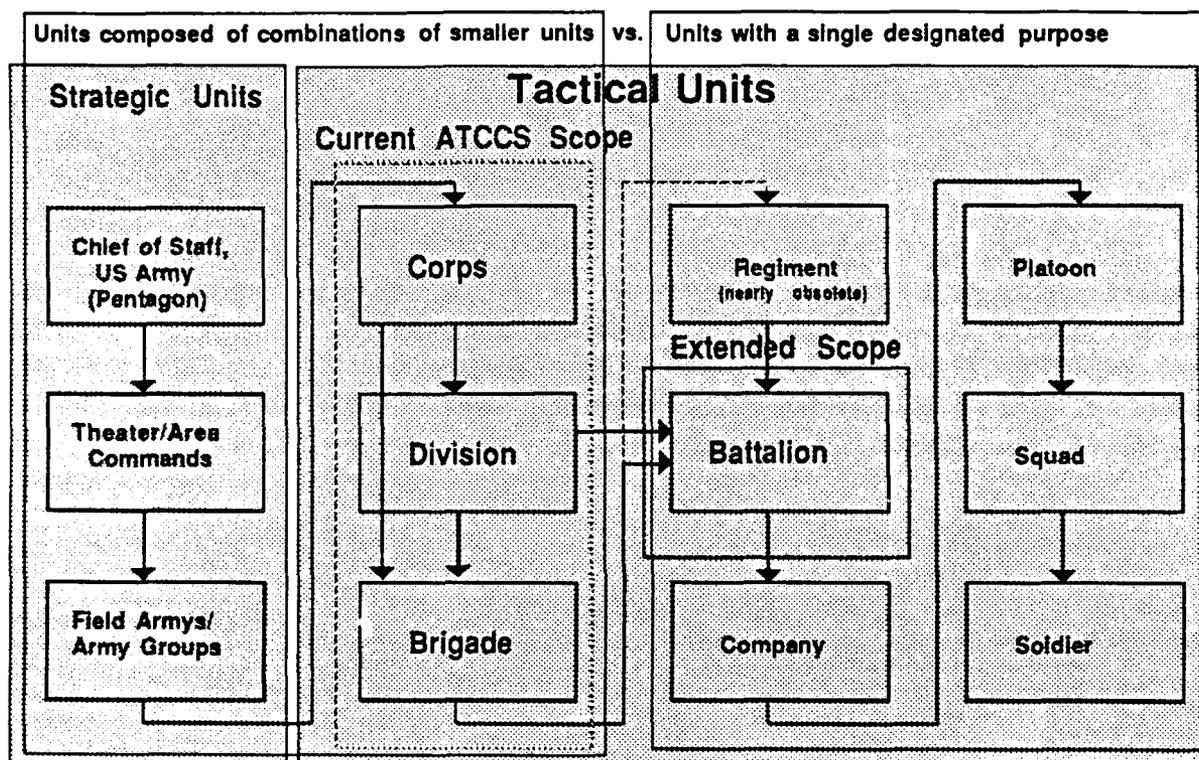


Figure 2-3: The Army Unit Hierarchy

2.3. The Structure of ATCCS

ATCCS is composed of 5 relatively independent systems as denoted in Figure 2-4. These system names are abbreviated into the acronyms inside each circular vertex of the 'star'. Each system supports a Battlefield Functional Area (BFA) named above the circle. Together these systems provide ATCCS with more than just command and control capabilities. They also have the additional capabilities of communications and intelligence, thus putting ATCCS into the more powerful class known as C³I (command, control, communications, and intelligence) systems. The BFAs and corresponding ATCCS nodes are described in Appendix A.

The figure shows that there is much more to the modern battlefield than just moving troop units from one place to another to confront, engage and disperse or destroy the enemy.

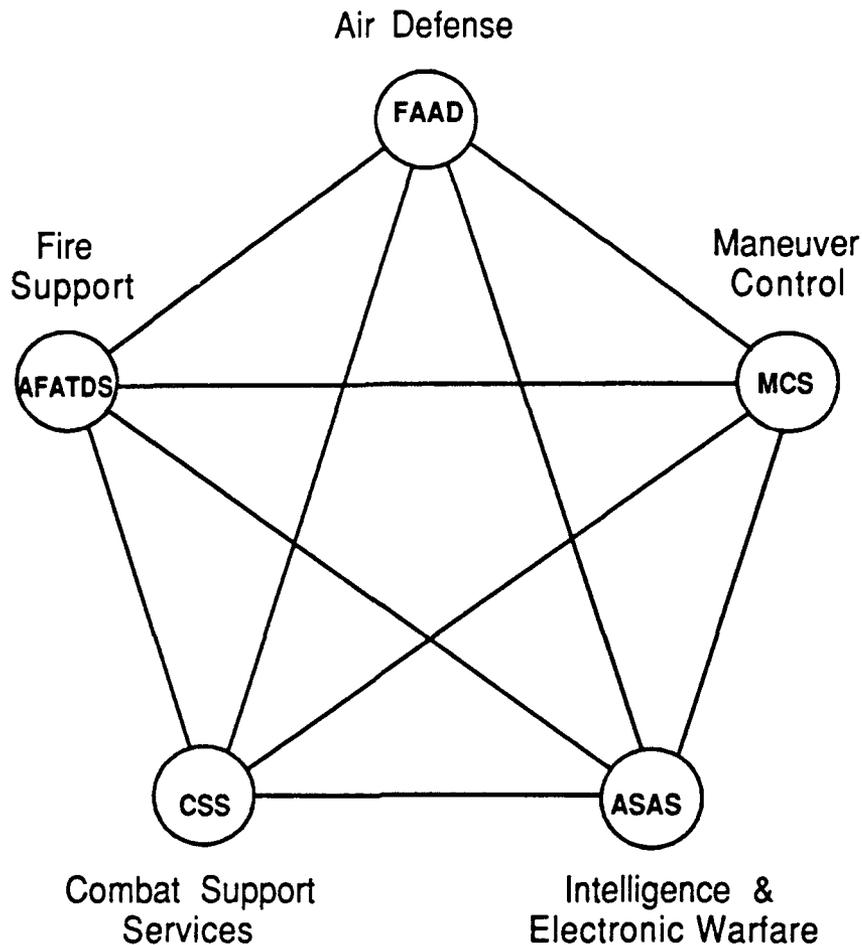
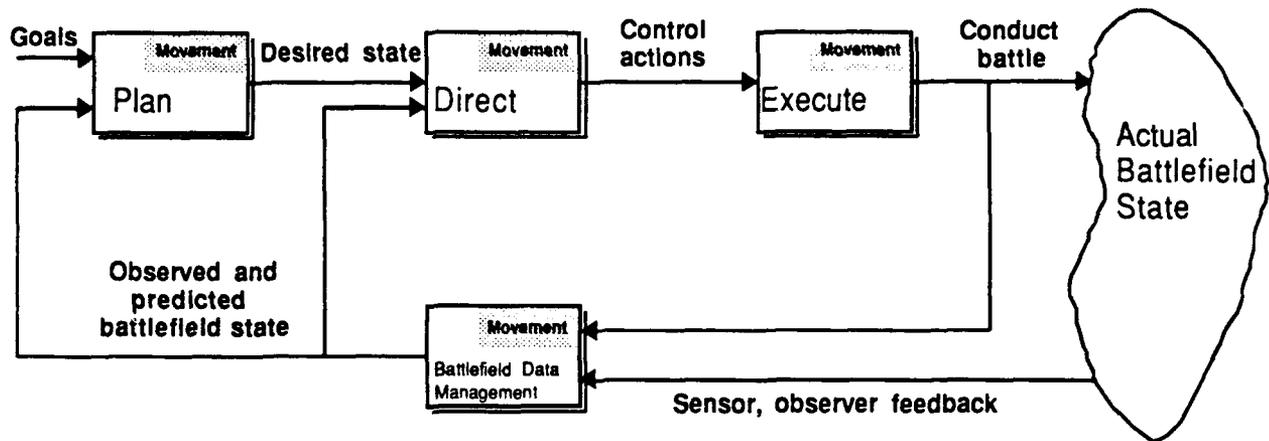


Figure 2-4: The 5 Nodes of ATCCS

The usage of men and tanks in maneuver planning must be coordinated with the functions of fire support, air defense support, combat services, electronics and intelligence in order to achieve satisfactory, let alone optimal, results. Building a system that provides automated assistance for each of these functions or BFAs suggests that each BFA have a node of computing hardware and software to support its unique requirements. But to achieve good coordination, these nodes must be connected and have a certain degree of interoperability. Thus, each node in the ATCCS 'star' is strongly connected to each of the others. These connections allow for the flow of orders and information that increase the effectiveness of ATCCS beyond the capabilities of each individual node.

2.3.1. A Reference Model for C²/C³I Systems

ATCCS is a typical FLCS or C³I system in that there are three major activities occurring in a sequence: *plan*, *direct*, and *execute*. External events from the battlefield provide feedback to those activities. The general sequence of functionality in C³I systems is depicted in Figure 2-5. Although the 'plan, direct and execute' cycle nomenclature may be meaningful only within Army C² [Army FM 100-15 89], we see this cycle as a paradigm that describes the overall functionality of any advanced C² or C³I system.



Goals - effective movement of combat resources to support appropriate timing and placement of combat power

Plan - evaluate data on status of resources, battlefield conditions, and topography to evaluate capabilities, establish movement, mission and priorities and develop recommendations to meet goals

Direct - allocate resources to coordinate battlefield movement

Execute - perform battlefield movement functions to conduct battle and carry out plan

State - actual status of battlefield (friendly and enemy positions, environment)

Data - maps depicting topography of battlefield and maintenance of battlefield status through operator actions, sensor input, observer reports

Figure 2-5: Generic Stages and Feedback in C³I Systems

The commander of a unit at some level and his support staff, with the assistance and information supplied by the system, *plan* to achieve the objectives given to the commander by his superiors. The steps of a plan are refined to *direct* the usage of the assets under their control. The discrete orders are then *executed* by promulgating them to the correct lower level units for implementation or to direct the use of other automated systems. The feedback comes from multiple sources such as sensors, status reports from units, etc.

The next section will establish the placement of movement control software within the software structure of ATCCS and its constituent nodes. Chapter 3 further defines the scope and context of the movement control domain.

