NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

A HISTORICAL PERSPECTIVE OF THE GLOBAL TRANSPORTATION NETWORK (GTN)

by

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March 2000

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE March 2000	3. REPORT TYPE AND DATES COVERED Master's Thesis

4. TITLE AND SUBTITLE : A Historical Perspective of the Global Transportation Network (GTN)	5. FUNDING NUMBERS
6. AUTHOR(S) Sciaretta, Kent J. and Trettel, David J.	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A	10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT	12b. DISTRIBUTION CODE
Approved for public release; distribution is unlimited.	

13. ABSTRACT *(maximum 200 words)* This thesis analyzes the changes within the Global Transportation Network (GTN)/In Transit Visibility (ITV) feeder systems and the subsequent ITV they provide by comparing the current position to the past and by examining future trends. Up until now, there has been no definitive documentation showing the initial inception or the subsequent improvements that have taken place in developing the GTN and feeder systems. The inception of the GTN is documented, including some of the "proof of concept" prototypes. The operational prototypes and production systems are also analyzed, including the feeder systems used in the GTN and how the GTN performed during operation Desert Shield/Storm. USTRANSCOM's vision of the future GTN, up to FY04, is explained along with the authors' view of possible future GTN capabilities.

14. SUBJECT TERMS Global Transportation Network (GTN), Intransit Visibility (ITV), Total Asset Visibility (TAV), Transportation Logistics	15. NUMBER OF PAGES
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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A HISTORICAL PERSPECTIVE OF THE GLOBAL TRANSPORTATION NETWORK (GTN)

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MASTER OF SCIENCE IN MANAGEMENT

from the

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ABSTRACT

This thesis analyzes the changes within the Global Transportation Network (GTN)/In Transit Visibility (ITV) feeder systems and the subsequent ITV they provide by comparing the current position to the past and by examining future trends. Up until now, there has been no definitive documentation showing the initial inception or the subsequent improvements that have taken place in developing the GTN and feeder systems. The inception of the GTN is documented, including some of the "proof of concept" prototypes. The operational prototypes and production systems are also analyzed, including the feeder systems used in the GTN and how the GTN performed during operation Desert Shield/Storm. USTRANSCOM's vision of the future GTN, up to FY04, is explained along with the authors' view of possible future GTN capabilities.

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I. INTRODUCTION

A. PURPOSE

This research shows what changes have occurred within Global Transportation Network (GTN)/In Transit Visibility (ITV) feeder systems and the subsequent ITV it provides by comparing the current position to the past and by examining future trends. GTN has increased in capability since the initial concept was set forth in 1988. To date, there is no single document or research to show the advances in GTN/ITV feeder systems capability and the subsequent increased ITV of cargo and passengers in the system. Data is available to show current and past capability, but definitive documentation is lacking to show the initial inception or the subsequent improvements that have taken place in the ongoing development of GTN and feeder systems. In addition, current capacity is not quantifiable to show the current position with a view toward desired future states.

B. RESEARCH QUESTIONS

1. Primary Research Questions

What has been the historical ITV capability within GTN and other sources, how have the capabilities progressed to the present state, and what are the desired future capabilities of GTN/ITV, given advances in Information Technology (IT)?

2. Secondary Research Questions

a. What were the lessons learned from the Persian Gulf War in regards to Total Asset Visibility (TAV)?

b. What are the GTN feeder systems and associated integration challenges?

c. What are the concerns involved with future development of the GTN?

d. What technologies need to be developed or improved for increased exploitation of GTN capabilities?

C. RESEARCH SCOPE AND METHODOLOGY

This research will analyze past (pre-GTN) capability, current capability, and future desired capabilities of the GTN. The following resources were used to accomplish this analysis:

1. Literature search of books, magazine articles, CD-ROM systems, and other library information.

2. Conduct personal interviews.

3. Conduct research on Internet web-sites.

4. Complete data gathering and interviews at USTRANSCOM.

5. Electronic messaging (email).

D. ORGANIZATION OF STUDY

Chapter II will describe the inception of GTN and introduce some of the early "proof-of-concept" prototypes. The background will also include definitions and descriptions of TAV, ITV, and Electronic Data Interchange (EDI) that all play a role in the GTN. Chapter III describes GTN evolution and examines the various operational prototypes and production systems. The development of GTN capabilities and performance through time is illustrated by examining the changing user requirements, lessons learned from the Persian Gulf War and other contingencies, as well as changes in information technology. The chapter also describes the current GTN feeder systems. This includes the history of integration and the associated challenges with integration of feeder systems. To aid in the analysis, migration and legacy systems are defined and discussed.

In Chapter IV, USTRANSCOM's vision of future desired GTN capabilities are presented. In envisioning the future capabilities of the GTN, the authors took into account USTRANSCOM's vision, lessons learned from the research, and future trends of IT. Using this information, the authors presented an operational concept of the GTN that would address present and future DOD and commercial transportation challenges.

Chapter V summarizes the findings of the research and presents recommendations for further research and study. The summary includes recommendations for business processes, infrastructure, and management practices that will facilitate reaching the envisioned GTN goals.

E. BENEFITS OF STUDY

The results of this research will show what changes have occurred within Global Transportation Network (GTN)/In Transit Visibility (ITV) feeder systems and the subsequent ITV provided. It will also provide a concept of future GTN capabilities that may prove beneficial to the Defense Transportation System (DTS). The goal of this study is to provide leadership in the Joint arena, a basis of justification for business processes, management, and infrastructure changes necessary to reach desired future GTN capabilities that will evolve over time.

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II. BACKGROUND

A. INTRODUCTION

USTRANSCOM was established in 1987 as the Department of Defense's manager for common user lift during wartime. In 1992, a Secretary of Defense memorandum designated the Commander in Chief, USTRANSCOM as the single manager for defense transportation during both peace and wartime. This memorandum was superceded by DOD directive 5158.4 on 8 January 1993, which transferred combatant command of Air Mobility Command (AMC), Military Sealift Command (MSC), and Military Traffic Management Command (MTMC) to USCINCTRANS. All military transportation assets, except service-unique assets were also transferred to USCINCTRANS. USTRANSCOM coordinates personnel and material movement via both military and commercial modes of transportation, as well as providing control and supervision of all transportation services. [Ref. 1]

Shortly after creating USTRANSCOM, the GTN concept was established as the backbone of the DTS information network and was considered one of USTRANSCOM's highest priorities. To understand the GTN concept and subsequent developments, an understanding of TAV, ITV, and EDI is necessary.

B. TOTAL ASSET VISIBILITY (TAV)

To understand how TAV is integrated into the GTN, TAV must be defined. TAV is defined as:

> The ability to gather information from DOD systems on the identification, quantity, condition, location, movement, and status of material, units, personnel, equipment, and supplies anywhere in the logistics system at any time, and to apply information to improve logistics processes. DOD has expanded TAV to include all classes of supply, units, personnel, and medical patients. TAV provides an essential management tool to customers, item managers, weapon

system managers, and commanders in chief (CINCS) to move and redirect materiel, to redistribute items, to view forces flowing into theaters, and to optimize overseas stock positioning. [Ref. 2]

TAV includes assets that are in storage, in process, and in transit. In storage assets are defined as:

> All material being stored at retail consumer sites (operating activity storerooms or warehouses); retail intermediate storage sites, contractor facilities (as government-furnished material), disposal activities, or wholesale depots. [Ref. 3:pp. 2-9]

In process assets are defined as:

> All material that are either on order from DOD vendors but not yet shipped, undergoing repair at depot-level organic or commercial maintenance facilities, or at intermediate maintenance facilities. [Ref. 3:pp. 2-9]

In transit assets are defined as:

> All personnel and materiel that are being shipped from external procurement or repair sources, or moving within the DOD distribution system. [Ref. 3:pp. 2-9]

TAV usually involves Automatic Identification Technology (AIT). AIT facilitates data collection and transmission to Automated Information Systems (AIS). AIT encompasses a variety of read and write data storage technologies that capture asset identification information. Those technologies include bar codes, magnetic stripes, integrated circuit cards, optical memory cards, and radio frequency identification tags. AIT also includes the hardware and software used to store information in storage devices, read the information stored on them, and integrate that information with other logistics data. It also uses satellites to track and redirect shipments. [Ref. 4:pp. iii-iv]

C. INTRANSIT VISIBILITY (ITV)

ITV is an integral component of TAV. ITV is the ability to track the identity, status, and location of DOD unit and non-unit cargo, passengers, patients, and personal property from origin to consignee or destination during peace, contingencies, and war. using AIT, ITV provides "real-time" visibility and information flow that can prove vital to operation and support commanders. Knowing exactly where assets are located reduces the uncertainty of asset management, and in turn reduces unnecessary inventory. When ITV is not in place, redundant inventory acts as a "back-up" to the system providing operational commanders confidence in the logistics support provided to them. These redundancies, however, increase the cost of material in the logistics pipeline and also increase inventory and warehousing costs. Numerous military operations have confirmed that a comprehensive ITV program is key to ensuring responsiveness, ensuring needed assets are diverted to higher priority destinations, and that shipments can be reconstituted to fulfill the needs of operational commanders. [Ref. 3:p. iii]

D. ELECTRONIC DATA INTERCHANGE

Over the years, paper has been the traditional medium for documenting business transactions. Company records are filed on paper, which needs to be physically carried between companies to exchange information. Computers allowed companies to process data electronically, but paper still needed to be physically moved between companies. The common practice has been for a company to enter data into a business application, print the data on paper, and mail it to a trading partner. The trading partner, after receiving the paper, re-keys the data into another business application. This system of data exchange relies on the timeliness of the delivery system and is susceptible to errors during data input. Although the computer allowed data to be processed and stored electronically, an efficient way to communicate that data was needed. [Ref. 5]

Communicating data electronically was realized with the widespread use of computer telecommunications. Transmitting data over telephone lines provided a means of data exchange without the delay of delivery systems, with less paperwork and fewer errors in transcribing data. [Ref. 5]

Computer telecommunications solved only part of the problem. To transfer data via computer telecommunications, a data exchange format had to be agreed upon prior to transferring data. This made it very difficult for data to be transferred between many trading partners. [Ref. 5]

In the late 1970's, work began on national and international Electronic Data Interchange (EDI) standards. To make EDI work for all users, a set of standard data formats needed to be created that:

- were hardware independent;
- were unambiguous, such that they could be used by all trading partners;
- reduced the labor-intensive tasks of exchanging data (e.g., data re-entry); and
- allowed the data transmitter to control the exchange, including knowing if and when the recipient received the transaction.

Although today there is much syntax for EDI, only two are widely recognized: X.12 and the Electronic Data Interchange for Administration, Commerce, and Transport (EDIFACT). These two families of standards are mandated for use within the Federal Government. [Ref. 5]

Uses of EDI include but are not limited to the following: generating purchasing orders, sending invoices and bills of lading, advance shipment notification, and shipment tracking. [Ref. 6] By 1993, the federal government began implementing EDI with an executive order directing full-scale implementation of the federal electronic commerce system by 1997. Procurement reform legislation was also passed that provided incentives for government agencies to use EDI by raising the small-purchase threshold from $25,000 to $100,000 for EDI-based procurement transactions. [Ref. 7] The federal government has since adopted ANSI X.12 formatting standards to conduct business using EDI. DOD uses Standard Exchange Format (SEF) which is based on the ANSI X.12 and EDIFACT formats; this allows DOD to conduct business with commercial industry. [Ref. 8]

DOD's EDI implementation is uses the Defense Transportation Electronic Data Interchange Program (DTEDI). When fully implemented, DTEDI will replace many of the routine freight and personal property documents with EDI transactions. Figure 1 shows the operating concept of DTEDI. [Ref. 8]

EDI fully exploits electronic commerce in the DOD. Taking the lead from the commercial sector, DOD has been a pioneer in developing new uses of electronic commerce. DOD is making strong progress in moving towards a paperless environment, using EDI and electronic commerce in the areas of contract administration and finance, internet-based commerce, paper-free weapons systems support, internet-based publishing, consolidating logistics and transportation, travel reengineering, and household goods transportation. [Ref. 9]