2.3.2. The ATCCS Development Strategy

The ATCCS software development is implemented using a hierarchy of layers as seen in Figure 2-6. The figure is in the form of a structure diagram as described in Section 1.3.1.

Layers 1 and 2 of the figure show the Common Hardware and Software (CHS) suites which provide a powerful operating environment for each computer that is part of ATCCS. The two layers provide the low level interoperability to allow the networking of the computers running the BFA software on each node. The line between Layers 2 and 3 symbolizes the standard interfaces to packages such as the UNIX operating system, the Structured Query Language (SQL) for relational databases, and graphics packages like X Windows. Packages such as these provide a high degree of software portability as the hardware platforms evolve over time. Layer 3 shows the Common ATCCS Support Software (CASS), which provides 6

ATCCS
Applications
Software
Layer 4

Common ATCCS
Support Software
(CASS)
Layer 3

System support
Software (COTS)
Layer 2

Hardware
Layer 1

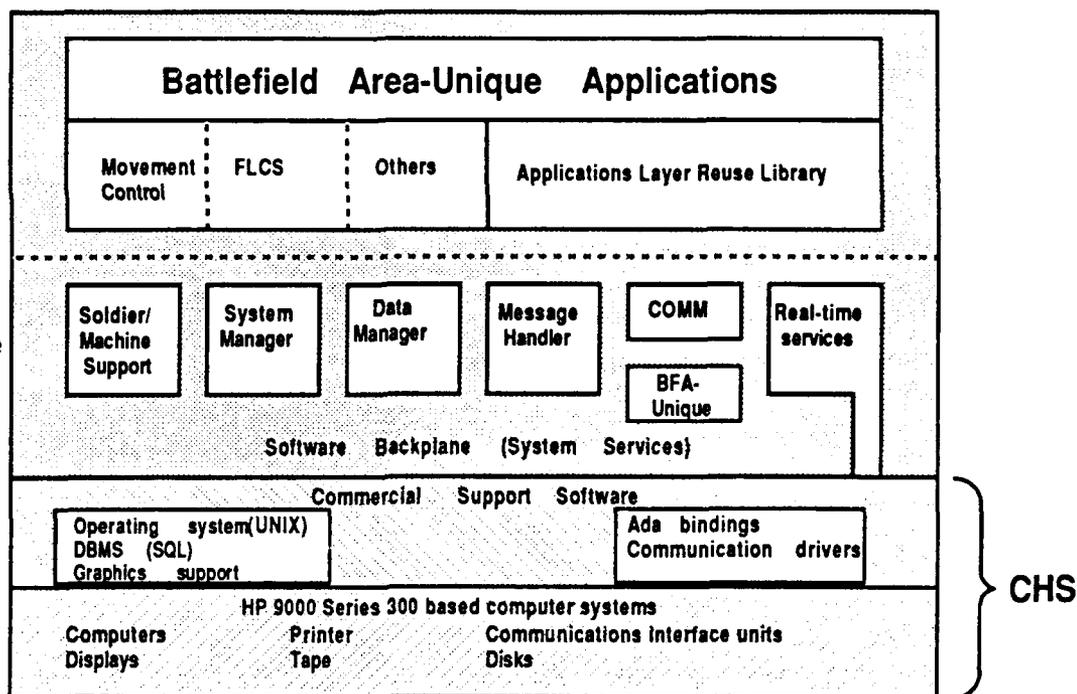


Figure 2-6: The ATCCS Overall Software Architecture

common services such as message handling and system and data managers as well as ways to add unique services needed for each BFA. This layer provides for much higher maintainability and extensibility of the ATCCS software. The dotted line between Layers 3 and 4 denotes support for the commonality of the CASS services. This commonality provides the ability to isolate the applications in Layer 4 above from the support services in Layer 3 below to make the applications more maintainable. The top layer shows the individual applications for each BFA. Note that under the unique BFA software is a sublayer of application reusable components in a library. This is where reusable movement control software could be applied as noted on the left hand box of the reuse library sublayer in the figure.

3. Scoping of Movement Control

The previous chapter described our knowledge and understanding of the relationships of movement control to C² systems. It highlighted the characteristic need for these systems and their use within the Army. The context analysis of movement control produced two important results, the structure diagram and the context diagram. The structure diagram was presented earlier in Figure 2.3. In this chapter, we will present the scope of the movement control domain within a BFA.

3.1. Definition of Movement Control

Movement control is concerned with the movement of battlefield assets in support of tactical objectives. As noted in Section 2.3, movement control plays a role in each of the three key operations (plan, direct, execute) within a C² system. Movement control receives inputs as *commander's guidance* during the 'plan' function, checks the requests against the *constraints and options* data and generates the *movement estimate*. Also, movement control generates *orders* during the 'direct' function as output to the 'execute' functionality as shown in the context diagram, Figure 3-1. The orders are also *stored* so that their status (for example, in progress, completed, or canceled) can be requested or updated via the *movement status* inputs from Position Reports.

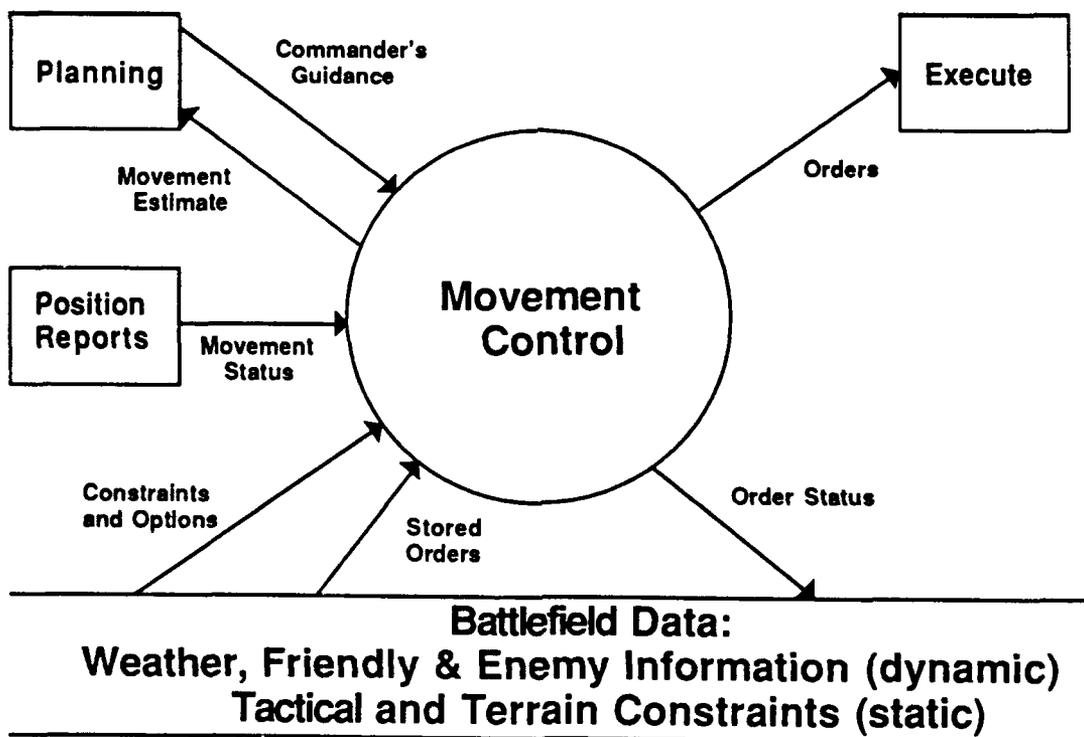


Figure 3-1: The Context Diagram for Movement Control

As an example, brigade commanders may provide their subordinate battalions with orders to each cover a particular sector in a defensive front. Each battalion commander will individually generate a movement request containing route and timetable data to get their unit to the sector it is to cover. Requests are granted with movement orders after the commander's staff (or software they use) ensures that the requested movement does not interfere with other simultaneous movements by other units.

The computation of movement feasibility (the resources needed, routes to be followed, etc.) requires that two types of information be available:

1. **static data:** information about the terrain over which movement is to occur (roads, mountains, rivers, bridges, etc.), measures of unit sizes and payload capacities, and information about tactical considerations which limit or constrain movement options.
2. **dynamic data:** information about the weather, current availability of transportation assets, and data on enemy unit locations.

Most of the data is produced or maintained by functionality outside the scope of the movement control domain. See Appendix A.5 for a brief discussion of the databases maintained by the Maneuver Control System (MCS) and Appendix A.2 for Combat Service Support inputs.

As a further breakdown of movement control functionality, three major processes for movement control operations were identified in a report [COMCON 89] on the feasibility of the use of Artificial Intelligence (AI) techniques in AFATDS software. These same processes seem to be applicable to all 5 ATCCS nodes at some level. The processes or **features** and their *inputs/outputs*, generalized for more commonality, are:

1. **developing movement requirements:** determining the need to move an asset. This feature appears to belong to the planning function. Its output is *movement requests* which are generated either by superior commands planning for subordinate unit usage or by subordinate units seeking approval from their superiors for future actions.
2. **movement determination:** detailing the routing and timing of movement. Comparison and coordination of new requests to existing requests is done and conflict resolution is performed as needed. A completed request, with complete route and timetable, is transformed into a *movement order*.
3. **movement data maintenance:** updating and tracking of *movement orders* through the use of *movement reports* inputs. Movement reports are generated using a message format not specified in the movement control software.

Each of these features and others found later will be described more precisely during work performed in the domain modeling phase. The FODA method allows for some preliminary domain modeling to occur early to ensure that the scope of the target domain as determined by context analysis is adequate, complete, and correct. The next section presents some of these preliminary results.

3.2. Areas within Movement Control to be Explored

The primary issues during domain modeling are the gathering and understanding of the **features** and their **functionality** within the domain. Some concepts we have seen during the context analysis as important areas to clarify and explore during domain modeling are:

1. Movement planning and implementation considerations: what abstractions form the **operations** for movement

a. Routing

- i. Movement considers and works on *avoiding* obstacles when generating routes and timetables. Movement does not consider *removing* obstacles; this is a separate part of planning.

- ii. Possible obstacles:

1. obvious physical obstacles such as unbridged rivers, swamps, mountains, and other terrain features or man-made obstructions
2. less obvious physical obstacles such as areas of nuclear, biological, and chemical (NBC) warfare activity, weather, and enemy units
3. constraints or abstract obstacles such as time with regards to distances and rates of travel, restrictions on time of day (night movement is slower due to lower visibility, but lessens the chances of enemy observation), or space as an obstacle (capacity of roads, rail lines, etc.)

- iii. There are various relationships between the objects being moved and what constitutes an obstacle for that object. For example, tanks and armored personnel carriers, as opposed to some classes of trucks, are not restricted to roads.

- b. Modeling the nature of movement: how the **mission** affects the movement operations

- i. There appear to be **two distinct varieties** of movement that occur on the battlefield. **Maneuver** is the relocation "of forces supported by fire to achieve a position of advantage from which to destroy or threaten destruction of the enemy." [Army FM 100-5 86] This type of movement is 'free play' in nature and occurs quickly as the local battle situation changes. The other kind of **movement** is a change in location that usually occurs behind the battle and is much more rigid in nature, requiring the coordination of various command functions (operations and logistics at a minimum). Both appear to have a strong commonality in an apparent need for route planning and scheduling of some type.

- ii. There exist two kinds of movement, **tactical** and

administrative [Army FM 100-15 89]. Tactical movement is movement or maneuver to contact with the enemy or during which contact is anticipated. Administrative movement occurs when no enemy interference is expected, except possibly by air. A critical difference occurs in the organization of the moving units. In tactical movement, elements are organized to facilitate combat, while administrative movements are planned to maximize the efficiency of transportation resources.

- iii. The areas of the battlefield (close, deep, and rear) also play a part in determining movement considerations. Movement in the rear area is seen mostly as administrative; close movements are considered maneuver; and movement in the deep area is usually proposed as part of the planning process for the follow-on battle.

c. Scheduling and Allocating Resources

The Operation Plan (OPLAN) and Operation Order (OPORD) each contain an annex specifically designated to handle the coordination of road movement. This annex contains very precise information as to the whos, whats, wheres, and whens of movement needed to place troops during an operation. The Rear Command Post of a corps usually houses a Movement Control Center (MCC). The MCC is in charge of implementing and coordinating the movement aspects of the OPORD and the subsequent movements needed during the battle. The domain analysis should determine what means (automated or manual) the personnel in the MCC use to conduct their business, and what software is available, for example DAMMS-R, to support the automation of this task.

d. Timing

There appear to be 3 distinct timing windows for planning and implementing movement:

- i. more than 48 hours between the decision/order to move a unit and the completion of the movement
- ii. movement completed between 24 and 48 hours of the order
- iii. less than 24 hours between initiation and completion

These windows appear to correlate strongly to the potential to make the movement administrative or tactical and to the degree of planning involved. The level of command issuing movement instructions also correlates strongly to the timing aspects. Theater or army commanders issue the long-term orders, corps commanders plan and direct in the 24 to 48 hour time frame and division commanders plan to move their subordinate units in short time frames. The size of the unit to be moved and the distance to be covered are important considerations in planning a movement. For example, it takes more than 24 hours to move a division a distance of 25 miles [Army FM 55-10 86].

2. Movement feasibility considerations

- a. Movement software should point out if proposed movement cannot be accomplished and why.
- b. The role of unit mobility and the combat situation in determining tactics: Due to the advances made in tank speed and increased usage of armored personnel carriers, helicopters, and other machinery to move men and equipment, the potential rate of advance of a substantial friendly or enemy force is >100 miles a day (as seen in Operation Desert Storm) [Flanagan 91] and the same kind of speed can be utilized to counter such an advance. However, advancement rates during intense ground combat are still about 3 miles per day, comparable to that seen in major advances during World War I [Bellamy 87]. The domain analysis must investigate how rate of advance is determined and what rates of speeds are realistic under various combat conditions.

3. Database/Information Needs

- a. Specific subsystems/data needs of movement software: friendly unit positions and movements, weather, terrain, threat intelligence (enemy unit locations and headings), route capacities, inventory and status of transportation assets, priorities of movement requests and more.
- b. Movement must maintain/access a database of all ongoing and approved movement orders.

In the next section, the features of movement control are related to the ATCCS nodes and the BFAs they each support.

3.3. Movement Control and its Role and Interfaces in ATCCS

For each ATCCS BFA node, the usage of movement features in the fielded system and the timing of their inclusion into a released version of the software is described briefly below.

Note: the information below is taken from the ATCCS Software Development Master Plan (SDMP) [SDMP Annex A 90].

- Air Defense
 - This BFA node utilizes all features of movement control capability.
 - Movement control functionality scheduled for inclusion in Version 3 of the FAADC3I system, to be available for Initial Operational Test and Evaluation (IOT&E) in the 2nd quarter of FY93.
- Combat Service Support
 - Movement control functionality is incorporated into Department of the Army Movement Management System – Redesign (DAMMS-R); includes receipt, recording and disseminating of movement information to logistics

managers and command and control centers, disseminating reports to traffic control elements, and *control of internodal asset allocation and use* through MIS functionality.

- Functionality to be incorporated into CSSCS, Versions 3 and 4, availability dates unknown.

- **Field Artillery**

- This BFA node utilizes all features of movement control capability.
- Functionality to be fully automated and incorporated into AFATDS, Version 3, availability date unknown.

- **Intelligence and Electronic Warfare**

- NO movement control functionality is specified, although one might assume that some movement of IEW assets may be necessary. Movement of enemy units reported by IEW assets should be stored in a database accessible to movement control software and some aspects of movement ought to be applicable to target analysis (threat evaluation).
- Movement control functionality in ASAS is TBD.

- **Maneuver**

- NO movement control functionality is specified, although one might assume that some aspects of movement control must be handled at some level during the planning process. Also, knowledge of current movement status of friendly units is useful for display and should be stored in a database accessible to movement control software.
- Movement functionality in MCS is TBD.

4. Applying Results from the Context Analysis

The previous chapters have described the application of FODA in performing the context analysis of a specific domain. Context analysis has established the scope of the domain according to the following considerations:

1. the ability to apply the method to the domain
2. the complexity of automating the domain or using the results of the domain analysis
3. the potential impact of the results

These characteristics of the scope will provide the basis for creating the domain model during the next phase of the project. Section 1.3.2 described the major activities of domain modeling. Each activity leads to a specific model; together, these models constitute the domain model:

1. *Entity relationship model*: The established scope will limit this model to aspects of orders and battlefield data relating specifically to movement. The domain model will treat entities within this scope, including:
 - information required to define routes and schedules
 - unit and task force organization
 - resources necessary to perform the move
 - battlefield information, such as terrain, weather, and enemy locations
2. *Feature model*: The feature model will consider user-visible capabilities of applications within the scope of the domain. Section 3.2 listed the primary categories of features for modeling. This model will abstract features from actual Army systems that perform movement control operations. The model will also utilize Army doctrine and the knowledge of movement control domain experts to establish movement mission and user interface features.
3. *Functional model*: The functional model will represent common functions linking entities and features. This model will cover only a subset of the entire domain in depth and will demonstrate how alternate and optional features are used to parameterize the functional model. This approach proved successful in exploring the application of the method in conjunction with support tools as seen during the feasibility study ([FODA 90], Chapter 7). During the movement control analysis, the functional model will explore the relationship between commanders and staff in performing course of action planning, staff estimates, generation of movement requirements and requests, and the issuance of movement orders.

As described in [FODA 90], the domain model should provide a basis for understanding the problems in a domain and for creating a software solution. To test this assertion within the context of movement control, the domain model will be used to simulate the functionality of selected movement control features. During the feasibility study this approach was accomplished through simulation in Statemate. During the domain modeling phase, the project will apply similar modeling tools to generate prototype software. Through contacts with domain

experts during the modeling activity, other opportunities for applying the domain model will also be identified.

Appendix A: Description of ATCCS Battlefield Functional Areas and System Nodes

This information is drawn from descriptions in the ATCCS System Development Master Plan [SDMP Annex A 90].

A.1. Air Defense

mission	To nullify or reduce the effectiveness of attack or surveillance by hostile aircraft or missiles.
objective	To provide ground forces commanders the freedom to maneuver without interference from enemy air attack.

The Air Defense BFA is divided into two categories of air defense:

1. High-To-Medium Altitude Air Defense (HIMAD), consisting of the HAWK and PATRIOT weapon systems. Most of the capability is controlled at the corps and EAC levels and has interfaces with various early warning and tactical communications systems to include usage of Navy, Air Force, and other NATO assets.
2. Forward Area Air Defense (FAAD), which include the Vulcan, Product Improved Vulcan Air Defense System (PIVADS), the Stinger, and the Chaparral. Presently, these systems are controlled using the Manual Short Range Air Defense Control System (MSCS), which uses a hierarchy of Air Battle Management Operations Centers (ABMOCs) at the various command levels to promulgate data and fire orders down to fire units for appropriate action.

Both of these systems rely mainly on manual interfaces and methods to achieve their results and there is a lack of coordination between them. The fielded FAADC3I system will provide automated assistance in the performance of air defense operations using six subsystems:

1. the ABMOC subsystem
2. the Army Airspace Command and Control (A2C2) subsystem
3. the Sensor/C2 subsystem, each with either a ground based sensor or an Aerial/Masked Target Sensor (MTS)
4. the Battery Command Post subsystem
5. the Platoon Command Post subsystem
6. the Fire Unit subsystem

A.2. Combat Service Support

- mission** To sustain or reconstitute the friendly force through material and personnel functional support.
- objective** To provide the following services: maintenance support, ammunition services, bulk petroleum, oil, and lubricants (POL) support, general supply support, medical services, transportation services, field services, and personnel services.

The responsibilities of the Combat Service Support (CSS) BFA are:

- planning, coordinating controlling and directing the sustainment of the total force.
- controlling the employment and sustainment of organic and attached CSS units.
- providing CSS commanders and staff with logistical, medical, financial, and personnel information.

There are a large number of Standard Army Management Information Systems (STAMISs) but each is accessed as a separate system with manual means of coordinating information inputs and requests. The CSSCS will provide an automated means for accessing and utilizing all the STAMISs and other logistical computing systems using a single common set of interfaces.

A.3. Fire Support

- mission** To control and coordinate the use of indirect-fire weapons, armed aircraft, and other lethal (mortars, field artillery, naval gunfire, Army aviation and air delivered weapons) and nonlethal (electronics warfare (EW) capabilities) means in support of a battle plan.
- objective** To provide command and control capabilities to integrate the usage of Fire Support assets and to provide fire direction to field artillery systems.