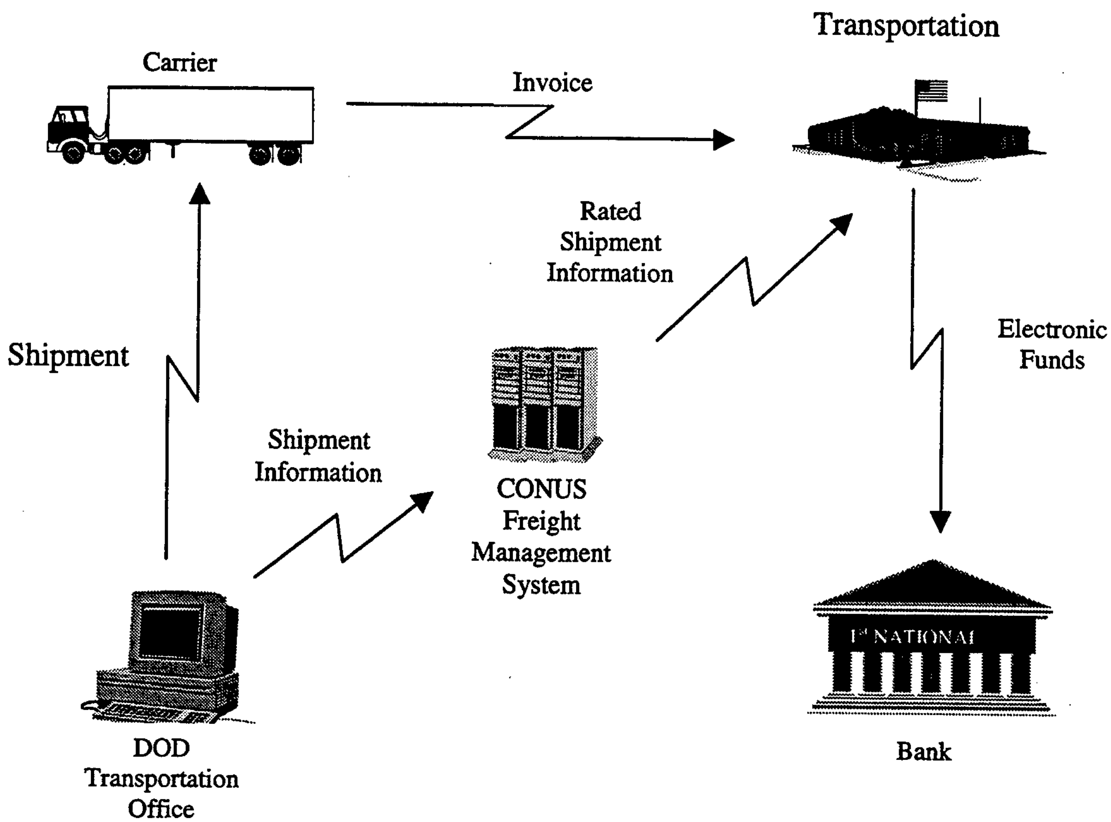

Figure 1. DTEDI Program Operating Concept [Ref. 3: p. 1-6]

E. SYSTEM INCEPTION

1. Overview

In the past, single managers for air, sea, and land transportation within each of the services managed transportation for their service. This was accomplished through the USTRANSCOM Transportation Component Commands (TCCs); the Army's Military Traffic Management Command (MTMC), the Navy's Military Sealift Command (MSC), and the Air Force's Air Mobility Command (AMC). [Ref. 10:p. 10]

Along with the emphasis on joint operations came the need to project power to any location in the world. In an environment of reduced military resources, the need for a highly effective and efficient DOD transportation capability became increasingly evident. Each service and defense agency had its own existing automated system for transportation management that was partially integrated and supported by policies and procedures unique to each service. The shortfall of this arrangement was that there was virtually no horizontal integration or coordinating policies and procedures or data management activities between the services and defense agencies. The result was a very complex and confusing array of systems that individually provided the needed transportation support to the services but failed to provide the information necessary for centrally managing the joint transportation network. [Ref. 10:p. 10]

Figure 2 illustrates the various integration disconnects that existed between the independent systems. A vertical disconnect existed between joint/specified systems used to plan movements and the service/component systems that received movement requirements and executed movements. Both systems had related capabilities but did not exchange transportation-related data. Horizontal disconnects also existed between the individual service/component systems that were responsible for DOD transportation. Policies and procedures existed for the DTS; however, they did not coordinate or integrate the air and surface systems. Effective command and control (C^2) requires that variations in actual and planned movement requirements are monitored and managed to control transportation assets. Vertical and horizontal disconnects inhibit free information flows and hide critical C^2 information. [Ref. 10:pp. 10-11]

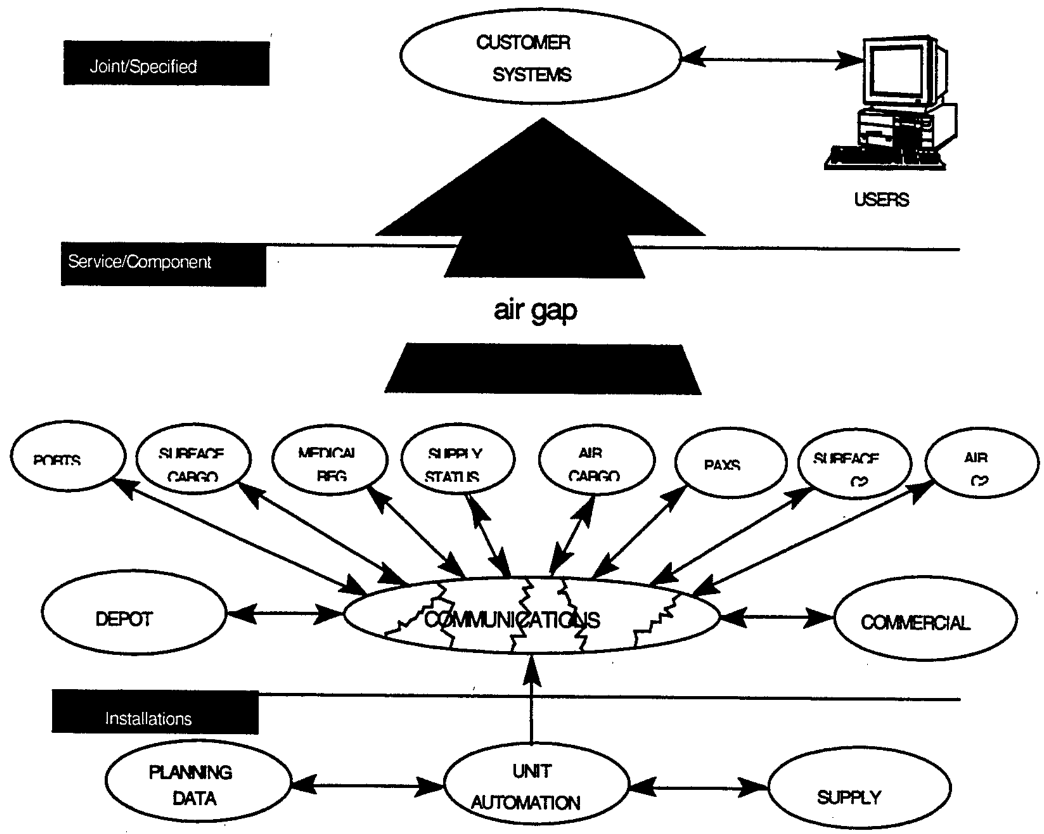

Figure 2. System Disconnects [Ref. 10:p. 11]

F. HISTORY

Shortly after the birth of USTRANSCOM, a Concept of Operations (CONOPS) was completed in 1987. The next challenge to USTRANSCOM was to develop an Automated Data Processing (ADP) master plan , which fell under the responsibility of the Directorate for Command, Control, Communications, and Computer Systems (C□S). The goal was to develop an ADP system with the capability to integrate mobility, deployment, and acquisition of transportation ADP systems to ensure overall system compatibility. This system also had to be integrated into transportation C^2 systems. [Ref. 11:p. 46]

The complexity of integrating the existing transportation ADP systems was enormous. For example, a single portion of the project, MTMC's automated system for transportation, involved six major systems, which included 43 subsystems and 2,400 application programs. When completed, the ADP master plan would set the groundwork for USTRANSCOM's success. [Ref. 11:p. 46]

In January 1988, the Director of USTRANSCOM's Directorate for C□S, Brigadier General Beasley, changed the name of USTRANSCOM's ADP master plan. To more accurately define its scope and purpose, it would henceforth be referred to as the C□S Master Plan. Brigadier General Beasley also organized the C□S Master Plan development into four stages. [Ref. 12:p. 141]

The first stage established a baseline of current systems. The second stage defined the Joint Deployment Community systems requirements. The third stage compared the requirements to the baseline and assessed the deficiencies. The fourth stage produced a set of technical solutions based on the list of deficiencies. These solutions were divided into three major areas for developing integrated systems. The three areas were planning, command and control, and intransit visibility. [Ref. 12:p. 141]

These three areas would ultimately develop into the Global Transportation Network (GTN), an integrated system of command, control, communications, and computer systems. This network would be supported by procedures, policies, and personnel employed and managed by USTRANSCOM to meet its global transportation mission.

By the end of 1988, although still early in a conceptual stage, the GTN appeared to be a viable, long-term solution to the current Joint Deployment Community's C□S problems. It was thought that being able to interface with sophisticated government and civilian C□ systems, the GTN would provide in-transit visibility and improve USTRANSCOM's ability to anticipate user requirements. To harness the optimum benefit for transportation management, the GTN had to provide security for both commercial and government vendors, standardize data, and capture the best of commercial information technology. It would also have to allow for rapid prototyping and provide the DOD with substantial savings in transportation costs. [Ref. 12:p. 145]

By the end of 1988, a Memorandum of Understanding (MOU) was also drafted to gain the support of the Air Force Systems Command (AFSC) to develop the GTN. The proposed MOU outlined the responsibilities of AFSC and USTRANSCOM. AFSC's responsibilities were outlined as follows:

- Serve as program manager for technical studies and systems development support
- Provide program planning to assess ongoing and planned activities
- Develop alternative solutions and courses of action
- Advise on the development and implementation of appropriate acquisition strategies
- Assist in working with other Commanders in Chief, services, and agencies in planning and developing integrated, interoperable, compatible, and mutually supporting transportation C^{4}S

USTRANSCOM's responsibilities were outlined in the MOU as follows:

- Provide requirements direction and guidance for analyzing and developing the C^{4}S in support of the command's mission

- Review, evaluate, and validate AFSC-developed plans and assessments
- Identify special studies and analyses needed to assure proper integration and interoperability of the command's C^4S.

"The two commands would work together to man and fund the activities listed in the MOU." AFSC's Commander, Gen Bernard P. Randolph, signed the MOU in January 1989. [Ref. 12:p. 147]

On 16 March 1989, a five-year labor hour contract was awarded to Computer Sciences Corporation (CSC) to support USTRANSCOM in developing the C□S master plan. The master plan highlighted USTRANSCOM's mission, organizational relationships and C□S baseline. It also outlined the requirements and deficiencies identified from the baseline and some solutions to those deficiencies. In essence, the document outlined a plan to transform the existing multiple independent systems to an integrated C□ system. [Ref. 13:p. 158-159]

In October 1988, the Secretary of Defense directed MTMC to consider the feasibility of developing a worldwide ITV prototype for DOD. In December 1988, the JCS tasked USTRANSCOM to produce a proposal for a pilot ITV program. As a result, USTRANSCOM and MTMC began to coordinate their efforts to ensure their work would be compatible with the GTN. Early in 1989, USTRANSCOM began to plan a proof-of-concept prototype and selected the best databases to use in the project. These databases were:

- MTMC's Terminal Management System (Honeywell DPS-8), hosted in Oakland, California
- Military Airlift Command's Passenger Reservation and Manifesting System (PRAMS)(Honeywell DPS-8), Scott Air Force Base, Illinois

- The Army's Logistics Control Activity Databases (IBM), San Francisco, California
- DOD's Defense Transportation Tracking System (AT&T 3B2), Norfolk, Virginia

To demonstrate the capability to tap into civilian systems, American President Lines' Tracking System (Eagle Link) (IBM 3090), San Mateo, California was also included as one of the information databases. [Ref. 13:pp. 161-162]

Since both the USTRANSCOM and MTMC prototypes involved very similar technologies, General Cassidy, Commander in Chief, USTRANSCOM, decided to combine them and use the best features of each prototype. A UNIX-based "surround" technology developed by Cambridge Technology Group (CTG) was chosen as the likely approach for the GTN/ITV prototype. USTRANSCOM contracted with CTG to develop two GTN/ITV proof-of-concept prototypes and provide the hardware and software. The $200,000 contract also included a one-year lease for an NCR Tower computer, training, documentation, and a demonstration at Scott Air Force Base. [Ref. 13:p. 162]

In August 1989, the GTN/ITV prototype was installed at USTRANSCOM and successfully demonstrated. Throughout the rest of 1989, prototype demonstrations were held at US Pacific Command (USPACOM) headquarters and at US European Command (USEUCOM) headquarters. The prototypes focused on tracking unit and non-unit cargo and personnel across the Pacific, and ammunition and container tracking to Europe. The tracking was accomplished by answering a small number of ITV inquiries that pulled "real time" ITV information from existing databases. These successful demonstrations prompted further development and investment toward expanded capabilities and prototypes for the worldwide GTN/ITV system. [Ref. 13: p. 163]

G. CHAPTER SUMMARY

USTRANSCOM was established as the single manager for transportation in both peace and war through its Transportation Component Commands (TCCs). As part of its mission, USTRANSCOM was tasked with exploring the feasibility of creating a transportation management system that would provide ITV to all DOD transportation users throughout the world. The system, known as the Global Transportation Network (GTN) used existing databases as the source data to provide much needed real-time information to support and operational commanders.

One of the major challenges to building such a system was the integration of existing independent automated information systems that provide critical transportation data to their unique service component but do not communicate effectively with other transportation systems.

Shortly after creating the GTN concept, the feasibility of providing global ITV was demonstrated through "proof-of-concept" prototypes. These prototypes were deemed a success, prompting the first operational prototypes, which will be discussed in the next chapter.

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III. THE GLOBAL TRANSPORTATION NETWORK

A. INTRODUCTION

The "proof-of-concept" prototypes were successfully demonstrated and by the end of 1989, USTRANSCOM defined objectives for the operational prototype. Those objectives are listed in table 1. In addition to defining objectives for the GTN, some challenges were recognized. System security, data standardization, and managing external databases were causes for concern. At the end of 1989, project costs remained unknown and funding sources were undetermined. [Ref. 13:p. 164]

USTRANSCOM planned to develop the GTN incrementally, periodically releasing versions containing a few major integration changes and appropriate technical infrastructure. As the system grew, so would USTRANSCOM's responsibility for maintenance, network management, security, and transportation information integration and administration. [Ref. 13:p. 164]

UNITED STATES TRANSPORTATION COMMAND GLOBAL TRANSPORTATION NETWORK/INTRANSIT VISIBILITY OPERATION PROTOTYPE OBJECTIVES

I. Refine functional requirements for the Command, Control, Communications, and Computer Systems Master Plan.

II. Quickly and economically develop a Global Transportation Network technical capability that addresses all three Global Transportation Network elements: Command and Control, Planning (Joint Operation Planning and Execution System), and Intransit Visibility.