The fielded systems (Tactical Fire Direction Systems (TACFIRE and Light TACFIRE) provide only tactical and technical (range and direction to target, etc.) fire direction for field artillery systems only. They do not consider nor assist in the integration of other fire support systems. The Fire Support Coordinator (FSCOORD) must use his personal abilities to integrate all usage of Fire Support assets.

AFATDS automates and integrates the Fire Support BFA through the following five categories of functionality:

1. Fire Support Planning: supervision of all fire support means in support of maneuver operations, including the integration of naval gunfire, air fire support, mortars, offensive EW, and field artillery.
2. Fire Support Execution: provision of actions and coordination necessary in the determination of targeting requirements; the collection, interpretation, evalua-

tion, and dissemination of targeting information; and, with appropriate guidance, establishment of targeting priorities.

3. Movement Control: management of the control and movement of field artillery units and sensors, and coordination of the movement of fire support units and sensors.
4. Field Artillery Mission Support: provision of the functions necessary to logistically and administratively support the field artillery system.
5. Field Artillery Fire Direction Operations: provision of interfaces to the individual weapons systems; collection and maintenance of weapons data required for day-to-day operations; generation of fire commands for field artillery systems, and submission of status and capability reports to higher echelons of command.

A.4. Intelligence and Electronic Warfare

mission	To provide the commander the current and predicted enemy situation, manage the intelligence/electronic warfare and counter-intelligence effort in support of combat operations, and support the execution of command and control functions throughout the IEW arena.
objective	To detect, locate and identify enemy units both within the area of influence and the area of interest, assess friendly force vulnerabilities, and exploit, disrupt, and deceive the enemy's command and control system while protecting friendly use of radio frequency emitting systems.

Intelligence data comes from a large number of diverse resources. Currently, IEW BFA C² functions are performed primarily in a manual mode supported by stand-alone personal computers that perform limited automation functions. The process is inundated with massive amounts of data that must be manually reviewed and analyzed to produce useful products. Also, the entire intelligence fusion process is manual. There is one automated IEW system that is currently fielded to a limited number of users.

ASAS is a computer-based intelligence support system design to support Army tactical commanders by providing a near real-time assessment of intelligence data required for the decision making process. It receives the commander's intelligence information requirements; accepts, evaluates, processes, correlates, displays, and disseminates intelligence for all sources; and produces situation assessments and target nominations.

A.5. Maneuver

mission	To gain and hold ground within the battle area using infantry, armor, cavalry, aviation, engineer, military police, signal and chemical assets, and direction of the other four BFAs.
objective	To provide for the acquisition, management, and assessment of battlefield information, and the dissemination of plans and orders to subordinate maneuver elements and the other BFAs.

Much of the MCS functionality has already been fielded. Current available functionality includes:

- Unique MCS format message and data file exchange between computers in the MCS network and other communications interfaces.
- Storage, retrieval, and manipulation of information in databases partitioned into three tactical categories:
 1. Friendly Forces: Information in this database is organized to conform to the using unit's Task Organization. Information relating to the location, activities, resources and combat readiness is entered into the database and is available for viewing and manipulation. Visibility of unit data resources is maintained up to two echelons down. Automatic "roll-ups" of subordinate unit data into an "own unit" report is provided.
 2. Enemy Forces: This database supports the maneuver commander by providing a ready source of "fused" intelligence information fed to it by the IEW BFA at each echelon of command.
 3. Operational Environment: This database provides information on obstacles and barriers, areas of Nuclear/Biological/Chemical (NBC) contamination, and tactical control measures.
- Information can be displayed as either text or graphics.
- Automation is provided for the preparation of the Situation Report (SITREP).
- A integrated business package is provided to support word processing, spreadsheet, and database management functions.
- A U.S. Message Text Format (USMTF) Message Preparation Package is provided.

The enhancements to MCS that will support the completed ATCCS primarily involve the integration of the information provided by the other ATCCS nodes into a common Force Level picture of the battle. This common picture includes a major enhancement of MCS software to provide situation maps with overlays showing friendly assets of all five BFAs, enemy data, and other useful information.

Appendix B: Movement Control Domain Dictionary of Terminology

Note: Except where indicated with an asterisk, the terms and definitions in this dictionary are drawn verbatim from authoritative Army documents, most notably Army Regulation 310-25 or FM 101-5-1 (Operational Terms and Symbols).

abatis: A vehicular obstacle constructed by felling trees 1-2 meters above the ground on both sides of the road so that they fall, interlocked, toward the expected direction of enemy approach. The trees should remain attached to the stumps, be at a 45-degree angle to the roadway, and the obstacle itself should be at least 75 meters in depth to be most effective.

administrative unit: Unit organically able to do its own interior management. It may be both administrative and tactical.

advance by bounds: Move forward in a series of separate advances, usually from cover to cover or from one point of observation to the next.

advance by echelon: Advance by separate elements of a command moving at different times.

advance depot: Supply point in the forward part of the communications zone of a theater of operations, ahead of the intermediate and base depots.

advance detachment: The leading element of an advance guard. It is set out from the advance guard.

advance guard: The security element operating to the front of a moving force.

advance officer: An officer designated by the commander to precede the column by a distance sufficient to reconnoiter the route of march and to select alternate routes or detours if required; to instruct and place guides and route markers, where appropriate; to notify authorities of approach of column and receive instructions or changes to instructions at highway regulation points. This officer may also command the advance party.

advance party: A security element of an advance guard. It is sent out from, and precedes, the advance guard support on the march. It sends forward and is preceded by the advance guard point.

advance to contact:
See *movement to contact*

air assault: Operations in which air assault forces (combat, combat support [CS], and combat service support [CSS]), using the firepower, mobility, and total integration of helicopter assets in their ground or air roles, maneuver on the battlefield under the control of the ground or air maneuver commander to engage and destroy enemy forces.

- airborne operation:** An operation involving the movement of combat forces and their logistic support into an objective area by air.
- airborne units:** Units organized, equipped, and trained primarily for making assault landings from the air.
- airhead** 1. A designated area in a hostile or threatened territory which, when secured, permits the delivery (airdropped or airlanded) of forces and supplies and provides maneuver space for operations. Normally it is the area seized in the assault phase of an airborne or air assault operation.
2. A designated location in an area of operations used as a base for supply and evacuation by air. (See also *beachhead* and *bridgehead*).
- alternate position:** The position given to a weapon or unit to be occupied when the primary position becomes untenable or unsuitable for carrying its task. The alternate position is so located that the weapon or unit can continue to fulfill its original task.
- area of influence:** A geographical area wherein the commander is directly capable of influencing operations by maneuver or fire support systems normally under his command or control.
- area of interest:** That area of concern to the commander, including the area of influence, areas adjacent thereto, and extending into enemy territory to the objectives of current or planned operations. This area also includes areas occupied by enemy forces who could jeopardize the accomplishment of the mission.
- area of operations:** That portion of an area of conflict necessary for military operations. Areas of operations are geographical areas assigned to commanders for which they have responsibility and in which they have authority to conduct military operations.
- area of responsibility:** A defined area of land in which responsibility is specifically assigned to the commander of the area for the development and maintenance of installations, control of movement, and the conduct of tactical operations involving troops under his control along with parallel authority to exercise these functions.
- armor:** A fighting combined arms team consisting of tanks, and armored cavalry reconnaissance/security units, supported on the battlefield by Army aviation, a flexible and rapid communications network, and a mobile logistics system, all trained and equipped for mounted ground combat.
- armor group:** A field army unit designed to exercise command control and supervision of one or more separate tanks, armored infantry, and armored cavalry battalions, assigned to a corps or field army.

- armor sweep:** A raid or other limited attack without terrain objective by a rapidly moving armor unit through or across enemy controlled territory. An armor sweep may be conducted for reconnaissance in force, destruction or capture of personnel or material, or to harass or disrupt enemy plans and operations.
- armored cavalry:** Combat units characterized by a high degree of mobility, fire-power, shock action, and multiple flexible communications. The units are especially designed to execute reconnaissance, security, combat or economy of force operations utilizing organic surface and air mode of transport.
- armored Infantry:** A field Army unit designed to close and destroy the enemy by fire and maneuver, to repel hostile assault in close combat, and to provide support for tanks.
- army:** The largest administrative unit of the forces consisting of two or more Army corps and supporting troops; field army.
- asset:** a useful or valuable quality or thing (soldiers, machines, arms, and ammunition are common Army assets).
- avenue of approach:** An air or ground route of an attacking force of a given size leading to its objective or to key terrain in its path.
- basic load:** For other than ammunition, basic loads are supplies kept by using unit for use in combat. The quantity of each item of supply in a basic load is related to the number of days in combat the unit may be sustained without resupply.
For ammunition, it is that quantity of non-nuclear ammunition authorized and required to be on hand in a unit to meet combat needs until resupply can be accomplished. The basic load for ammunition is specified by the theater army and is expressed in rounds, units, or units of weight as appropriate.
- basic tactical unit:** Fundamental unit capable of carrying out an independent tactical mission, such as a rifle company in the infantry, or a battery in artillery.
- battalion:** Unit composed of a headquarters and two or more companies or batteries. It may be part of a regiment and be charged with tactical functions only, or it may be a separate unit and be charged with both administrative and tactical functions.
- battery:** the basic tactical artillery unit, corresponding to the company in the infantry.
- battle position:** Position on which the main effort of the defense is concentrated. A battle position is made up of defensive sectors that support one another.

- beachhead:** A designated area on a hostile shore which, when secured, ensures the continuous landing of troops and material, and provides maneuver space requisite for subsequent projected operations ashore. The beachhead is the physical objective of an amphibious operation. (See also *airhead* and *bridgehead*.)
- bound:** 1. Single movement, usually from one covered and concealed position to another by dismounted troops or combat vehicles. 2. Distance covered in one movement by a unit which is advancing by bounds.
- boundary:**
A control measure normally drawn along identifiable terrain features and used to delineate areas of tactical responsibility for subordinate units. Within their boundaries, units may maneuver within the overall plan without close coordination with neighboring units unless otherwise restricted. Direct fire may also be placed across boundaries on clearly identified enemy targets without prior coordination, provided friendly forces are not endangered. Indirect fire also may be used after prior coordination.
- Lateral boundaries* are used to control combat operations of adjacent units.
- Rear boundaries* are established to facilitate command and control.
- bridgehead:** 1. An area of ground held or to be gained on the enemy's side of an obstacle. 2. In river crossing operations, an area on the enemy's side of the water obstacle that is large enough to accommodate the majority of the crossing force, has adequate terrain to permit defense of the crossing sites, and provides a base for continuing the attack. As a minimum, ground must be secured which eliminates direct and observed indirect fires on the crossing site. (See also *airhead* and *beachhead*.)
- brigade:** 1. a unit consisting of a variable number of combat battalions. 2. formerly, a unit of the Army composed of two or more regiments commanded by a brigadier general.
- brigade support area:** A designated area in which combat service support (CSS) elements from division support command (DISCOM) and corps support command (COSCOM) provide logistic support to a brigade. It normally is located 20 to 25 kilometers behind the forward edge of the battle area (FEBA).
- checkpoint:** A predetermined point on the ground used as a means of coordinating friendly movement. Checkpoints are not used as reference points in reporting enemy locations.
- close air support:** Air action against hostile targets that are in close proximity to friendly forces and that requires detailed integration of each air mission with the fire and movement of those forces.
- coll:** An arrangement of vehicles forming a circle.

- column formation:** An arrangement of vehicles or dismounted troops which (1) provides good security and permits maximum fire to the flanks; (2) facilitates control; (3) facilitates rapid deployment into any other formation; (4) is used in road marches, night movements, and when passing through defiles or dense woods.
- combat arm:** Branch of the Army whose officers are directly involved in the conduct of actual fighting. They are Aviation, Infantry, Field Artillery, Air Defense Artillery, Armor and and Corps of Engineers.
- combat orders:** Orders pertaining to operations in the field. They include operation orders, administrative orders, and letters of instruction.
- combat service support:** A grouping of branches and officers primarily concerned with providing combat service support and/or administration to the Army as a whole. They are Adjutant General, Finance, Ordnance, Quartermaster, and Transportation. Engineer, Signal, and Military Police are both services and arms.
- combat support arm:** Branch of the Army whose officers provide operational assistance to the combat arms. They are Corps of Engineers, Signal Corps, Chemical Corps, Military Police Corps, and Military Intelligence. Certain branches are both an arm and a service.
- combined arms:** More than one tactical branch of the Army used together in operations.
- command:** A specifically designated linetype organization with direct line authority from the next higher commander or the Chief of Staff, United States Army. It must have a clearly identifiable headquarters and organization structure composed of a variety of units.
- commander's estimate:** The procedure whereby a commander decides how to best accomplish the assigned mission. It is a thorough consideration of the mission, enemy, terrain and weather, troops available, and time (METT-T) and other relevant factors. The commander estimate is based upon personal knowledge of the situation and upon *staff estimates*.
- command post:** The principal facility employed by the commander to command and control combat operations. A CP consists of those coordinating and special staff activities and representatives from supporting Army elements and other services that may be needed to carry out operations. Corps and division HQ are particularly adaptable to organization by echelon into a tactical CP, a main CP, and a rear CP.
- commitment:** Assignment of units and/or resources to given courses of actions or uses.
- communications:** Routes and transportation for moving troops and supplies, especially in a theater of operations.

- company:** Basic administrative and tactical unit in most branches of the Army. A company is on a command level below the battalion and above a platoon and is equivalent to a battery of artillery, etc.
- compartment of terrain:** Terrain area bounded on at least two sides by terrain features such as woods, ridges or villages, which limit observation and observed fire into the area from points outside the area.
- concentration:** Assembly of troops in a given locality for purposes of offense or defense.
- concept of operations:** A graphic, verbal, or written statement in broad outline that gives an overall picture of a commander's assumptions or intent in regard to an operation or series of operations; includes at a minimum the scheme of maneuver and fire support plan. The concept of operations is embodied in campaign plans and operations plans particularly when the plans cover a series of connected operations to be carried out simultaneously or in succession. It is described in sufficient detail for the staff and subordinate commanders to understand what they are to do and how to fight the battle without further instructions.
- constraint:** something that restricts, limits, or regulates.
- control:** authority or ability to direct or regulate.
- control measures:** Directives given graphically or orally by a commander to subordinate commands in order to assign responsibilities, coordinate fires and maneuver, and to control combat operations. Each control measure can be portrayed graphically. A minimum number of control measures should be used so that the operation progresses according to the concept of the operation. Less restrictive control measures are used, as much as possible, to permit subordinate commanders the freedom of action in executing assigned missions. In general, all control measures should be easily identified on the ground. Examples of control measures include boundaries, objectives, coordinating points, contact points, lines of departure, assembly areas, axis of advance, and direction of attack.
- control point:** A conspicuous terrain point which is given a name or number as a means of control of traffic movement.
- convoy:** A group of 10 or more vehicles organized for the purpose of control and orderly movement with or without escort protection.
- corps:** a tactical unit of ground forces between a field army and a division commanded by a lieutenant general and composed of two or more divisions and auxiliary service troops.

coordinating point:

A control measure that indicates a specific location for the coordination of fires and maneuver between adjacent units. They usually are indicated whenever a boundary crosses the forward edge of the battle area (FEBA), and may be indicated when a boundary crosses report lines or phase lines used to control security forces. In NATO, physical contact between adjacent units is required.

corridor:

Compartment of terrain, the longer axis of which is parallel to, or extends in, the direction of movement of a force.

covered approach:

1. Any route that offers protection against enemy observation or fire. 2. Approach made under protection of other forces or by natural cover.

course of action:

1. Any sequence of acts that an individual or unit may follow. 2. A possible plan open to an individual or commander that would accomplish or is related to accomplishment of the mission. 3. A feasible way to accomplish a task or mission which follows the guidance given, will not result in undue damage/risk to the command, and is noticeably different from other actions being considered.

covered movement:

movement of troops when adequate security is provided by other friendly forces.

covering barrier:

A barrier located beyond the forward edge of the battle area which is elected by field army, corps, or division to assist in delaying actions of covering and security forces.

critical point:

A selected point along a route used for reference in giving instructions. It includes start points, release points, and other points along a route where interference with movement may occur or timings are critical.

cross compartment:

Compartment of terrain, the longer axis of which is perpendicular or oblique to the direction of movement of a force.

cross-country movement:

The movement of military vehicles (usually tactical) across terrain without using roads and bridges.

crossing site:

A crossing point or site used for vehicles and equipment to cross a restrictive terrain feature.

debarkation:

The loading of troops with their supplies and equipment from ships and/or aircraft.

dedicated battery:

A cannon battery whose total fire power is immediately available to suppress enemy direct fire weapons that threaten a designated company/team during a movement to contact.

deep battle:

All actions that support the friendly scheme of maneuver and which deny the enemy commander the ability to employ his forces not yet engaged at the time, place, or in the strength of his choice.

- defense area:** Area assigned to a given unit to be protected from, and held against, enemy attack.
- defense in place:** System of defense based upon firm resistance without retreat, as opposed to delaying action in successive positions.
- deferred unit:** A unit whose required delivery date in support of a specific operation plan has been postponed.
- defile:** A narrow passage that tends to restrict the movement of troops.
- delaying position:** Position taken to slow the advance of the enemy without being decisively engaged.
- detached unit:** A unit that is serving away from the organization to which it is organic and to which it remains assigned. A detached unit may function as an independent organization, or it may be attached to or serve with or under another organization. See also *operational control*.
- direct:** to give orders or commands.
- direct support:** 1. A mission requiring a force to support another specific force and authorizing it to answer directly the supported force's request for assistance. 2. In NATO, the support provided by a unit or formation not attached to, nor under command of, the supported unit or formation, but required to give priority to the support required by that unit or formation. See also *general support*.
- division:** an administrative and tactical unit that is smaller than a corps but is self-contained and equipped for prolonged combat activity.
- double envelopment:** A form of enveloping maneuver executed by three principal tactical groups; a secondary attack force which attacks the enemy frontally, and two enveloping attack forces which move around the flanks of the enemy position to attack the flanks or objectives in the rear of the enemy front line.
- double staggered column:** Two-lane column of vehicles moving in the same direction, so spaced that the vehicles in one lane are opposite the space between vehicles in the other lane.
- earliest arrival time:** The earliest date a unit should arrive "in theater" in support of a specific operation plan.
- echelon:** 1. A subdivision of a headquarters (such as forward echelon, rear echelon). 2. Separate level of command. As compared to a brigade, a division is a higher echelon; a battalion is a lower echelon. 3. A fraction of a command in the direction of depth to which a principal combat mission is assigned (such as attack echelon, support echelon, reserve echelon). 4. A formation in which its subdivisions are placed one behind another, with a lateral and even spacing to the same side.

echelons above corps:

Army headquarters and organizations that provide the interface between the theater commander (joint or combined) and the corps for operational matters, and between the continental United States (CONUS)/host nation and the deployed corps for combat service support (CSS). Operational EAC may be US only or allied headquarters while EAC for CSS will normally be US national organizations.

embarkation: The loading of troops with their supplies and equipment into ships and/or aircraft.

engineer: Member of the Corps of Engineers; soldier who performs engineer duties, including construction, demolition, surveying, road and bridge building, and camouflage.

execute: perform or carry out what is required by orders.

external control: In highway transportation, the control exercised by a higher headquarters, such as a highway traffic regulation headquarters, and/or by military police, over a convoy, serial or march unit.

field artillery: A basic branch of the Army. The branch name identifies personnel and units which employ cannons, rockets and missiles systems, with target acquisition means assisting in land combat operations.

final coordination line:

A line close to the enemy position used to coordinate the lifting and shifting of supporting fires with the final deployment of maneuver elements. It should be recognizable on the ground.

final protective line:

Line selected where an enemy is to be checked by interlocking fires from all available weapons. A final protective line may be parallel with, or oblique to, the front of the position.

fire direction: Tactical employment of fire power; the exercise of tactical command of one or more units in the selection of targets, the concentration or distribution of fire, and allocation of ammunition for each mission.

fire support: Assistance to those elements of the ground forces that close with the enemy (such as infantry and armor units), rendered by delivering field artillery fire, naval gun fire, and close air support.

flow cycle: The complete sequence of phase movement through a traffic point.

flow phase: Nonconflicting movement of traffic through a traffic point.

follow-up elements:

Elements following a march column whether for cleanup, prevention of straggling, maintenance and recovery of equipment, or other purposes.

forward command post:

Station of a unit's headquarters where the commander and staff work. In combat, a unit's headquarters is often divided into a forward and rear echelon.