III. Satisfy the Deputy Secretary of Defense's requirement for Military Traffic Management Command to develop an Intransit Visibility prototype.

IV. Define technical specifications for the Global Transportation Network program.

V. Produce a viable, usable, fielded information prototype in three theaters and the United States Transportation Command.

(1) Prove a capability to provide immediate visibility of transportation assets, personnel, and cargo movements.

(2) Prove a capability to provide command and control of global mobility operations and determine information critical to the success of a supported commander's operation.

(3) Prove a capability to provide information expansion for quick response planning and replanning.

(4) Develop effective technologies to integrate Department of Defense and civil sector transportation information systems.

(5) Isolate the user from the diverse technical requirements of multiple information systems, yet allow free access to strategic decision information.

(6) Develop usable methodologies to present strategic transportation decision information.

Table 1. [Ref. 13:p. 164]

B. DATA STANDARDIZATION

Lack of standardized data was also considered to be a major impediment to implementing the GTN. Different systems represented the same information in a variety of different formats and definitions. It was difficult for different systems to share information when, for example, Rhein-Main Air Base, Germany was represented as "GYRZ", "EDAF," or "FRF" depending on the system used. [Ref. 13:p. 166]

To resolve the standardization problem, the Deputy Secretary of Defense mandated that unnecessary redundancy be reduced by developing common data requirements and formats. To accomplish this task, an executive level body was formed with representation from within and outside DOD. In particular, this executive body was tasked to:

- Use a Corporate Information Management program developed for DOD to recommend an overall approach and plan of action to increase the availability of standardized information in common areas.
- Recommend corrective actions to the process and procedures used for overseeing new DOD information systems and software development.
- Establish working groups, in both technical and common business areas, to develop information requirements and data formats in DOD that are uniform and consistent. [Ref. 13:p. 167]

In 1990, working with its component commands, USTRANSCOM drafted a regulation entitled "Data Management and Standards Program." The Data Management and Standards Program set the foundation for data sharing between the commands and defined the requirement for a Defense Transportation Data Dictionary. [Ref. 14:p. 97]

C. GTN PROTOTYPE DEVELOPMENT

During 1990, USTRANSCOM made several management changes as well as significant progress toward fielding a GTN operational prototype. Some of the major management changes included revising the GTN Memorandum of Agreement (MOA) with MTMC. Under the new agreement, USTRANSCOM's Directorate of Operations and Logistics (TCJ3/4) became the GTN Program Manager and the Directorate of C^4S

(TCJ6) became the Deputy Program Manager for technical direction, acquisition strategy, network management, system development, and integration. MTMC became the Deputy Program Manager for the GTN/ITV prototype. [Ref. 14:p. 98]

Under the new GTN management structure, the development of the GTN made significant progress. In March, the proof of concept prototype was evaluated during Operation Team Spirit. It was also demonstrated at the Pentagon to senior government officials. Following the demonstration, USTRANSCOM performed an extensive review of CINC and other DOD agency ITV needs, and on 20 March 1990, released a request for proposal for a GTN Operational Prototype Version 1. The contract was awarded to Advanced Technology Incorporated teamed with TRW on 19 April. The plan was to field the prototype at 25 locations in September, but Operation Desert Shield altered the schedule and the prototype was limited to MTMC, Military Airlift Command (AMC), United States Central Command, and USTRANSCOM. [Ref. 14:pp. 98-99]

D. OPERATION DESERT SHIELD/STORM

The lack of information concerning movement and identification of shipments and units entering a theater of war has always been a major concern for operational commanders. Inadequate ITV was particularly apparent during Operation Desert Shield/Storm. During Desert Shield/Storm, more than 40,000 containers entered the theater of operations. Over half of the containers had to be opened, inventoried, resealed, and put back into the transportation system simply because military personnel in theatre did not know what they contained. In addition to container identification problems, lack of patient movement information caused 60 percent of evacuated patients to end up at the wrong destination. These visibility shortfalls also cost DOD an estimated $150 million in unnecessary demurrage and detention fees for containers. [Ref. 15:p. 1-1]

ITV capability was essentially non-existent during Operation Desert Storm/Shield for several inter-related reasons. Dozens of transportation systems lacked interfaces and data standardization. The lack of common software language and hardware connectivity did not allow various service systems to effectively communicate with each other.

Recognizing the ITV shortfall, USTRANSCOM and its component commands developed a very limited ITV capability during Desert Shield/Storm. USTRANSCOM and MAC developed interfaces between the Joint Operational Planning and Execution System (JOPES) and MAC's Global Decision Support System (GDSS). The result of this interface was that JOPES provided actual carrier movement schedules with real manifests attached for movement tracking. USTRANSCOM directed MAC teams to report what was loaded on departing aircraft via the GDSS and the Automatic Digital Network (AUTODIN). MAC moved Remote Consolidated Aerial Port Subsystems (RCAPS) terminals to aerial ports in the United States and the Area of Operations (AOR). A deployable, more flexible version of CAPS, RCAPS provided users access to cargo and passenger manifest information using personal computers and local area networks tied to CAPS long-haul lines and the Defense Data Network (DDN). [Ref. 16:p. 28]

Upon completing the Gulf War, USTRANSCOM concentrated its efforts on planning and executing the redeployment of US forces, supplies, and equipment from the USCENTCOM AOR. The redeployment, nicknamed "Desert Sortie," began on 11 March 1991 and was completed on 27 September 1991. As the effort shifted from Desert

Storm to Desert Sortie operations, the requirement for information on the redeployment created the need for upgrading critical communications and computer systems. These systems included MAC's primary command and control system, GDSS, the Joint Staff's JOPES, and USTRANSCOM's GTN, which included interfaces with the GDSS to provide intransit visibility. USTRANSCOM and MAC also used the RCAPS mentioned above to provide visibility to returning troops' home stations.

[Ref. 17:pp. 42, 51]

During Desert Sortie, USTRANSCOM realized there was a disconnect between the Defense Medical Regulating Information System and the Automated Patient Evacuation System. Although the systems interfaced, neither system had the capacity to function in a major contingency and maintain intransit patient visibility. To deal with this shortfall, USTRANSCOM hosted the Joint Casualty Evacuation Working Group to review lessons learned from Operation Desert Shield/Storm. The goals of the conference were to isolate common joint problems, assign tasks to work issues, pursue consensus to consolidate intertheater medical regulating, and establish two working groups to work on issues concerning joint evacuation, data system standardization and interface between different theatres.

Three recommendations came out of the conference: establish a single joint integrated data system for medical regulating worldwide; USTRANSCOM, along with the services and other organizations, to provide a proposal to the JCS to allow USTRANSCOM to assume an effective level of command and control of worldwide medical regulating; and the Joint Staff's Logistics Medical Readiness Division was tasked with writing and staffing a joint doctrine paper addressing joint casualty evacuation issues. [Ref. 17:pp. 42]

USTRANSCOM had the responsibility of producing the GTN, but the lessons learned from Desert Shield/Storm/Sortie made it apparent that if the GTN was to meet the warfighter needs and expectations, USTRANSCOM would have to be given peacetime authority to enforce system compatibility, data standardization, training, and documentation. Subsequently, on 14 February 1992, a Secretary of Defense memorandum designated the Commander in Chief, USTRANSCOM as the single manager for defense transportation. This designation assigned the three Transportation Component Commands (TCCs) to USTRANSCOM during peace in addition to wartime. As the sole manager for defense transportation, USTRANSCOM now had the authority to accomplish the goals of a single, joint, integrated GTN. [Ref. 16:pp. 28-29]

E. POST GULF WAR GTN PROTOTYPE DEVELOPMENT

GTN Version 1.0 was highly information-intensive because it relied on pulling data from participating systems, processed queries individually and did not retain the results. GTN Version 2.0 was developed to solve these problems. On 14 February 1992, Computer Sciences Corporation (CSC) delivered Version 2 software, manuals and specifications. Version 2.0 uses participating systems to "push" information to a centralized database. This allows a much larger number of customers to use the system without significantly increasing interactive load on the supporting systems. [Ref. 15:pp. 1-4]

Version 2.0 was also the first attempt to combine data from surface systems owned by MTMC and air systems owned by AMC to provide intransit visibility of passengers and cargo moving between the U.S. and overseas locations. The first delivery of Version 2.0 in February 1992 had numerous problems. Most importantly, Version 2.0 could not stay running for more than a few hours and returned incorrect information. Consequently, it was not accepted and was returned to CSC. CSC corrected a significant portion of the problems and the Government accepted the improved Version 2.0 on 22 July 1992. However, this version was not released for operational use and efforts were directed toward developing and refining requirements for Version 2.1. [Ref. 18]

On 3 March 1992, the GTN Program Management Office (PMO) was officially formed when ASD (C3I) designated GTN a Major Automated Information System (MAIS) program. Prior to this, GTN was an internal command effort under the Directors of Operations and Logistics (USTRANSCOM/TCJ3/TCJ4) and Command, Control, Communications, and Computer Systems (USTRANSCOM/TCJ6). [Ref. 19:pp. 1-2] Also, due largely to the problems related to Version 2.0, it was apparent that a single focal point for GTN development was needed. One of the PMO's primary objectives would be to integrate the functions of TCJ3/J4-G and TCJ6-G. The PMO would report directly to the USTRANSCOM Deputy Commander-in-Chief (DCINC). [Ref. 18]

Consequently, between 14 September 1992 and 28 January 1993, the DCINC, the Assistant Secretary of the Air Force for Acquisition (SAF/AQ), and the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD/C3I) participated in discussions that resulted in the SAF/AQ signing a memorandum turning over GTN program management responsibilities to USTRANSCOM (a function normally performed by a Service vice a joint command.) In addition, the memorandum allowed the DCINC to establish the authority of the PMO through the GTN Program Manager's Charter. [Ref. 18]

Responsibilities and accountability outlined in the charter established that the PM report to the DCINC for overall cost, schedule, and performance of the system to meet validated requirements. The PM was responsible for establishing and maintaining a Memorandum of Agreement (MOA) between USTRANSCOM and the Air Force Materiel Command's Electronic Systems Center (AFMC-ESC). In accordance with the MOA, ESC was to provide acquisition support, which included contract preparation. The PM would report to the Designated Acquisition Commander (DAC), AFMC-ESC/CC for acquisition matters. The DAC would provide acquisition management oversight and report to SAF/AQ regarding all acquisition and procurement issues. Other PM responsibilities included:

- Establish a process for obtaining and validating requirements for the GTN program with HQ USTRANSCOM.
- Develop an acquisition strategy and program baseline.
- Budget for and manage the funds to develop and field the GTN program.
- Identify life cycle costs and manpower requirements.
- Establish a detailed program schedule.
- Manage and oversee contracts to design, develop, test, and field an automated command and control system to satisfy GTN requirements.

PM authority included:

- The PM had full control and authority over all approved program funds.
- The PM had full authority to communicate with Major Commands involved in the GTN program. These Major Commands include the TCCs, AMC, MTMC, MSC, Service Headquarters, the supported CINCs, and AFMC-ESC.

- To achieve the objectives of the GTN program, the PM had full authority to arrange inter-service support agreements or MOAs with other DOD agencies.

- The PM had the authority to pursue contracts for engineering, Independent Verification and Validation (IV&V), testing, and business services support to the GTN program office. [Ref. 20]

During the time frame from September 1992 through January 1993, the TCGT produced a Mission Element Need Statement (MENS) identifying the future requirements of the GTN system. [Ref. 18]

CSC delivered the GTN Version 2.1 prototype in March 1993 (figure 3). Version 2.1 provided intransit visibility for all passenger and cargo lift manifests on AMC's organic and chartered aircraft. Due to the prototype's success, Version 2.1 was fielded, on a limited basis, for the operational community. Version 2.1 received Military Standard Requisitioning and Issue Procedures (MILSTRIP) transactions from Defense Automated Addressing System (DAAS) and used this information to link the requisition number, national stock number (NSN), and transportation control number (TCN). Using the Headquarters On-line System for Transportation (HOST) network, the TCN is linked to Advance Transportation Control and Movement Document (ATCMD) data received from AMC port activities. HOST also provides some unit movement data. For passenger movements, AMC's Passenger Reservation and Manifest System (PRAMS), provides GTN with passenger names and social security numbers. The GTN also receives aircraft scheduling information from AMC's Global Decision Support System (GDSS). [Ref. 15:pp. 1-4, 1-5]

To improve the reliability and responsiveness of the system, there were five maintenance releases during 1993. During this time frame, CSC worked on a major upgrade of the GTN prototype for delivery in January 1994. The upgrade provided the sealift intransit visibility to the DOD. [Ref. 21]

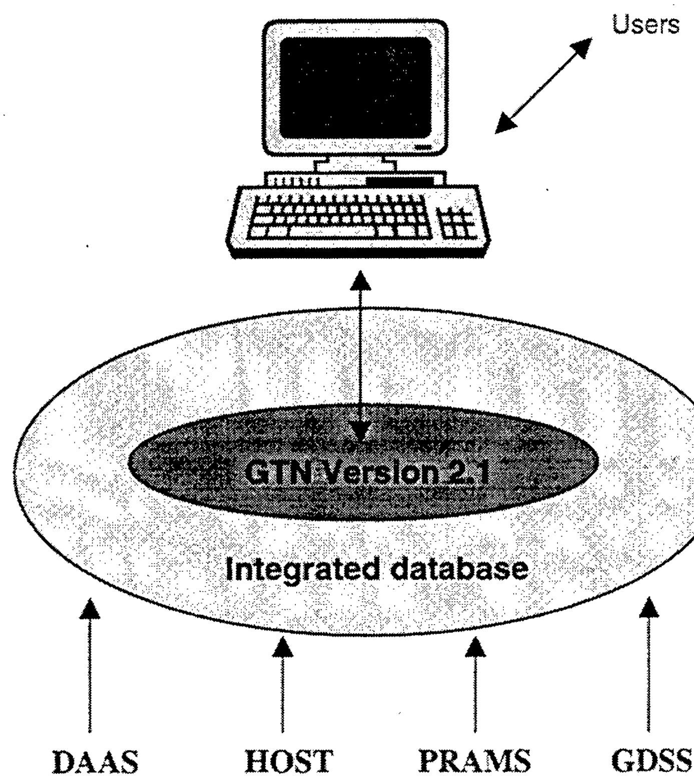

Figure 3. GTN Version 2.1 – Air Interfaces [Ref. 15:p. 1-5]

Meanwhile, the GTN PMO worked to acquire a new contract to fully develop the GTN, and on 18 May 1993, the GTN Operational Requirements Document (ORD) was approved by USTRANSCOM. The ORD defined the GTN program requirements. The Major Automated Information System Review Council (MAISRC) reviewed the proposed GTN in April 1993 and issued a Systems Decision Memorandum (SDM) in May that officially placed the program in Phase I. Tasking was assigned to be completed prior to reaching Milestone II. This tasking required USTRANSCOM to prepare a draft

Life Cycle Cost/Benefit Analysis (LCC/BA) in September 1993. The final version would be produced by USTRANSCOM after review by the Office of the Director (OD) Program Analysis and Evaluation (PA&E). Both the GTN PM and OD PA&E agreed on the methodology and responsibilities for executing a cost and benefits study of the GTN. [Ref. 22:pp. 2-1]

In August 1993, the Joint Transportation Corporate Information Management (CIM) Center (JTCC) was tasked to improve the efficiency and effectiveness of the DTS by centrally directing transportation information systems development and migration, applying functional process improvement techniques, and standardizing data. [Ref. 23]

The DTS systems migration effort involved eliminating duplicate systems capabilities and redirecting systems toward hardware independent modules with information capabilities. In addition, JTCC, with the cooperation of the joint transportation community, reviewed core DTS business processes. Functional process improvement projects were undertaken on behalf of a process owner and took an end-to-end view toward functional process improvement across Service boundaries. Problems relating to data standardization identified in the DTS related to non-standard information systems that did not use transportation assets efficiently and effectively. In order to achieve successful systems migration, data standardization was essential. The JTCC worked to develop and obtain DOD approval of transportation data standards in a transportation logical data model. All of these efforts significantly enhanced GTN development and effectiveness. [Ref. 24:pp. 1-12]

USTRANSCOM Commander-in-Chief, General Ronald R. Fogleman, designated 1994 as the "Year of Intransit Visibility." By proclaiming the intransit visibility theme, Gen. Fogleman sought to bring together the different efforts going on in DOD and emphasize the importance of ITV within the full GTN planning and development. The prime objective for the year was to identify ITV requirements, develop a concept of operations, and publish a comprehensive integration plan, all coordinated with DOD components. [Ref. 25] This initiative also served as a significant impetus for further improving the GTN.

During 1994, there were several GTN prototype enhancements. Version 2.2 was delivered in January and provided intransit visibility to land and sea shipments in much the same manner as Version 2.1 provided intransit visibility to air shipments. As in Version 2.1, the requisition number, NSN, and TCN data was provided by DAAS. Transportation control movement document (TCMD), booking, and other shipment information was provided by MTMC's Worldwide Port System (WPS), Terminal Management System (TERMS), and Military Export Traffic System (METS II) for surface cargo shipments moving between POE and POD. These relationships are shown in figure 4. [Ref. 15:p. 1-5]

GTN Version 2.2.1 was delivered in March 1994. It involved maintenance for 83 incident reports and included five new functionalities. These functionalities were Mission Lock, Surface Wildcard, NSN Popup, WPS changes, and Installation Enhancements. [Ref. 26]

In August 1994, GTN Version 2.3 was delivered. It contained seven new capabilities and 91 software corrections. These new capabilities included:

- GDSS message interface, which included GDSS updates and more accurate GDSS information.

- DODAAC address popup that included unit, mailing, and billing addresses.

- Air and surface queries by commodity code and overview/pairs location.

- The ability to use a wildcard TCN.

- Consolidated of requisitions under a TCN.

- Changes in passenger data and mission schedule displays.

- Several corrections for the System Administrator and Functional Data Base Manager (FDBM). [Ref. 26]

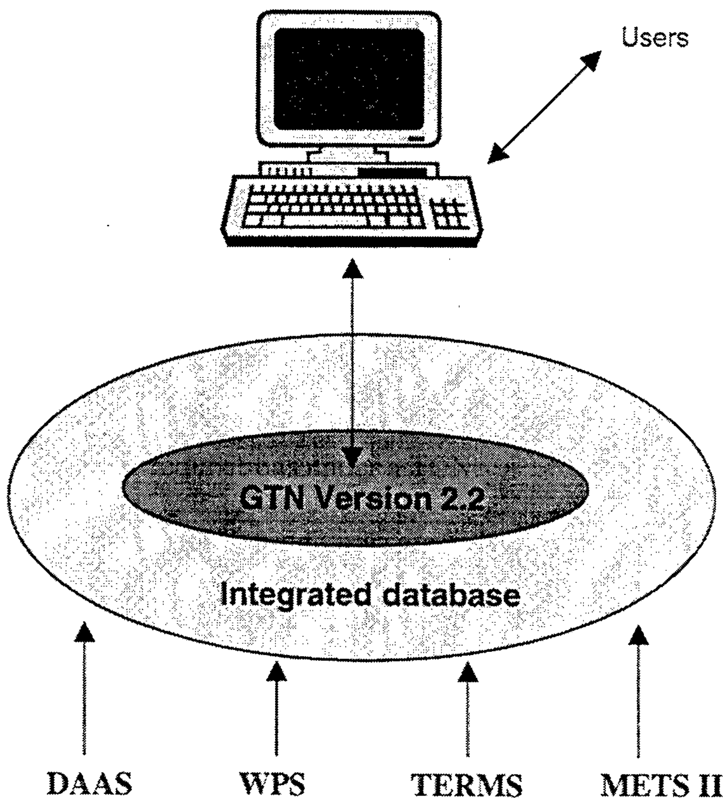

Figure 4. GTN Version 2.2 – Surface Interfaces [Ref. 15:p. 1-6]

GTN Version 2.3.1 was delivered in December 1994 and contained four new capabilities and 21 Interface Requirements (IRs). The new capabilities included:

- Accepting data from the new GDSS interface.
- GCCS data transfer.
- CDSS interface.
- Global Transportation Network Electronic User Interface (GTNEUI)

The IRs included:

- Show-manifest for GBLs.
- Truck information.
- Queries that exceeded the 15 minutes response time.
- Return mail on queries when GTN was exited before the query was complete.
- Accessing the Military Standard Transportation and Movement Procedures (MILSTAMP) Seaport popup in Overview/Pairs.

The prototype contract with CSC expired in September 1994. A follow-on contract for prototype maintenance/upgrades was awarded in September 1994 and was scheduled to expire in March 1997. [Ref. 26]

F. LIFE CYCLE COST/BENEFIT ANALYSIS

The Office of the Director (OD) Program Analysis and Evaluation (PA&E) reviewed the GTN Life Cycle Cost/Benefit Analysis (LCC/BA) draft in September 1993. The final version was subsequently produced in January 1995. The LCC/BA was a driving factor in obtaining approval for production system development. In this analysis, USTRANSCOM compared the costs and benefits of two different options. The first option, the Status Quo Alternative, involved continuing the operational prototype (v. 2.3) through fiscal year 2010. The second option, the Preferred Alternative, involved the full development, implementation, operations and support [of GTN] through fiscal year 2010.

Operational prototype maintenance would continue until delivering the Preferred Alternative Initial Operational Capability (IOC), slated for fiscal year 1997. OD PA&E considered other options infeasible, impractical or unnecessary. [Ref. 27:p. 2-2]

Benefits. The primary benefits of a comprehensive ITV system, such as GTN, are enhanced war fighting capability and reduced operating costs. An effective ITV system is a force multiplier because it gives the war-fighting commanders confidence in their logistical support, allowing them swift and decisive moves. Such benefits are difficult to quantify, so the LCC/BA addressed the issue by determining a value of "Improved Operational Effectiveness." A three-day conference was held at USTRANSCOM in June 1993 to determine the types of benefits to be used. Participants at the meetings discussed the situations that had occurred in Operation Desert Shield/Storm and other operations and how they might have been handled differently if the capabilities of the GTN were available. A second conference was held in July 1993 where the participants constructed detailed estimates of specific benefits and estimated the dollar value of these benefits. An estimate of the total benefit was then constructed. [Ref. 27:p. 2-3]

Costs. The LCC/BA for GTN cost estimations used constant FY95 dollars. Another assumption was that two major regional conflicts would occur during the service life of GTN. The LCC/BA was projected from FY97 through FY10. The study used 1999 and 2005 as the major regional conflict years based on the USTRANSCOM/J2-O "Hot-spots 1993" briefing and the USTRANSCOM J2-O "2010" briefings. These two possible contingencies were for planning purposes only and were anticipated to be of the same intensity as Desert Shield/Storm. A greater number of conflicts would add to the benefit margin and a smaller number of conflicts would reduce it. [Ref. 27:p. 2-4]

__Analysis.__ In the Life Cycle Cost/Benefit Analysis study, the Preferred Alternative had a hard cost savings of $1,368 million, with an additional estimated $193 million in cost avoidance. Expert opinion valued the non-quantifiable benefits from the Preferred Alternative at $781 million. The future development and maintenance cost for fielding the Preferred Alternative of GTN was estimated at $422 million through FY10 [Ref. 27:p. 2-5]

The Status Quo Alternative would cost $66 million through FY2010 and realize an estimated hard cost savings of $294 million. The Status Quo Alternative discounted benefit/cost ratio was 4.39 compared to the Preferred Alternative benefit/cost ratio of 3.11. However, if total prior year costs were factored into the benefit/cost ratio, the Preferred Alternative proved superior with a ratio of 2.67 versus the Status Quo Alternative ratio of 2.10. Both alternatives projected a break-even point of FY99. [Ref. 27:p. 2-6] These results are summarized in Table 2.

G. MIGRATION STRATEGY

As part of the JTCC's migration strategy, which began in 1993, the JTCC proposed a new baseline to reduce functional redundancy among systems. [Ref. 28] This resulted in fewer individual systems and increased integration. [Ref. 29:p. 1] The goal was to reduce cost and increase compatibility between transportation information systems.

Systems associated with transportation were categorized as "legacy systems" or "migration systems." A legacy system was defined as an automated information system that performs the same functions as those performed by a selected migration system. Legacy systems have a finite life, with all further system development and modernization resources applied to a selected migration system. [Ref. 3:p. B-1] A migration system is an existing system that has already been developed (or is being developed/enhanced), and is officially designated to support standard processes. [Ref. 3:p. B-2]

Table 2: Life Cycle Cost/Benefit Analysis [Ref. 27:p. 2-6]

LCC/BA Recap (Actual Dollars) as of: 22 December 1994	Constant $K	Discounted $K
Status Quo Alternative		
Total Quantifiable Benefit (cum savings):	294,506	238,903
Total Future Year Costs:	66,515	54,378
Total Prior Year Costs (not discounted):	59,405	59,405
Total Costs (cum):	125,922	113,783
Net Present Value = PV Benefits - PV Costs:		184,525
Benefit/Cost Ratio PV:		4.39
Benefit/Cost Ratio (cum):		2.10
Break Even Year:		FY99
Preferred Alternative		
Total Quantifiable Benefit (cum savings):	1,368,431	1,112,167
Total Future Year Costs:	422,461	357,789
Total Prior Year Costs (not discounted):	59,405	59,405
Total Costs (cum):	481,866	417,194
Net Present Value = PV Benefits - PV Costs:		754,378
Benefit/Cost Ratio PV:		3.11
Benefit/Cost Ratio (cum):		2.67
Break Even Year:		FY99

By early July of 1994, the JTCC had found a total of 137 systems using transportation information [Ref. 28]. Of these systems, some had their primary function outside of transportation. As of September 1999, 23 systems were approved for migration and 22 systems remained as legacy systems. Appendix A gives a brief description of the 23 migration systems and Appendix B lists the migration systems, legacy systems, and termination dates. [Ref. 30]

To ensure only the best systems were included in the migration strategy, the process of selecting a system was very involved. Aspects of the legacy systems were normally incorporated in the surviving migration systems. The process of selecting a migration system began by grouping migration candidates into one of nine categories. Each migration candidate was then evaluated on the basis of functional coverage, technical merit, and programmatic requirements [Ref. 29:p. 5]. After evaluating each candidate, an Integration Decision Paper (IDP) was prepared for each functional category, which recommended the migration systems and the lead agency for each system. The IDP was then sent to the Office of the Secretary of Defense (OSD) for review and approval. When approved, the lead agency developed a System Decision Paper (SDP). The SDP contained detailed requirements of tasks, responsibility, estimated resources required, and milestones and metrics for the development efforts. The SDP was then sent to OSD for approval. Once approved, the lead agency began migration system development and implementation. [Ref. 29:p. 2] A summary of the nine functional categories, the 23 migration systems, and the lead agency, are listed in Table 3.