- forward echelon:** That part of a headquarters which is principally concerned with the tactical control of battle. See also *rear echelon*.
- free maneuver:** Practice maneuver in which each force acts as it chooses, and is limited only by the field orders received, by restrictions of area and time, and by the actions of the opposing force.
- general support:** Support that is given to the supported force as a whole and not to any particular subdivision thereof. See also *direct support*.
- going:** The classification of terrain according to its ability to support the passage of vehicles.
- grid coordinates:** The easting and northing value (of a grid) that designate the location of a point with respect to the grid. Coordinates usually are expressed to the nearest 100, 10, or 1 meter, with the easting and northing values combined into a single expression. Examples: 329378 (nearest 100 meters); 32943785 (nearest 10 meters); 3294837853 (nearest 1 meter).
- guide on me:** Order given by a battery commander for a unit to follow his movements. This unit then becomes the guide for the other units.
- harbor area:** An area designated for normal halts, for traffic control, and to avoid congestion in emergencies. Example applications are: to hold vehicles at both ends of a crossing or defile; to effect changes in density, especially at first or last light; to use as spillover areas in case of serious delay, which are likely to be caused by enemy air attack or its results; to use as areas where columns can rest and carry out maintenance and decontamination that may be necessary; to allow elements to change position in column if there is a change in priorities.
- headquarters company (battery) (troop):**
Administrative and tactical element of battalion or larger unit, with personnel used for the purposes of administration, intelligence, communications, and other necessary activities.
- headquarters detachment:**
Administrative and tactical element of a battalion or larger unit. In this meaning, a headquarters detachment differs from a headquarters company in that it has fewer personnel.
- heavy level of operations:**
Operations involving more than 60 percent of all force maneuver echelons and all fire support means engaged in all-out combat demanding total strength application over a period of time to include possible employment of next higher echelon resources to assure accomplishment of the force mission.
- highway capacity:** Maximum traffic flow obtainable on a given roadway using all available lanes.

highway regulation:

Planning, routing and scheduling the actual use of highways by vehicles, personnel afoot (including troops, refugees, and civilians) and animals to utilize highway transportation facilities and equipment most effectively in order to meet operational requirements.

highway regulation point:

Point on the highway at which the highway transport service records and reports the arrival and departure of, and regulates elements of, highway movement by issuing instructions for the continuance of the march, detours, diversions, schedules, etc.

holding force:

Forces assigned to hold a place or position; force that carries out a holding attack.

Infantry:

Infantry is a basic branch of the Army. The branch name identifies personnel and units who close with the enemy by means of fire and maneuver in order to destroy or capture him, or to repel his assault by fire, close combat, and counterattack. Personnel and units so identified fight dismounted or mounted according to the mobility means provided.

Intelligence:

The product resulting from the collection, processing, integration, analysis, evaluation and interpretation of available information which concerns one or more aspects of foreign nations or of areas of operations that is immediately or potentially significant to military planning and operations.

lane:

1. A clear route through an obstacle. A single lane is normally 8 meters wide and suitably marked; a double lane is 16 meters wide. 2. Strip of roadway intended to accommodate the forward movement of a single line of vehicles, usually 8 feet to 13 feet in width.

length of column:

The length of roadway occupied by a column in movement including the gaps inside the column for the front of the leading vehicle to the rear of the last vehicle.

letter of instructions:

Form of order by which superior commanders give information as to broad aims, policies, and strategic plans for operations in large areas over a considerable period of time. It is issued to large units of a command and has the same authority as an operations order. A letter of instruction is intended for the guidance and control of the operations of a large command.

line of departure:

In ground operations, a line, ordinarily located on or behind the last available terrain mask which can be reached without exposure to hostile observation and small arms fire; suitable, clearly defined terrain features such as roads, edges of woods and friendly front lines, may be used.

- logistics:** The planning and carrying out of the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with (1) design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of material; (2) movement, evacuation, and hospitalization of personnel; (3) acquisition or construction, maintenance, operation, and disposition of facilities; and (4) acquisition or furnishing of services.
- logistic support:** Provision of adequate material and services to a military force to assure successful accomplishment of assigned missions.
- main command post:** The main command post consists of those staff activities involved in controlling and sustaining current operations and in planning future operations. The main CP normally operates under the control of the chief of staff. In addition to the chief of staff, the main CP consists of G1, G2, G3, and G4 elements; fire support and chemical elements, tactical air control party (TACP) element, and an Army airspace command and control (A²C²) element consisting of air defense artillery (ADA) and Army aviation staff elements. The main CP exercises command and control of the current operations in case where a tactical CP is not employed.
- main defense area:** The area in which the main defensive battle is fought. For any particular command,, this area extends from the forward edge of the battle area to the rear boundaries of those units comprising its main defensive forces.
- maneuver:** The movement of forces supported by fire to achieve a position of advantage from which to destroy or threaten destruction of the enemy. A principle of war (from FM 100-5).
- maneuver control:** Employing forces on the battlefield through movement in combination with fire or fire potential to achieve an advantage over the enemy in order to accomplish the mission. The tactical commander is responsible for this function.
- maneuvering force:** Element of a combat unit that seeks to seize an attack objective through movement to a more advantageous position with respect to the enemy.
- march column:** Consists of all elements using the same route for a single movement of troops. March columns, regardless of size, are composed of three elements: a head, a main body, and a trail party, which perform various functions.
- march unit:** Unit which moves and halts at the order of a single commander. The march unit normally corresponds to one of the smaller troop units such as a squad section, platoon, company, or battery.
- metalled road:** Road constructed of gravel, crushed stone, slag, or similar material with a binder of fine aggregate tar or cement.

- mission:** 1. The primary task assigned to an individual, unit, or force. It usually contains the elements of who, what, where, and the reason therefor, but seldom specifies how. 2. The dispatching of one or more aircraft to accomplish one particular task.
- mobile unit:** A unit equipped with sufficient organic vehicles for the purposes of transporting all assigned personnel and equipment from one location to another at one time.
- moderate level of operations:** Operations involving 30-60 percent of all force maneuver echelons and over 50 percent of all fire support means engaged in continuous combat over a period of time, during which the employment of next higher echelon resources to assure accomplishment of the force mission is not anticipated.
- motor march:** Controlled movement of troops in which all elements move by motor.
- movement:** a change in the location of military troops.
- movement capacity:** The sum total of the capabilities of the shipping and receiving agencies and the transport services.
- movement control:** The planning, routing, scheduling, control and in-transit visibility of personnel, units, equipment, and supplies, moving over lines of communication in accordance with the directives of command planning. It is a continuum involving the synchronization and integration of movement information and programs spanning the strategic, operational and tactical levels of war. Movement control is guided by a system of balancing requirements against capabilities and allocating resources based on the combat commander's priorities.
- movement instructions:** Detailed instructions for the execution of a movement. They are issued by a transportation officer as an implementation of the movement programs, and represent accepted procedure to be followed by the shipper or receiver and transport services.
- movement plan:** Up-to-date logistics data reflecting a summary of transportation requirements, priorities, and limiting factors incident to the movement of one or more units or other special grouping of personnel by highway, marine, rail, or air transportation.
- movement program:** A plan prepared by a transportation movements section and issued in the name of the commander for the accomplishment of required movement by available transportation facilities projected over a stated period of time.

movement to contact:

Ground movement which is conducted in a theater of operations preliminary to combat to place troops in position to close with the enemy. Movement to contact is usually conducted in three phases: a. Contact remote. b. Contact improbable. c. Contact imminent.

objective area:

1. A defined geographical area where an objective is to be captured or reached by the military forces. 2. In airborne, air assault, and amphibious operations, it is the proposed area of operations and includes the airhead or beachhead.

oblique compartment:

Compartment of terrain, whose long axis is diagonal to the direction of march or to the front.

obstacle:

1. Any obstruction that stops, delays, or diverts movement. Obstacles may be natural: Deserts, rivers, swamps, or mountains; or they may be artificial: Barbed wire entanglements, pits, concrete or metal antimechanized traps, and they may be issued ready made or they may be constructed in the field. 2. A definable terrain feature that inhibits intervisibility or movement.

offensive:

1. Condition of a force when it is attacking. 2. Attacking; ready to attack. 3. Suitable for attack; used for attack. Gun and tanks are often offensive weapons.

open column:

A motor column in which distance between vehicles is increased to accomplish greater dispersion.

open route:

Roadway over which a minimum of supervision is exercised.

operation order for road movement:

Instructions issued for movement of personnel and prescribed equipment for one location to another within a stated period of time. These orders are issued by the authority having jurisdiction over the personnel involved in the order.

operational control:

The authority delegated to a commander to direct forces assigned so that the commander may accomplish specific missions or tasks that are usually limited by function, time, or location; to deploy units concerned, and to retain or assign tactical control of those units. It does not of itself include administrative or logistic control. In NATO, it does not include authority to assign separate employment of components of the units concerned.

option:

something chosen or available as a choice.

order:

A communication, written, oral, or by signal, that conveys instructions from a superior to a subordinate. In a broad sense, the terms **order** and **command** are synonymous. However, an order implies discretion as to the details of execution whereas a command does not.