Table 3: Migration Summary

Category	Num	System	Lead Agency
Unit Move	1	TC-AIMS II (TC-AIMS/MDSS II)	USA
ITO/TMO		TC-AIMS II (CMOS)	USA
	2	CFM	MTMC
	3	CANTRACS	DLA
	4	TOPS	MTMC
	5	GATES	AMC
	6	GOPAX	MTMC
Load Planning	7	AALPS	MTMC
	8	ICODES	MTMC
Port Management		GATES	AMC
	9	WPS	MTMC
Financial Mgt	10	FACTS	USN
Mode Clearance	11	IBS	MTMC
	12	MOBCON	USA NG
Theater Trans Ops		TC-AIMS II	USA
	13	C2IPS	AMC
Planning/Execution	14	CAMPS	AMC
	15	GDSS-MLS	AMC
		GATES	AMC
		C2IPS	AMC
	16	GTN	USTC
	17	ELIST	MTMC
	18	AMS (MTMC)	MTMC
	19	IC3	MSC
Other	20	JALIS	USN
	21	DTTS	USN
	22	ACAS	AMC
	23	TRAC2ES	USTC

H. PRODUCTION SYSTEM SOURCE SELECTION

The Request for Proposal for the operational version of the GTN was put together in the first four months of CY94. The package included the System Specification, the Statement of Work, proposal preparation instructions, evaluation factors for award, contract data requirements list, contract clauses, and other special instructions. The RFP was released on 5 May 1994 and proposals were received on 1 July. The proposals were evaluated beginning 6 July and proceeded throughout remainder of the year. [Ref. 26]

On 23 Mar 95, the GTN Operational System contract was awarded to UNISYS Government Systems Group. However, due to protests by two unsuccessful offerors, final determination was delayed until 14 August 1995. The six-year contract had a potential value of $62.5 million and was to be delivered in five phases stretching over a four-year period. Fourteen months after contract award, UNISYS was scheduled to deliver a system (Delivery 1) for Initial Operational Test and Evaluation. Delivery 1 was to provide initial ITV capabilities. Delivery 2 would provide automation, modeling, and simulation tools to support current operations and switch from a client-server to a web-based architecture. Delivery 3 would provide automation, modeling, and simulation tools to support current & future operations. Delivery 4 would field five deployable sets of equipment to provide GTN capabilities to the supported CINC. Delivery 5 would provide the last of current operations functionality, and a set of automation, modeling, and simulation tools to support future operations and patient movement. [Ref. 31]

Loral Defense Systems-East purchased UNISYS Government Systems Group in May 95. [Ref. 32] Loral, now the prime contractor for the GTN, coordinated the work of six subcontractors. Encompass provided the same kind of logistics software it provides to corporate users. GTE provided communications and security services for the network, ISX developed the user interface with the GTN, Digital Equipment provided the client-server equipment, and Andrulis and Innolog provided their logistics functional expertise. [Ref. 33]

Milestone II Review was successfully conducted and the Milestone II System Decision Memorandum was issued on 19 Sep 95. Other approved documents included the revised GTN Operational Requirements Document (ORD) dated 30 Jan 95, GTN Test and Evaluation Mater Plan (TEMP) dated 30 Jan 95, and the GTN Program Management Directive (PMD) dated 1 Jul 95. [Ref. 32]

Lockheed Martin Corporation purchased Loral Defense Systems-East, effective 29 April 1996. As a result of delivery delays from Encompass, unplanned Bosnia support activities, post-System Acceptance Test (SAT) operational support, and external interface re-engineering, the cost of the Lockheed Martin GTN Development Contract increased by $2.7 million in 1996. [Ref. 34]

Test Readiness Review was performed in September 1996, and formal (SAT) was performed in October 1996. The Air Force Operational Test and Evaluation Center (AFOTEC) completed GTN's Initial Operating Test and Evaluation (IOT&E) in December 1996. [Ref. 34]

Several other reviews were performed throughout 1996. A Delivery 1 System Design Review (SDR) was conducted in March 1996, while a Systems Requirements Review (SRR) was accomplished with meetings in March, April, and May of 1996. A Software Process Assessment (SPA) was performed in March, two Joint Program Management Reviews (JPMRs), one in June and one in December, were hosted, and several Technical Interchange Meetings (TIM) were held throughout 1996. These reviews and meetings discussed many GTN aspects, including schedule, progress, hardware status, system components, system enhancements, external interfaces, increased command and control capability, and commercial Electronic Data Interchange (EDI). [Ref. 34]

A pre-IOC version of GTN was fielded by USTRANSCOM to selected US Army, Europe (USAREUR) activities in October 1996 to assist in Operation Joint Endeavor. USTRANSCOM provided limited on-site training at the time of this fielding. USAREUR units were scheduled for formal fielding and training during February and March 1997. [Ref. 34]

Two versions of the GTN were originally fielded. The first version was an Internet Web site for registered users with common network browser software. The second version was a client/server application, which required the user to have a software package installed. The Web Site version performed simple one-time queries, while the client/server version performed more complex, repetitive queries. Due largely to technological improvements and lessons learned from Operation Joint Endeavor, further GTN development began to focus more heavily on Web technology. Subsequently, less effort was spent on developing the client/server version. [Ref. 35]

I. DEFENSE TRANSPORTATION ELECTRONIC DATA INTERCHANGE (DTEDI)

EDI, using communications standards jointly developed with the commercial sector, processes ITV information through the GTN. A standardized EDI interface, both DOD and commercial, is essential to providing reliable ITV information through the GTN.

On 18 Jan 95, the Deputy Under Secretary of Defense for Logistics (DUSD(L)) designated USTRANSCOM as the lead agent to accelerate and expand EDI implementation to support of DOD transportation. To accelerate EDI implementation within DOD and with the commercial carrier industry, a DTEDI Program Implementation program was developed by USTRANSCOM and finalized on 4 Jun 96. This program prescribed aggressive schedules to accomplish the implementation goals. It described 15 EDI projects within four areas of transportation: tender submission, planning, movement, and payment. [Ref. 36]

In March 1996, USTRANSCOM was designated to be the Test Director for Systems Integration Testing (SIT) for the transportation billing and payment processes. SIT was performed in two phases. Phase I used canned data in a test environment, and phase II used production data transmitted by the shipper systems to process Government Bills of Lading (GBLs), with DFAS making payments using EDI techniques. Phase II began in August 1996. [Ref. 36]

J. AUTOMATIC IDENTIFICATIN TECHNOLOGY (AIT)

DOD incorporated sophisticated AIT devices during operations in Somalia, Haiti, and Bosnia. However, a Joint Logistics AIT Concept of Operations and Implementation Plan had yet to be developed. To ensure an integrated approach to AIT within DOD, the Office of the Under Secretary of Defense for Acquisition and Technology established an AIT task force on 7 January 1997. The goal of the task force was to develop an AIT Concept of Operations that addressed all the logistics processes that require collecting information about the identity and status of material throughout the logistics chain. [Ref. 37]

AIT is a critical component of ITV/TAV and the GTN. The strength of AIT, as an enabling technology, is its ability to capture data rapidly and accurately, and transfer the data to Automated Information Systems (AISs) automatically with little or no human intervention. [Ref. 38:p. 2-7] The Joint Total Asset Visibility (JTAV) Office has been established to ultimately provide a central AIS, which will encompass all of the various Services. One of the functions provided from the central database is aggregating and storing information that is gathered from the various AIT devices throughout DOD. The GTN will ultimately include the central repository for AIT data that will provide GTN users with ITV/TAV. [Ref. 37]

K. GTN INITIAL OPERATING CAPABILITY (IOC)

Initial Operating Capability of the GTN was initially expected in November 1996, but was delayed until March 1997 due to problem delays originating with Encompass and schedule slips. Encompass made a corporate decision early in 1996 to redesign their commercial application object model, which caused the delay. As a result, Delivery 1 was delayed overall from May 96 to Oct 96. [Ref. 39] Following Delivery 2, the original Deliveries concept was changed. The five Deliveries, as originally planned, were large functional additions, which were deemed to be relatively unmanageable. It was considered advantageous to break the Deliveries into smaller groups of functionalities that could be developed and managed more efficiently. [Ref. 40]

In March 1997, after reaching IOC for the production system, the GTN prototype maintenance contract with CSC was terminated. Additionally, a feasibility study was performed to determine if USTRANSCOM's Global Command and Control System and collateral local area network should move to the regional Defense Megaenter (DMC) in St. Louis, MO. The results of the study confirmed the move, and plans were made to execute the move in 1998. [Ref. 39]

In 1997, the value of the Lockheed Martin GTN Development Contract increased by $48.6M. The majority of the increase reflected two Capital Purchase Program funding authority awards. These awards covered unfunded requirements, including new system requirements and increased capabilities defined by the functional user community. The increased capabilities included a Windows NT environment, a Common Transportation Server, integration of commercial carrier movement information via Electronic Data Interchange (EDI), and migration to a Web-based user architecture.
[Ref. 39]

Intransit visibility capability became operational in 1997; by December, the GTN had a data warehouse including over 43 gigabytes of information. The GTN also had the capability to post approximately 80 percent of information received within five minutes of receipt, and to replicate it within seconds. [Ref. 41] During April 1998, the GTN discontinued support of the client/server in favor of the web-based systems approach. This gave system users better logistics support while reducing overall program costs. Transaction volume increases and additional functionality made it necessary to upgrade GTN hardware at Scott AFB and at the DMC. These hardware upgrades made Commercial Electronic Data Interchange (CEDI) interface implementation possible. Three initial carriers were interfaced to the GTN via CEDI implementation. SeaLand (ocean), CSXT (rail), and FedEx (air) were successfully integrated with existing GTN data in May 1998. [Ref. 42]

Carrier links to the GTN via CEDI will help military shipments planning, improve readiness and combat capability, and reduce duplicate ordering. Carriers feed shipment data to CSX Integrated Services (CSX Corp.'s technology arm) where the data is recoded into a generic format. The data is then transmitted to the GTN for the network's 4,000 military users. [Ref. 43] There were 24 CEDI carriers by the close of 1998. Other carriers linked to the GTN, in addition to the three named above, include the following in alphabetical order:

1. ABF Freight Systems
2. American President Lines
3. Baggett Transportation Co.
4. Burlington Air Express (BAX Global)
5. CI Whitten
6. Diablo Transportation, Inc.
7. Emery Worldwide
8. Green Valley Transportation Inc.
9. J.B. Hunt
10. Landstar Ranger Inc.
11. Lykes Line Limited
12. Mercer Transportation Co.
13. Nations Way Transport Service, Inc.
14. Old Dominion Freight Line
15. Overnite Transportation
16. Roadway Express
17. Preston Trucking
18. Trism Specialized Carriers
19. Tri-State Motor Transit Company
20. Union Pacific Railroad
21. Yellow Freight System (History 98, 1999)

In May 1998, the GTN was further enhanced by the Transportation Coordinator's Automated Information for Movement System II (TCAIMS-II) and Radio Frequency Tag (RF-TAG) interface. This interface provided the ability to access advanced transportation control movement documentation via the GTN, as well as passenger and cargo movement data within the European theater. [Ref. 42]

In support of Operation Desert Fox, Lockheed Martin installed what was called the Command and Control (C^2) Tracker on the GTN operational database in December. The C^2 Tracker is a predetermined set of data fields within GTN, enabling users to press a single button and enter minimal qualifiers to receive required data. Throughout 1998, great efforts were made to ensure the GTN was Year 2000 (Y2K) compliant. The Y2K certification letter was signed in December 1998. [Ref. 42] As of October 1999, only three of the migration systems had yet to be certified for Y2K compliance (FACTS, TC-AIMS II, and TRAC2ES). [Ref. 30]

L. CURRENT (2000) GTN VISION

USTRANSCOM's current vision of GTN is to combine DTS customers and lift providers into a single integrated network. The network will support customer needs by providing ITV, command and control (C2), and improved information that facilitates better management of warfighting and logistics. GTN will also serve to integrate DOD's transportation processes and commercial automated transportation systems to the maximum extent possible. Electronic Commerce (EC)/Commercial EDI (CEDI) will be used as the technology to provide ITV for DoD cargo moving via commercial carrier, estimated to be as high as 80 percent of all DTS movements. [Ref. 10:p. 2]

Figure 5 provides a basic view of the transportation process and how GTN fits into that process. The process is initiated by planning passenger, cargo, and patient transportation requirements. A movement requirement is then generated and submitted for item(s) that need to be transported. The requirement is differentiated by passengers or cargo, shipment planning performed, mode selection, and commercial or military lift. Transportation assets are then scheduled to move the required personnel and cargo. Movement is then initiated and tracked intra-CONUS from origin to Port of Embarkation (POE), through intertheater to the Port of Debarkation (POD), and intratheater to the final destination. [Ref. 44:p. 15]

Figure 5. DTS DataFlow with GTN [Ref. 44:p 18]

GTN will capture data at selected points in the transportation process. The data will primarily consist of:

- Supply, cargo, forces, passenger, and patient requirements
- Schedules and movements of airlift, air refueling, aeromedical evacuation, and surface lift (land and sea)
- Closure estimates as provided by future operations, location, and operational status of transportation assets
- Operational plan data
- Transportation infrastructure information

This data is collected from the various source systems into an integrated database (see figure 6). This database will provide the necessary ITV, C2, and business operations applications and information to the user. The users include USTRANSCOM and the TCCs, DoD, Joint Staff, unified commands, defense agencies, and the Military Services. [Ref. 44:pp. 16-19]

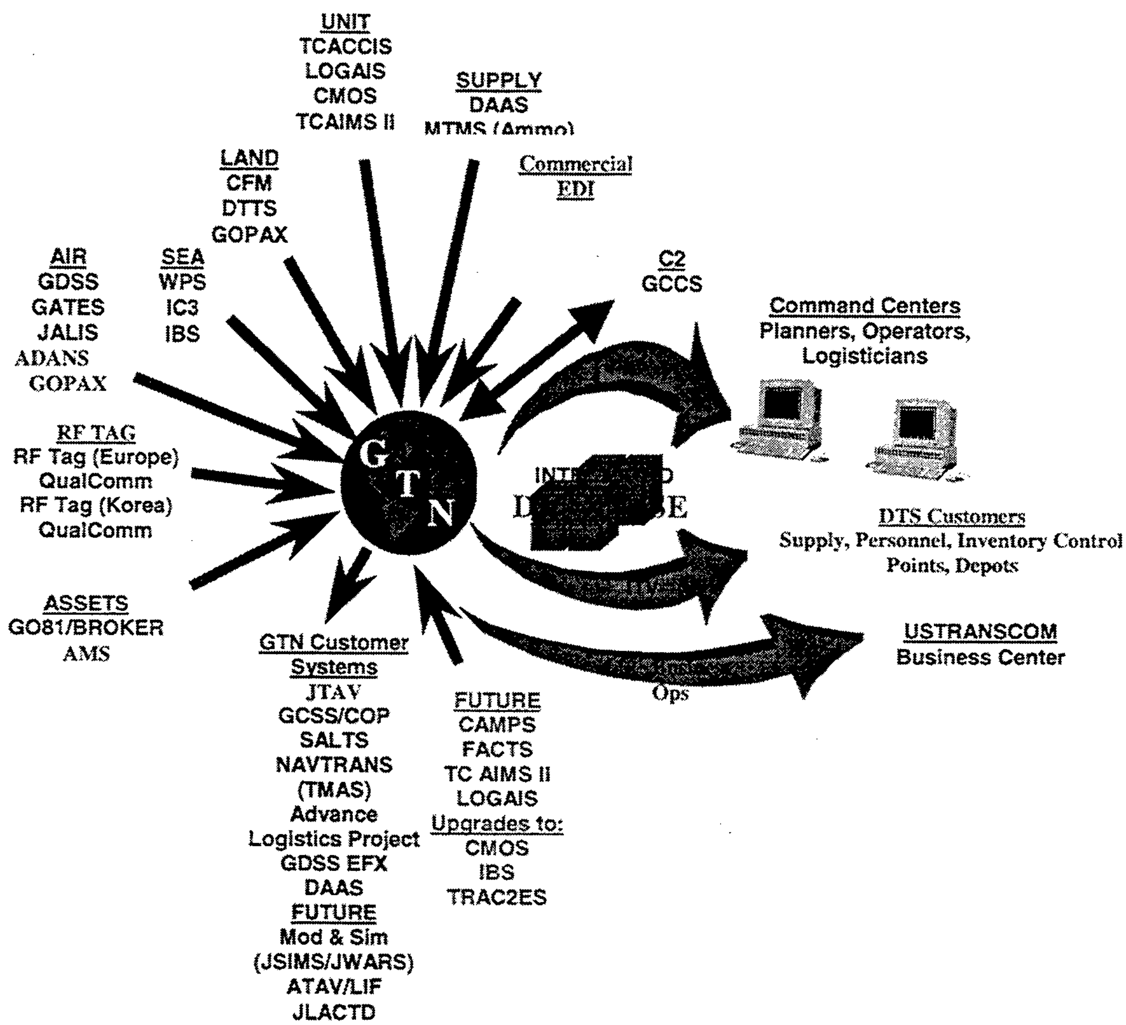

Figure 6. GTN Concept [Ref. 45]

M. CHAPTER SUMMARY

Earlier success with "proof of concept" GTN prototypes set the stage for developing operational prototypes. As GTN sophistication and capability increased, so did the responsibilities of USTRANSCOM. A number of challenges had to be overcome to provide the robust capabilities to meet DTS customer needs. However, until February 1992, USTRANSCOM did not have the peacetime authority to enforce system compatibility, data standardization, training, and documentation. These were some of the major impediments to system development. The Gulf War, in particular, highlighted the lack of ITV and the critical need for it. Once USTRANSCOM was granted this authority, the 90's proved to be an unprecedented decade for GTN development.

The capabilities of the operational prototypes increased steadily. USTRANSCOM implemented a number of initiatives to incorporate user needs and take full advantage of evolving technology. Pull systems gave way to push systems. Surface, air, and sea capabilities were added. Client server architectures were replaced with Web-based technology. A number of key management and infrastructure changes were also implemented. In addition, numerous initiatives were implemented that aided in development. These initiatives included data standardization, migration strategies, ITV, JTAV, DTEDI, AIT, EB/CEDI, and life cycle costs/benefits analyses.

The contract for the GTN production system was awarded in 1995. New capabilities and functionalities were continually enhanced throughout the 1990's. Questions continually arose concerning the future of the GTN.

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IV. GTN FUTURE

A. INTRODUCTION

Evolving technologies have considerable potential to impact the GTN in ways never before imagined. Advances in biotechnology and health sciences offer the potential to significantly increase the length of human life. The revolution in information technology has been no less spectacular. Miniaturized computers that fit into a pair of eyeglasses and possess significantly more power than desktop PCs are standing by ready for production and distribution. In the race for global competitiveness, this revolution also provides the competitive edge and economies of scale never before possible. This revolution should be no less significant in the evolution of the GTN. In addition to providing a competitive edge, it also provides the potential for DOD to accomplish its mission with the highest efficiency and at the lowest possible cost – both in assets and in human life.

B. CUSTOMER SURVEY

USTRANSCOM retained American Management Systems (AMS) to conduct the FY99 USTRANSCOM Customer Survey as part of USTRANSCOM's customer outreach program. The survey was administered to key USTRANSCOM customers to determine customer satisfaction, identify customer requirements, and provide recommendations for improvements. The survey was assembled through information gathered from mail and e-mail surveys and personal interviews. [Ref. 46:p. 3]

In general, customers viewed USTRANSCOM's service as adequate. Although the survey sought feedback on USTRANSCOM as a whole, some insights into the GTN performance and progress were obtained. The CINCs rated the IT systems of which

GTN was one, as valuable to their organizations, but voiced concern that GTN does not provide the ability to track all cargo 100%. The survey sighted a possible cause of the lack of visibility was operators, at all levels, not inputting data into the GTN in a timely manner. The services believed that ITV has come a long way but still has much farther to go. The respondents suggested that more integration of GTN systems that would eliminate redundancy and streamline information flow would improve GTN effectiveness. [Ref. 46:pp. 12-21]

Shippers, on the other hand, did not give GTN as high a rating sighting the GTN as ineffective compared to the carriers systems. Shippers did not understand why the carriers systems feeding the GTN were accurate and timely, but the GTN's data was not the same. Shippers would prefer that the GTN information be just as accurate as the carrier's data. If the GTN data was as reliable as the carriers' data, the shippers could use only the GTN rather than a number of different carriers' data systems. [Ref. 46:p. 22-26]

Part of the challenge for the GTN is that it is fed by a large number of feeder systems. The difference between a feeder system's data and the data available in the GTN is that the GTN has to be updated with data from the feeder systems, therefore a lag time is inherent between the feeder system and the GTN. One of the goals for future GTN planning should be to shorten the gap between the data available from the carrier and the data available to the GTN customer.

C. END STATE

As the GTN evolved from inception to the present time, it became clear that rapidly changing technologies made it almost impossible to define the GTN end state. Timelines were periodically updated as new information and transportation technologies emerged making it necessary to change the plan with respect to the development of the GTN. As a result, the GTN is now seen as a work in progress with no foreseeable end state. The GTN will continue to evolve with technology.

There does exist a solid plan for the near future. The following timeline shows the plan for continued development of the GTN through FY04. [Ref. 47]

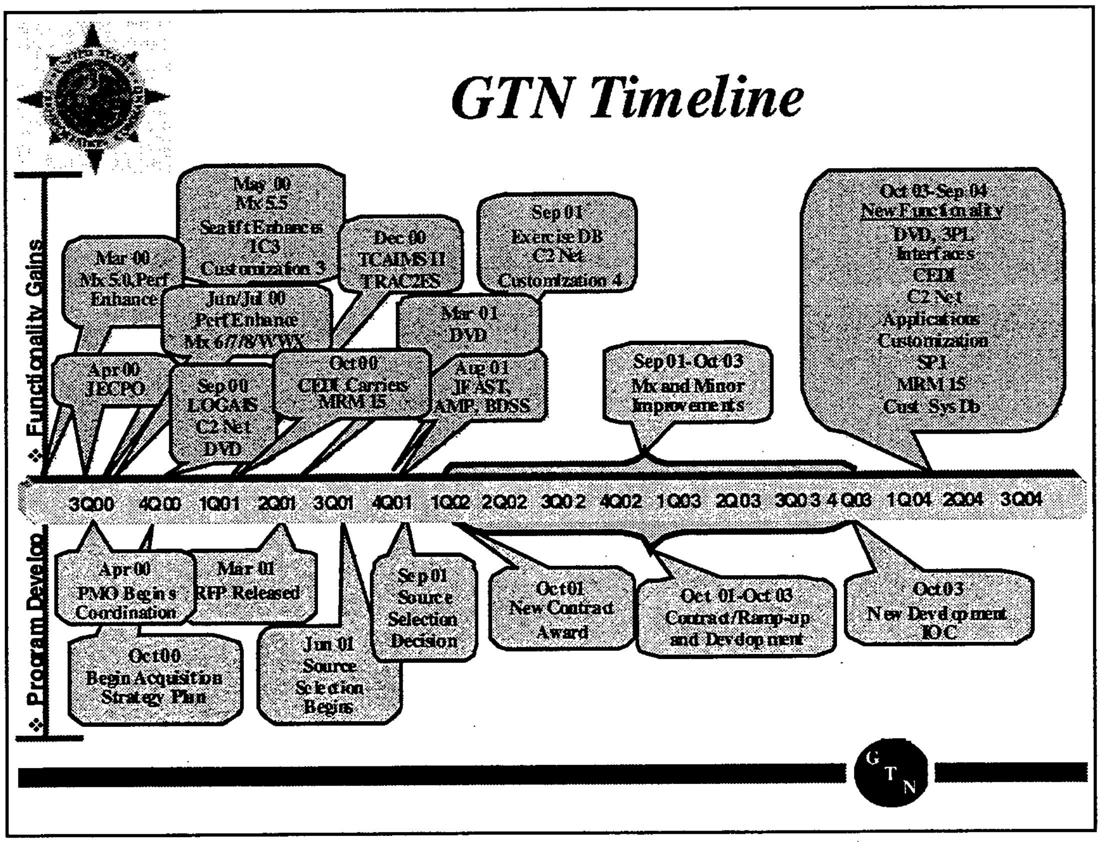

Figure 7. Functionality Improvements/Timeline [Ref. 47]

Functionality Improvements, FY00-04
Mar 00 - Infrastructure performance enhancements increasing system's responsiveness.
Apr 00 - 32 commercial carriers migrated to the Joint Electronic Commerce Program Office Value Added Network. Results in visibility of over 63% of cargo moving via air, rail, motor GBL's and 91% of sea containers.
May 00 - Improved sealift screenfaces and data quality. User will have access to unclassified sealift schedules. Customization will enable an alert function where GTN will notify users of a particular pre-programmed event.
Jun 00 - Development of multiple on-hand values; performance enhancements and worldwide express carrier query.
Sep 00 - New interface with USMC's LOGAIS. Improvements in the C2 reports and initial analysis on JOPES S&M module. Direct Vendor Delivery pharmaceutical query becomes operational.
Oct 00 - Incorporation of additional commercial carrier EDI information. Reduction of data elements in support of MRM15 initiatives.
Dec 00 - New interfaces with TCAIMS II and TRAC2ES.
Mar 01 - Direct Vendor Delivery repair parts query becomes operational.
Aug 01 - New interfaces with JFAST, BDSS, ADANS and AMP.
Sep 01 -Exercise Database becomes operational, JOPES S&M Phase I delivered, improved screenfaces and dynamic alerts. Improvements in NSN Tables and WPS transactions.
Sep 01 - Oct 03 - Miscellaneous minor maintenance improvements.
Oct 03 - Delivery of new database.
Oct 04- Assorted functionality improvements.

Figure 8. Functionality Improvements/Timeline [Ref. 47]

D. BUILDUP ANALYSIS

In the past, before sending American soldiers, sailors, and airmen into harms way to fight a war, it was necessary to amass huge amounts of support material near the theater of operations. Not until it was certain that forces going into battle had the needed support and could be sustained for as long as deemed necessary to win the war, did the operational commanders feel confident about engaging their forces in combat. In recent years, the military and the American public have become intolerant to personnel casualties, and the idea of sending American youth to their deaths in support of a political ideal has become unacceptable.

It took six months to buildup enough equipment, supplies, and personnel during Operation Desert Shield before Operation Desert Storm could commence. From the beginning of Operation Desert Shield on 7 Aug 1990 to the commencement of hostilities and Operation Desert Storm on 17 January 1991, 439,553 personnel and 7,276,092 tons of cargo were deployed to the Gulf. [Ref. 16:p. 13]

It is quite possible that combat forces needed that much cargo and personnel for the duration of the war but did not need that much cargo and personnel to begin the war. If operational commanders felt they could engage the enemy sooner with just enough resources for a relatively short time, with the confidence that resources would be at their disposal when needed, numerous advantages would be realized. If the U.S. took less time to build up resources, the enemy would have less time to prepare for war. If huge amounts of material did not need to be staged prior to war and material could be routed closer to a moving force as the war progressed, the added flexibility would give operational commanders a strategic edge that previously was not at their disposal.

One of the primary functions of the GTN should be to provide the operational commanders with the confidence that through TAV of personnel and material, support will be at the right place and time. If this capability were available during Desert Storm, it is possible that the time for support buildup could have been months shorter. Because the outcome of Desert Storm was so overwhelming, the months that could have been saved by a fully developed GTN might not have made much difference. If this capability were available prior to the beginning of World War II, however, the time saved in building up for D-Day could have made the war in Europe much shorter. Having such capability in the future will prove most valuable when it is necessary to engage a more formidable foe and do so in an expedient manner to quickly gain the upper hand.

E. FUTURE GTN CAPABILITIES – AN OPERATIONAL SCENARIO

The GTN of the future should be one of the most valuable resources available to senior leadership and operational commanders during peacetime and war. An operational commander should be able to enter the GTN, and with the proper clearance, be able access all information concerning movement of personnel, equipment, and supplies throughout the world. One of the ways future GTN capabilities can be applied to satisfy the following scenario can illustrate an operational need in the future:

Rebels have attacked the government building of one of our allies (Country X) and it is urgent that the U.S. react swiftly before the rebels gain momentum. It is decided that U.S. troops will be sent in from an amphibious ready group off the coast, and within 48 hours reinforcements are scheduled to arrive from CONUS. The original plan, Plan A, called for the use of conventional ground forces and is scheduled to take at least five months but will result in minimal U.S. casualties. Plan B is an alternative plan that is more aggressive and could save much time but has the potential of significant U.S. casualties.

After initial contact with the rebels, the commander of U.S. forces in Country X makes an assessment of the situation and has to make a decision of how to proceed. If he is certain that the reinforcements will arrive on time, and the reinforcements have the right mix of equipment and specialized personnel, he will proceed with Plan B. If Plan B is carried out with the right mix of equipment and personnel, it is almost certain that the rebels will be contained and the conflict will be over within 72 hours with minimal loss of U.S. life. If the reinforcements do not have the right mix of personnel and equipment, and the commander proceeds with Plan B, it will take one month to subdue the rebels and may cost many American lives. If the original Plan A is carried out, it may take many months to subdue the rebels but loss of American lives will be minimal and the stability of the Country X will be in question. The reinforcements deployed three hours ago and are in route to the theater. The operational commander has one hour to make his decision. He does not have enough time to communicate with the reinforcement's base or the aircraft carrying them. What is he to do?

In the future, the operational commander should have at his disposal the capability to get to the GTN web site, and with the proper clearance, bring up a map of the world. He can find out where the reinforcements originated from and locate the three C-17s carrying them on the map and know the exact real-time location of the aircraft. With a click of the mouse or a voice command, a diagram of a C-17 and its contents pop up. Not only would a list of all cargo and personnel be displayed, the diagram of the plane will show where in the plane the person is seated or piece of equipment is stowed. This knowledge can prove very valuable when time does not allow the luxury of unloading the plane and sifting through the cargo to find a specific item. Information about the individuals on the plane would also be accessible. Training records, qualifications, skills, medical information, prior experience, etc., could prove valuable to operational leaders.

In our scenario, the operational commander in Country X finds the information he needs and decides that the proper personnel and equipment are indeed on the C-17s and proceeds with planning for Plan B with confidence it will be a success.

The TAV capability of the future GTN can be used in other ways. A query for a critical repair item could be done and the location of all such items that are in-transit could be found. For example, a query for part Z en route to the Mediterranean could result in a list or map depicting all aircraft, vehicles, or ships carrying that part. As in our previous scenario, diagrams of the aircraft, vehicles or ships carrying the part could show the physical stow location. All pertinent information concerning the part could be shown such as document numbers, bills of lading and final destinations. Transportation schedules change very rapidly. Knowing where transportation assets are at any one time can prove very valuable in such a dynamic environment. The availability of satellite and GPS technology provides the means from which this visibility can be accomplished.

For obvious reasons, the ability to change the routing of an item would rest with the proper authority. This change of routing while in-transit could be accomplished via the GTN. The GTN would be available to all points along the way of a shipment. At any point, the part could be pulled (if the stow location makes it practicable) and re-routed to a different destination.

Because technology is changing at such a rapid pace, it is not feasible to know exactly what technologies will be available in the future that will have an affect on the GTN. For this reason, the GTN does not have a future end state and is not expected to. The GTN will be constantly evolving with no end in sight.

F. FUTURE GTN CONCERNS

1. Security

In order for the GTN to provide such real-time visibility and control of material, equipment, and personnel to operational commanders, a large amount of information at all levels of classification would have to be inputted into the GTN. With so much sensitive information feeding into the system, concerns about security have been raised. In order for the GTN to reach its potential as an effective tool, security has to be assured. Without absolute confidence in the ability of the GTN to process sensitive information without compromise, the GTN will not be able to be used to its full potential. [Ref. 48]

Threats to the GTN system include hackers, ranging from the amateur, to the sophisticated, elite hacker. Motivation for hackers can be curiosity, feeding their respective egos, or financial gain. In times of crisis, foreign countries may seek to try to disrupt our deployment plans, logistical requisitions, and resupply and sustainment transports. [Ref. 48]

If these countries were to gain access to sensitive information in the GTN, they could locate and target our forces, reinforcements, or logistics pipelines. By doing so, military operations would be disrupted severely affecting the course of a war.

There is also a potential threat from terrorists. Information from the GTN could be used to obtain information on personnel, travel itineraries, and movement plans. Malicious code could be launched by internal or external means and may be designed to stay dormant and wait for a specific time or until orders are given before damaging the GTN and related systems. [Ref. 48]

Although hackers, foreign countries, and terrorists pose a significant threat, the biggest threat is from insiders who have authorized access to our systems. These insiders already have access to information and therefore can bypass most security mechanisms designed to keep the unauthorized intruder from the outside from gaining access. [Ref. 48]

The GTN consists of an Unclassified GTN network and a Classified network. By its very nature the classified network is easier to control access to and the threat of security breaches from outside intruders are less than that of the Unclassified network. Currently, the unclassified GTN system web servers and databases are protected by actively monitoring and employing a set of industry standard security processes and state of the art hardware and software tools. These processes and tools are blended into a defense in depth architecture. [Ref. 48]

The security process includes Auditing, Access Control, Encryption, and Configuration Management. Auditing identifies who has accessed or attempted to access the system, detects unauthorized changes to the GTN system security settings and enforces security policy. Access Control allows only authorized connections and Encryption allows secure connections from the user's desktop to GTN web servers and secure database data replication between databases. Configuration Management physically protects and identifies all systems on the network identifies protocols and services they use their vulnerabilities, and controls the impact of hardware and software updates on security of the network. [Ref. 48]

Each of these security processes are supported by one of the following security tools: Crack, Tripwire, COPS Checkpoint Firewall I, NIDS VPN, C2 Guard, Proxy Server, Netscape Certificate Server, SSL, SSH, TKIned, Fstrobe, MITRE, Enhanced SATAN, Internet Security Scanner, Webserver and Browser. These tools are integrated into an architecture that provides three levels of protection for the system. [Ref. 48]

Level 1 is to prevent the USTRANSCOM network infrastructure form being used as a platform to attack the GTN network. Level 2 is GTN's own network with redundant and independent protection. Level 3 provides monitoring and oversight of the previous two levels. [Ref. 48]

As the GTN uses more web technology, the protection of the GTN's web servers is critical. Protection of the web servers is accomplished by setting them up on their own network segments to minimize potential collateral damage.

The challenges for keeping the GTN secure for the future involves feeder systems and the classified GTN. Because the GTN relies heavily on the interconnectivity of a number of networks, the security of the networks is key to a secure system. If a feeder system is compromised, the possibility exists that the active GTN system could be compromised and corruption of data is possible. The most effective weapon against feeder system security breaches is educating the feeder system supervisors. Other way to ensure that feeder systems are not compromised is the use of services and agencies in acquiring protective hardware, software, and expertise. The implementation of Information Architecture/Internet Protocol (IA/IP), which uses encryption technologies for information passing over the Internet, will strengthen the security of the GTN feeder systems. (GTN Security Brief, Jan 00) The security architecture has been tested and evaluated by several DOD organizations including DISA, NSA, ER, AFTWC, JC2WC. These organizations have done daily connection and probe attempts and has found the unclassified GTN secure. [Ref. 48]

Security is improving against the threat from outsiders, and as a result, the shift is moving from instituting attacks from the outside to instituting attacks from the inside. Some of the most harmful security breaches in the DOD have been from people working inside the U.S. government. The security measures that are present in the unclassified network are required to protect the classified GTN. Access control and audit capability are needed to prevent insider attacks to the system which have the potential to be just as harmful is not more harmful than attacks from the outside. [Ref. 48]

If the GTN is to remain safe from intrusion in the future, the GTN security architecture will have to be continually improved. The threat is an evolving one and those attempting to infiltrate our systems will continue to exploit new technologies. Whatever form the GTN takes in the future, preventing security attacks will require the utmost vigilance.

2. Formats

The systems that feed into the GTN are usually in ANSIX12 format, since that is the format that is the standard in the U.S. Any feeder systems from outside the U.S. are usually in the international standard format, EDIFACT. The GTN uses its own flat format and data from feeder systems must be translated into this flat format for use by the GTN. Because of the labor involved with translating each feeder system's data, Value Added Networks (VAN) are used to translate data from the feeder systems and the GTN. Just recently, a contract was awarded to a VAN to translate all data from all formats and feeder systems. Using one VAN is more efficient than dealing with a large number format versions. [Ref. 49]

Since there are essentially two standard formats, ANSIX12 and EDIFACT, why doesn't the GTN use one of these formats? Although ANSIX12 and EDIFACT are the standards for data transmission, there are a number of different versions of each standard currently being used by feeder systems. Even if the GTN used one of these standard formats, translation would still have to be done to match up the feeder systems with the version that the GTN was using. [Ref. 49]

Many of the systems that feed into the GTN are from small companies who do not have the resources to invest in updated EDI systems. Keeping up with the most updated standard version would be cost prohibitive for these companies. Using a standard format that is cost effective and easy to use that would satisfy the needs of both the feeder systems and the GTN would be ideal. This would make it unnecessary to use a VAN to translate data for use in the GTN. Data could be transmitted from each feeder system directly into the GTN without the delay and cost of translating it.

There is an emerging data format that holds promise. Extensible Markup Language (XML) is a fairly new format that is simpler to use and is more capable than HTML. In fact, using XML may be the answer to the problem of different formats needing to be translated to flat data files for use in the GTN. XML may make it possible for small feeder systems to feed the GTN without the use of a VAN. [Ref. 49]

G. GTN FUTURE TECHNOLOGIES

1. Intelligent Transportation Systems (ITS)

The definition of ITS is: Any project that (in whole or in part) involves the application of electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system. Although this definition deals with surface transportation, the definition may be altered to include any form of transportation. [Ref. 50]

The GTN can benefit from the developments in ITS and must stay abreast of current and future developments in the ITS arena to stay on the cutting edge of transportation technology. ITS technology covers a wide range of areas from automatic cars and highways to real time mapping and traffic status. Most of the developments in ITS will benefit DOD transportation as a result of the commercial sector universally adopting new technologies that will affect general transportation. An example of such a technology that will be universally adopted is automatic tollbooths. As tollbooths become automated, DOD transportation will benefit in concert with the general public from the cost and timesaving brought about by such technology. [Ref. 50]

There are, however, a few ITS technologies that can be exploited by the DTS without having to wait for the technology to take hold in the commercial sector first. One of these technologies concerns automatic route optimization. When large movements of troops or equipment are planned, whether for training or for actual deployments, data concerning the surface transportation routes can be available automatically. This data can be used to plan the route that will allow the most expeditious movement from the point of departure to the destination. Information concerning road conditions, ongoing road/infrastructure construction, highway, bridge, and tunnel weight and height limitations, hazardous material limitations along a route, planned traffic along a route for specific time of day or the week, weather conditions along the route, and any delays due to emergencies or accidents is available using ITS technology. This information, in whole or in part, is currently available in certain metropolitan areas of the world, including many areas in the United States. Including this information in the GTN could provide significant advantages to planning and executing force movements.

The following scenario is an example of how such technologies could be used as part of the GTN. All information concerning the route of movement mentioned above is fed into the GTN. In the event of contingencies, it will be necessary to execute a large movement of deploying troops from Fort Hood, Texas along surface transportation routes to embark on ships waiting in port New Orleans, Louisiana. The planned route is entered into the GTN. The system can be set up to provide constant updates of route conditions on a monthly, weekly, daily, or hourly basis. When the order comes to commence movement, the system could provide the best route to take, what time of day is optimum, and when to stagger, if needed, vehicle movements so as to prevent congestion at the departure or arrival destinations.