- organic:** Assigned to and forming an essential part of a military organization; an element normally shown in the unit's table of organization and equipment (TOE).
- plan:** 1. formulate a scheme or program for the accomplishment of tactical objectives. 2. the results of the formulation in 1.
- prescribed load:** The quantity of combat essential supplies and repair parts (other than ammunition) authorized by major commanders to be on hand in units and which is carried by individuals or on unit vehicles. It is normally a 15-day level. The prescribed load is continuously reconstituted as used.
- primary road:** A linear surface feature making an open way for vehicles on an artificially made surface of bitumen or concrete, of a width greater than 6 meters.
- probable line of departure:**
A line previously selected on the ground where attacking units deploy prior to beginning an assault under conditions of limited visibility.
- rear area:** For any particular command, that area extending rearward from the rear boundary of its main defense area to that command's rear boundaries. The area primarily provided for the performance of administrative and logistic functions.
- rear command post:**
The rear CP consists of those staff activities concerned primarily with combat service support (CSS) of the force, administrative support of the HQ, and other activities not immediately concerned with current operations. Typical representatives within the rear echelon are elements of the G1 and G4 sections, G5, Adjutant General (AG), Staff Judge Advocate (SJA), Inspector General (IG), Provost Marshal (PM), supporting Military Intelligence (MI) elements concerned with counterintelligence and prisoner of war interrogation (IPW) activities, and the tactical airlift representative of the tactical air control party (TACP). Normally, rear CPs are near or collocated with CSS units (for example, COSCOM).
- rear echelon:** That part of a headquarters which is principally concerned with administrative and logistical matters.
- reconnaissance in force:**
A limited objective operation by a considerable force to discover and test the enemy's dispositions and strengths, or to develop other intelligence.
- regiment:** Administrative and tactical unit, on a command level below a division or brigade and above a battalion, the entire organization of which is prescribed by table of organization. The commanding officer of a regiment is usually a colonel.
- regulating officer:** Officer in command of a regulating station responsible for the smooth, orderly movement of troops and material within the area controlled.

regulating unit: Unit within the marching column that sets the pace for the rest of the column.

release point: A clearly-defined control point (or critical point) on a route at which specific elements of a column of ground vehicles or flight of aircraft revert to their respective commanders, each one of these elements continuing its movement towards its appropriate destination. 2. In dismounted attacks, that point at which a commander releases control of subordinate units to their commanders/leaders.

request: ask an entity to do something.

restricted traffic: Limited traffic, traffic over a route controlled by regulations limiting speeds, types of vehicles permitted maximum weight allowed, and hours at which the route may be open to different types of traffic.

retirement: A retrograde operation in which a force out of contact moves away from the enemy.

retrograde: An organized movement to the rear or away from the enemy. It may be forced by the enemy or may be made voluntarily. Such movements may be classified as withdrawal, retirement, or delaying operations.

road clearance distance:
The total distance the head of a motor column must travel for the entire column to clear a given section of road.

road movement graph:
Time space diagram used in planning and controlling marches, both road and foot, and in preparing or checking road movement tables.

road movement table:
A composite list showing the general organization and time and space schedule for march movement. It is generally published as an annex to an operation order for road movement.

road reconnaissance report:
A report which contains detailed information necessary for classification of a road.

road screen: Anything that is used to conceal movement along a road from enemy observation, especially artificial concealment or camouflage.

route: The prescribed course to be traveled from a specific point of origin to a specific destination.

route classification:
Classification assigned to a route indicating the heaviest vehicle that can be accepted. It is based on the weakest bridge or portion of the route.

route column: 1. Close order formation of troops, suitable for marching. 2. A flexible formation adopted for contact remote phase of movement to contact. During this phase, troops need not be tactically grouped, and may move by various means of transportation and by different routes.

routes of communication:

Network of roads, etc., over which supplies are carried and combat movements are made. Routes of communication include navigable waters, aircraft landing, and rail facilities.

schedule control system:

System of traffic control in which truck column and troops are dispatched over fixed routes at given rate of speed according to a time schedule.

secondary road: A linear surface feature making an open way for vehicles on an artificially made surface of gravel, bitumen, or concrete, and of a width between 4 and 6 meters.

signal axis: Line or route on which lie the starting and probable future locations of the command post of a unit during a troop movement; main route along which messages are relayed or sent to and from combat unit in the field.

single envelopment:

Maneuver made against one flank, around one flank against the rear, of the initial disposition of the enemy.

staff:

Officers who are specially ordered or detailed to assist the commander in his exercise of command. The staff provides information for the commander, makes a continuing study of the situation for anticipatory planning, submits recommendations as to plans and orders on its own initiative or in response to directives, translates decisions of the commander into orders, and provides for dissemination thereof, and supervises, as directed, the execution of orders to insure adherence to and successful execution of the intentions and policies of the commander.

staff estimate:

The staff officer's evaluation of how factors in his particular field of interest will influence the courses of action under consideration by the commander.

start point:

A clearly defined initial control point (or critical point) on a route at which specified elements of a column of ground vehicles or flight of aircraft come under the control of the commander having responsibility for the movement.

strategic:

pertaining to the overall planning and conduct of large-scale combat operations.

supplementary position:

That location which provides the best means to accomplish a task that cannot be accomplished from the primary or alternative positions.

support echelon: 1. Those elements that furnish logistical assistance to combat units. 2. Those units that support, by fire, the commander's plan of maneuver.

support unit:

Unit that acts with, and assists, or protects another unit, but does not act under the orders of the commander of the protected unit, of which it is not an organic part.

tactical:

Pertaining to the employment of units in combat.

tactical column: Contact improbable phase of movement to contact during which troops are tactically grouped to facilitate prompt adaptation of combat formations.

tactical command post:

The tactical CP is the forward echelon of a headquarters. The tactical CP may consist of G2, G3, fire support, tactical air control party (TACP), air defense artillery (ADA), and combat service support (CSS) liaison (G1, G4) elements. It is located well forward on the battlefield so that the commander is in proximity to subordinate commanders and can directly influence operations. At division, the tactical CP is located within FM radio range of the committed brigades.

tactical communications:

Communications provided by, or under the operational control of, commanders of combat forces, combat troops, combat support troops, or forces assigned a combat service support mission.

tactical high mobility:

The highest level of mobility designating the requirements for extensive cross-country maneuverability characteristic of operations in the ground-gaining and fire support environment.

tactical logistics: The provision of logistics support to combat forces deployed within a theater of operations.

tactical movement:

Movement of troops and equipment with a tactical mission under combat conditions when not in direct ground contact with the enemy.

tactical plan:

Plan for a particular combat operation, exclusive of arrangements for supply, evacuation, maintenance, or administration.

tactical standard mobility:

The second highest level of mobility designating the requirement for occasional cross-country movement,

tactical support mobility:

A level of mobility designating the requirement for infrequent off-road operations over selected terrain with the preponderance of movement on primary and secondary roads.

- task force:** 1. Based upon mission, a temporary grouping of units under one commander formed to carry out a specific operation or mission, or a semi-permanent organization of units under one commander to carry out a continuing single task. Units may be designated as a TF, regardless of attachments, whenever they are on a semi-independent mission. Brigades and higher units normally are not designated as TFs unless the mission requires joint airborne, amphibious, or other special, semi-independent operations. 2. Based upon organization, a battalion-sized unit of the combat arms consisting of a battalion control headquarters, with at least one of its major subordinate elements (a company), and the attachment of at least one company-sized element of another combat or combat support arm. An example is an infantry battalion headquarters; one or more of its organic companies; and the attachment of one or more of the following: a tank company, an armored cavalry troop, or an engineer company.
- task organization:** A temporary grouping of forces designed to accomplish a particular mission. Task organization involves the distribution of available assets to subordinate control headquarters by attachment or by placing assets in direct support (DS) or under the operational control of the subordinate.
- technical intelligence:** Intelligence concerning foreign technological developments and operational capabilities of foreign material which have or may have practical applications to military requirements. It is the end product resulting from the processing and collation of technical information.
- terrain:** The total of all natural or man-induced non-meteorological phenomena that influence the performance of vehicles, personnel, or other systems.
- terrain analysis:** The process of interpreting a geographic area to determine the effect of the natural and man-made features on military operations.
- terrain evaluation:** The evaluation and interpretation of an area of probable military operations to determine the effect of the terrain on the lines of action open to opposing forces in the area.
- terrain factor:** Any attribute of the terrain that can be adequately described at any point (or any instant of time) by a single measurable value; for example, slope or obstacle height.
- tertiary road:** A linear surface feature making an open way for vehicles or persons on a natural treated surface to improve its trafficability or gravel surface (including footpaths) less than 4 meters wide.
- thrust line:** Line forming the base of all coordinates in the thrust line system locating the position of objects on a map. It is a line designated by the commander, and located on the map by two reference points, or by a reference point and a direction. Somewhere along the thrust line is a base point, designated by the commander, from which all coordinates are measured. Points are located by giving their distance along the thrust line, forward or back of the base point, and their distance perpendicular to the thrust line.

- time distance:** Time required for any one vehicle to travel between two given points at a given rate of speed.
- time gap:** The sum of the intervals between columns and elements of the columns. It is expressed in minutes.
- time Interval:** The time that elapses between successive elements of a column as they move past a given point.
- traffic control point:**
A place at which traffic is controlled either by military police or by mechanical means.
- traffic headquarters:**
Headquarters exercising highway traffic regulation, which is planning, routing, scheduling, and directing the actual use of the highway by vehicles, personnel afoot (including troops, refugees, and other civilians), and animals, to utilize highway transportation facilities and equipment most effectively, in accordance with assigned tasks.
- traffic management:**
The direction, control and supervision of all functions incident to the procurement and use of freight and passenger transportation services.
- traffic map:** Map used in planning and regulating the flow of traffic. It includes routes, road data, the direction of movement, and the amount of traffic moving.
- trall formation:** See column formation.
- transportation engineering:**
The science of evaluating the requirements for, and planning the layout and functional aspects of transportation facilities; and of developing the most efficient relationships with respect to transportation equipment, transportation facilities, and traffic movement patterns so as to ensure adequate, safe, and efficient movement by all means of transportation.
- transportation Intelligence:**
A facet of technical intelligence, it is the end product resulting from the collection, evaluation, interpretation, analysis, and integration of all available information about the air, land, and water transportation systems of foreign areas of operations that are of immediate or potential military significance. This intelligence includes data on the characteristics, condition, development, organizatio, material operation, maintenance and construction of transportation systems facilities.
- transportation management:**
The performance of command and/or staff functions related to – planning, coordinating, evaluating, and analyzing all aspects of water, rail, highway, and air transportation systems; development of transportation policies and doctrine; assessment of capabilities in terms of current and projected transport requirements; allocation and monitoring the use of transportation resources in accordance with established priorities; and preparation of contingency transportation plans.

transportation movements:

The management of the movement capability to ensure maximum accomplishment of movement requirements.

troop:

A subordinate unit of the cavalry squadron. The troop has both administrative and tactical functions. It is equivalent to a company or battery.

uncover:

Expose or leave unprotected by movement or maneuver.

uncovered movement:

A movement made when security normally provided by other friendly forces is lacking.

withdrawal:

A retrograde operation in which a force in contact with the enemy frees itself for a new mission.

Appendix C: ATCCS and Movement Control Acronyms

A²C²:	<i>Army Airspace Command and Control</i>
ACCS:	<i>Army Command and Control System</i> the acronym for referring to the grouping of command and control systems used at all levels of command, including AWIS and others for strategic purposes and ATCCS for tactical usage.
ACP:	<i>Air Control Point</i>
ACR:	<i>Armored Cavalry Regiment</i>
ADA:	<i>Air Defense Artillery</i>
AFATDS:	<i>Advanced Field Artillery Tactical Data System</i> the node of the ATCCS system for the Fire Support BFA.
AO:	<i>Area of Operations</i>
ASAS:	<i>All Source Analysis System</i> the node of the ATCCS system for the Intelligence and Electronic Warfare BFA.
ASL:	<i>Authorized Stockage List</i> A list of items from all classes of supplies to be stocked at a specific echelon of supply.
ATCCS:	<i>Advanced Tactical Command and Control System</i> an integrated system, consisting of 5 functional nodes, one supporting each BFA, that constitutes a FLCS for use at the ECB level.
ATMCT:	<i>Air Terminal Movement Control Team</i>
AWIS:	<i>Army WWMCCS Information System</i> a system used by the Army which is part of the WWMCCS system used by all three military services. See WWMCCS.
BFA:	<i>Battlefield Functional Area</i> one of the areas of interest for controlling tactical assets in a combat situation. The BFAs for the ATCCS domain are 1) Maneuver, 2) Air Defense, 3) Fire Support, 4) Intelligence and Electronic Warfare, and 5) Combat Service Support.
BMCT:	<i>Branch Movement Control Team</i>
BMNT:	<i>Beginning Morning Nautical Twilight</i> Begins when the sun is 12 degrees below the horizon. It is the <i>start</i> of that period where, in good conditions and in the absence of other illumination, enough light is available to identify the general outlines of ground objects, conduct limited military operations, and engage in most types of ground movement without difficulty.
CAS:	<i>Close Air Support</i>
CMCC	<i>Combined Movement Control Center</i>
COMMZ:	<i>COMMunications Zone</i>
COSCOM:	<i>COrps Support COMmand</i>

CS: *Combat Support*

CSS: *Combat Service Support*

CSSCS: *Combat Service Support Control System*
the node of the ATCCS system for the Combat Service Support BFA.

CTMC: *Combined Transportation Movement Center*

CTO: *Corps Transportation Officer*

DAMMS-R: *Department of the Army Movement Management System - Redesign*

DISCOM: *Division Support COMmand*

DODAAC: *Department Of Defense Activity Address Code*

DS: *Direct Support*

DTG: *Date Time Group*

DTO: *Division Transportation Office or Officer*

EAC: *Echelons Above Corps*

ECB: *Echelons Corps and Below*
those command entities at the Corps level or below, for example, Division, Brigade, Regiment, Battalion, etc.

EENT: *End Evening Nautical Twilight*
Occurs when the sun has dropped 12 degrees below the horizon, and is the instant of last available daylight for the visual control of limited ground operations. At the EENT, there is no further sunlight available.

FAADC3I: *Forward Area Air Defense Command, Control, Communications, and Intelligence system*
the node of the ATCCS system for the Air Defense BFA.

FEBA: *Forward Edge of Battle Area*
the front line of the combat area where enemy units are in close proximity.

FLCS: *Force Level Control System*
a system for coordinating the usage of Army units and their assets at various levels of command. For example, ATCCS is a FLCS for Corps, Division, and Brigade level units with planned extensions to include the maneuver Battalion level units. WWMCCS is a FLCS at the EAC level.

FLOT: *Forward Line of Own Troops*
the line showing the position of all friendly forces who are closest to the enemy.

FRAGO: *FRAGmentary Order*

GS: *General Support*

Gx: *General's staff, area x*
members of a command staff organization headed by an general officer whose responsibilities are designated by the numeral following the G. They include:

- G1: Administration and Personnel
- G2: Intelligence

- G3: Operations and Plans
- G4: Logistics
- G5: Civil Affairs

HET:	<i>Heavy Equipment Transporter</i>
HHC:	<i>Headquarters and Headquarters Company</i>
HHD:	<i>Headquarters and Headquarters Detachment</i>
HMCT:	<i>Highway Movement Control Team</i>
HNS:	<i>Host Nation Support</i>
HQ:	<i>HeadQuarters</i>
HRP:	<i>Highway Regulating Point</i>
HRPT:	<i>Highway Regulating Point Team</i>
HTD:	<i>Highway Traffic Division</i>
IEW:	<i>Intelligence/Electronic Warfare</i>
IPB:	<i>Intelligence Preparation of the Battlefield</i> A systematic approach to analyzing the enemy, weather, and terrain in a specific geographic area. It integrates enemy doctrine with the weather and terrain as they relate to the mission and the specific battlefield environment. This is done to determine and evaluate enemy capabilities, vulnerabilities, and probable courses of action.
Jx:	<i>Joint force staff, area x</i> staff officer to a joint force commander (multi-national and/or multi-service) with the responsibilities designated by the numeral x. See Gx.
JOPES:	<i>Joint Operational Planning and Execution System</i>
LIC:	<i>Low Intensity Conflict</i>
LOC:	<i>Lines Of Communication</i>
LOGPAC:	<i>LOGistics PACkage</i>
MBA:	<i>Main Battle Area</i>
MCA:	<i>Movement Control Agency</i>
MCC:	<i>Movement Control Center</i>
MCO:	<i>Movement Control Officer</i>
MCS:	<i>Maneuver Control System</i> the node of the ATCCS system for the Maneuver BFA.
MCT:	<i>Movement Control Team</i>
METT-T:	<i>Mission, Enemy, Terrain, Troops, and Time available</i>
MHE:	<i>Material Handling Equipment</i>
MI:	<i>Military Intelligence</i>
MP:	<i>Military Police</i>
MRE:	<i>Meals Ready to Eat</i>

MSR: *Main Supply Route*
MTMC: *Military Traffic Management Center*
OPCON: *OPerational CONtrol*
OPLAN: *Operational PLAN*
OPORD: *OPerational ORDer*
PDN: *Physical Distribution Network*
POD: *Port Of Debarkation*
POE: *Port Of Embarkation*
POL: *Petroleum, Oil, and Lubricants*
RAOC: *Rear Area Operations Center*
RMCT: *Regional Movement Control Team*
RMMT: *Rail Movement Management Team*
RP: *Release Point*
Sx: *Staff, area x*
staff officer to a commander not of general rank, with the responsibilities designated by the numeral x. See Gx.
S&S or S/S: *Supply and Service, or Service and Support*
SOP: *Standard Operating Procedure*
SP: *Start Point*
TAACOM: *Theater Army Area COMmand*
TACCS: *Tactical Army Combat service support Computer System*
TAMCA: *Theater Army Movement Control Agency*
TCMD: *Transportation Control and Movement Document*
TCN: *Transportation Control Number*
TCP: *Traffic Control Post or Plan*
TMR: *Transportation Movement Release*
TMT: *Transportation Motor Transport*
TOA: *Transportation Operating Agency*
TOE: *Table of Organization and Equipment*
TP: *Transportation Priority*
TPFDL: *Time-Phased Force Deployment List*
TR: *Transportation Request*
TRANSCOM: *TRANSportation COMmand*
UIC: *Unit Identification Code*

WWMMCS:

World Wide Military Command and Control System

The agency that provides the national command authorities with the information on world situations needed for accurate and timely decisions, to include the communications required for reliable transmission of those decisions with a minimum of delay under all conditions of peace and war for the national direction of US military forces. It consists of the facilities, equipment, communications, procedures, and personnel that provide technical and operational support involved in the function of command and control of US military forces.

References

- [Army 87] Department of the Army.
The Posture of the United States Army for Fiscal Year 1987.
Joint Statement by the Secretary of the Army and the Chief of Staff,
United States Army to Congress. 1987.
CMU Library.
- [Army FM 100-15 89] *Corps Operations*
Headquarters, Department of the Army, Washington, DC, September
1989.
GE ATCCS Library.
- [Army FM 100-5 86] *Operations*
Headquarters, Department of the Army, Washington, DC, May 5, 1986.
CACDA.
- [Army FM 55-10 86] *Movement Control in a Theater of Operations*
Headquarters, Department of the Army, Washington, DC, July 22, 1986.
DAMMS-R facility.
- [Bellamy 87] Bellamy, Chris.
The future of land warfare.
St. Martins Press, New York, NY, 1987.
CMU Library.
- [COMCON 89] COMCON, Inc.
Feasibility Report for the Control Assistance Studies Project.
Technical Report 542B-0489.001, for CECOM CSE, IEW Directorate,
Fort Monmouth, NJ 07703, April, 1989.
CECOM.
- [Flanagan 91] Flanagan, Edward M.
The 100-Hour War.
Army 41(4):18 - 26, April, 1991.
SEI Library.
- [FODA 90] Kang, K.C. et. al.
Feature-Oriented Domain Analysis Feasibility Study: Interim Report.
Technical report CMU/SEI-90-TR-21, Software Engineering Institute,
Carnegie Mellon University, Pittsburgh, PA 15213, October, 1990.
SEI.
- [SDMP Annex A 90] *ATCCS System Development Master Plan, Annex A*
PEO-CCS, U.S. Army Communications and Electronics Command, Fort
Monmouth, NJ 07703, 31 January 1990.
GE ATCCS Library.

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report describes the results of the first phase of a domain analysis performed by the SEI's Domain Analysis Project. The report establishes the context and scope of the movement control domain within command and control (C2) systems and in particular, ATCCS. It discussed the purpose of a domain analysis and presents an overview of the method being used to perform the analysis. The report describes both the Army's use of ATCCS in achieving the Army mission and the ATCCS software development strategy. A brief description of Army C2 systems lays a foundation for defining movement control and its context in the ATCCS structure. Within this context, the report identifies the key areas within movement control that will be explored during the remainder of the domain analysis. The report also describes the approach for performing the analysis and includes appendices providing additional information about ATCCS, relevant terms, and acronyms. <p style="text-align: right; margin-top: 10px;">(please turn over)</p>																		
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