By using this information, departure from base to embarking on the vessels can be executed efficiently with the minimum number of delays or routing problems and may save days on getting troops and equipment where they should be when they should be.

2. Satellites and Related Automated Information Technology (AIT)

Satellites and related AIT could theoretically play a central role in the future evolution of the GTN, particularly in the area of TAV. To set up this analysis, it is necessary to first examine some of the principles of AIT devices. Next, the authors will attempt to portray their future integration with satellite tracking systems and the relationship to the GTN/feeder systems.

AIT

AIT encompasses a variety of read and write data storage technologies that capture asset identification information. Those technologies include bar codes, magnetic stripes, integrated circuit cards, optical memory cards, and radio frequency identification tags. AIT also includes the hardware and software to create the storage devices, read the information stored on them, and integrate that information with other logistics data. It also includes the use of satellites to track and redirect shipments. [Ref 4:p. iii]

AIT devices offer a wide range of data storage capacities from a few characters to thousands of bytes. The information on each device can range, for example, from a single part number to a self-contained database. The devices can be interrogated using a variety of means, including contact, laser, or radio frequency, with the information obtained from those interrogations provided electronically to automated information systems (AISs) that support DOD's logistics operations. [Ref 4:pp. iii-iv]

Although not truly an AIT device, RF data communications (RFDC) also deserve mention because of their role in sending real time data to AISs. In applications that require a real-time update to a database, using RFDC is preferred to sending data as a batch via a modem or a direct-connect download. RFDC is usually used to provide a real-time link between an AIS host computer and a hand-held terminal. [Ref. 38:p. 2.2]

Railroads have used RFID technology since the late 1980s for tracking and equipment management. [Ref 51] Within the military, this technology is used to identify, categorize, and locate people and materiel automatically within relatively short distances (a few inches to 300 feet). RFID capabilities, particularly those provided by active RF tags, are beneficial when a user needs to locate and redirect individual containers or have stand-off, in-the-box visibility of container contents. RFID may also be used to support a customer in a forward area with an inadequate systems or communications infrastructure. The active RFID capability offers significant capabilities for yard management, port operations, and in-transit visibility (ITV) that cannot be provided by passive RF tags. [Ref. 38:p. 2.3]

Active and Passive RF Tags

RFID labels are known as tags or transponders. They contain information that can range from a permanent ID number programmed into the tag by the manufacturer to an extensive memory that can be programmed by a controller using RF energy. The controller is usually referred to as a reader or an interrogator. [Ref. 38:p. 2.4]

An interrogator and a tag use RF energy to communicate with each other. The interrogator sends a RF signal that "wakes up" the tag, and the tag transmits information to the interrogator. In addition to reading the tag, the interrogator can write new information on the tag. This permits a user to alter the tag's information within the effective range. Interrogators can be networked to provide extensive coverage for a system. [Ref. 38:p. 2.5]

Passive RF tags operate similarly to active RFID tags except the data capability of passive tags is significantly limited. Additionally, interrogation of these tags is generally constrained to line-of-sight. [Ref. 38:p. 2.5]

Satellite Tracking Systems

A satellite-tracking system provides the ability to track the exact location of vehicles and convoys. The latitude and longitude locations of trucks, trains, and other transportation assets equipped with a transceiver are transmitted periodically via a satellite to a ground station. Some systems also provide two-way communications between a vehicle operator and a ground station. [Ref. 38:p. 2.5]

Satellite tracking uses a cellular or satellite-based transmitter or transceiver unit to communicate positional information, encoded and text messages from in-transit conveyances to the ground station. Transceiver-based technologies also permit communications from a ground station to the in-transit conveyance. A user can compose, transmit, and receive messages with very small hand-held devices or units integrated with computers anywhere in the world. The greatest use of this technology is in the commercial motor carrier industry. However, this capability is easily adapted to rail, bus, barge, military organic, and other surface modes. Additionally, the emerging low-earth orbit (LEO) satellite constellations will facilitate tracking international multimodal shipments. [Ref. 38:p. 2.5]

The following description provides a clarification of how a satellite-tracking system may currently operate in DOD. A typical system has five components—a subscriber unit, satellite, earth station, network control center (NCC), and logistics managers. A subscriber unit is installed on the conveyance being tracked. The unit exchanges information with an earth station via satellite. The earth station is connected to a NCC that stores information in electronic mailboxes. Logistics managers access their mailboxes to receive information from subscriber units and return information to them. [Ref. 38:p. 2.6]

Satellite tracking to facilitate in-transit visibility has shown substantial benefits, but at the present is somewhat limited. Currently, the most effective use is for tracking and communicating with vehicles and other transportation assets rather than individual containers. The limitation lies in the need for a subscriber unit and an operator for that unit. [Ref. 38:p. 2.6] Presently, the technology has not developed sufficiently to offer a stand-alone "tag" that can be interrogated by a satellite and simultaneously be within the budget of the military. Although, there have been many advances which will conceivably lower the cost of this technology (particularly with the use of low-earth orbit satellites).

The John A. Volpe National Transportation Systems Center (Volpe Center), located in Cambridge, Massachusetts, has extensive expertise in satellite-based radionavigation systems. The Volpe Center is a unique Federal Government organization that is actually funded by client agencies, both public and private, to address specific problems such as the one outlined above. [Ref 52] Their research, combined with private enterprise, has the potential to yield significant progress for satellite tracking.

Satellites and the GTN

As satellite and information technologies develop further, the authors believe that the possibility to exploit their combined benefits may hold significant potential to substantially improve and increase the capabilities of the GTN. Additionally, as the cost of these technologies continues to decrease and their capabilities increase, many new possibilities are afforded to DOD.

To offer a theoretical operational concept, the following is provided. The concept proposes the use of a standard, miniaturized, reusable, active tag as the sole device for use in information coding (or capture of asset identification information) to be placed on virtually any item or person to be tracked. The use of these tags could be increased and expanded to other modes of travel. Additionally, it may be possible to eliminate many of the current information systems, hardware and software (and associated integration difficulties). This would be possible through the use of tags that continually feed positional and/or logistics data directly to the satellites or are interrogated directly by the satellites. In either case, the satellites would capture that data and forward it to a centralized repository (the GTN). That data would be immediately (or within seconds) available to authorized users, commercial and/or military.

The entire tracking system, including the satellite (or the usage of) and hardware components (tags, tagging system, etc…), could be under the responsibility of a separate directorate formed or contracted by USTRANSCOM. Membership would be comprised of the appropriate technical staff and representatives from all of the various initiatives currently being undertaken. In addition, representatives from DLA could augment the directorate staff. They would be needed to ensure that inventory policies and initiatives are also incorporated in conjunction with the directorate's efforts.

All associated software and information systems needed would be controlled under that centralized directorate. Further, a single information system and software could be adopted under this concept (once again, eliminating many of the associated integration problems). The service would essentially be offered through the Internet for both military and commercial customers. Correspondingly, there would be a fee for those services (most likely dependent upon usage, type of services required, hardware requirements, or some combination thereof). Thus, the fees, in combination with elimination of numerous redundant feeder systems and their infrastructures, may offer a cost-effective alternative to the current system.

Another possible advantage of the system is that it may hold the potential to become the industry standard. As the USTRANSCOM survey indicated, several shippers would be willing to use only the GTN if the information were as accurate as the carriers' systems. With the elimination of individual intermediate feeder systems (brought about through centralization) and much of the manual intervention eliminated (tag data transmitted directly to the satellite and directly to the GTN), data accuracy could substantially be increased. Over time, the improvements should lead to a robust capability that could conceivably rival commercial carrier systems. In the future, it may prove more cost effective for the commercial carriers to utilize the GTN services provided by the directorate. A standardized system among both the military and commercial sectors offers monumental advantages and the opportunity for further evolution.

H. CHAPTER SUMMARY

The future holds significant potential to increase and enhance the capabilities of the GTN. In addition, the current philosophy at USTRANSCOM is that there is no definite end-state in the evolution of GTN. As future technologies become available, the plan is to exploit them to the fullest extent possible to improve the GTN in support of its customers. The goal is continual improvement.

There are a number of future concerns that need to be continually addressed. These concerns include security and data formats. In order for the GTN to be utilized to its fullest extent, especially when processing sensitive information, security needs to be guaranteed. Data formats continue to be problematic. Currently a VAN is used to integrate the large number of differing formats and alternate solutions are being researched.

As suggested previously, the possibility of capitalizing upon new technologies is virtually limitless. The authors proposed several operational scenarios and suggested additional technologies that may offer increased capabilities for the GTN.

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V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

This research outlined the changes that have occurred within Global Transportation Network (GTN)/In Transit Visibility (ITV) feeder systems and the subsequent ITV they provide by comparing the current position to the past and examining future trends.

USTRANSCOM was established as the single manager for transportation in both peace and war. As part of its mission, it created a transportation management system that would provide ITV to all DOD transportation users throughout the world. Shortly after creating the GTN concept, the feasibility of providing global ITV was demonstrated through "proof-of-concept" prototypes. Earlier success with "proof of concept" GTN prototypes set the stage for developing operational prototypes.

The capabilities of the operational prototypes increased steadily and USTRANSCOM implemented a number of initiatives to address user needs and gain full advantage of evolving technology. Pull systems gave way to push systems. Surface, air, and sea capabilities were added. Client-server architectures were replaced with Web-based technology. A number of key management and infrastructure changes were also implemented. In addition, numerous initiatives were implemented that aided in development. These initiatives included data standardization, migration strategies, ITV, JTAV, DTEDI, AIT, EB/CEDI, and life cycle costs/benefits analyses.

The contract for the GTN production system was awarded in 1995. New capabilities and functionalities were continually enhanced throughout the 1990s. Questions continually arose concerning the future of the GTN.

The future holds significant potential to increase and enhance GTN capabilities. In addition, the current philosophy at USTRANSCOM maintains that there is no definite end-state in GTN evolution. As future technologies become available, the plan is to exploit them to the fullest extent possible to improve the GTN and support its customers. The goal is continual improvement.

There are a number of future concerns, including security and data formats that need to be continually addressed, but the possibility of capitalizing upon new technologies is virtually limitless.

B. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusion: Satellite technology possesses the potential to substantially improve and increase GTN capabilities, particularly in regard to TAV.

Satellite technology offers the possibility of a centralized technology that may eventually replace many of the current feeder systems and associated infrastructure. Data could theoretically be captured and forwarded to a centralized repository (the GTN) and be available virtually real-time for authorized users.

Recommendation: USTRANSCOM should evaluate the feasibility of establishing a separate directorate for satellite technology and incorporating satellite-collected data into the GTN.

Satellite technology has been used successfully to facilitate TAV, feeding information to the GTN. However, its use has been somewhat limited. Currently, the most effective use has been tracking and communicating with transportation assets. A separate directorate would be required to fully evaluate, develop, and implement the technology and to exploit the potential capabilities to include all transportation modes, containers, assets, and personnel.

Membership of the directorate should include representation from the appropriate technical disciplines, USTRANSCOM initiatives currently being undertaken, and from DLA. In conjunction with many of the current initiatives, a single information system, hardware and software could potentially be adopted under the centralized concept. This would provide a significant impetus to integration efforts.

Recommendation: USTRANSCOM should evaluate the feasibility of offering the services available, as a result of satellite technology (incorporated through the GTN), through the Internet.

The services available should be robust, accurate, and timely. The possible benefits are virtually limitless at all levels in the military and commercial sectors. Authorized access through the Internet offers the potential to assess fees and defray associated costs. Overall, assessing fees and eliminating many of the current systems and infrastructures could make this technology an extremely viable alternative.

2. Conclusion: The large variety of devices, tags and labels used for information coding and capturing asset identification information causes significant integration difficulties.

Currently, a number of devices or technologies are being used to capture and store asset identification information. This fact, in itself, generates a number of integration difficulties, particularly across the Services and in interaction with the commercial sector. Consequently, it also can result in problems with TAV.

Recommendation: USTRANSCOM should investigate adopting a standard, miniaturized, reusable, active tag technology to replace the number of current technologies being used for AIT.

As alluded to in the introduction, miniaturized computers have been developed that possess more capability than most current desktop PCs. They contain CPU chips that are smaller in size than a postage stamp. Conceivably, a chip used only to capture asset identification information and perform minimal processing could be even smaller and less expensive. As technology evolves, it may be possible and cost effective to use such a chip to facilitate TAV and replace the devices currently in use. In effect, a single technology that would facilitate AIT standardization and integration with standard use among all transportation modes. In addition, that technology could continually be made more cost effective through widespread adoption and mass production.

Recommendation: Incorporate the "standard" tag technology with satellite technology to facilitate TAV.

At present, the capability has been developed for a "tag" to communicate directly with one or more satellites or for the satellite(s) to interrogate the tag and obtain its information. These two technologies seem to be well suited to use in combination. A single AIT device would theoretically make the satellite technology referenced above significantly easier to implement for TAV.

3. Conclusion: The GTN must be kept up to date with the latest security software and security procedures to ensure vital data are not compromised as the GTN improves TAV capabilities.

The GTN has the potential to become the one source for logistics data to both operational commanders and strategic planners. Coupled with this potential is the increasing possibility of damage due to compromised data.

Recommendation: Continue vigilantly monitoring the GTN and its feeder systems for possible compromise due to hackers and terrorist activity. Maintain training efforts to keep users current on the latest methods for preventing security breaches. Closely follow the latest security technologies in both government and the private sector, and implement the most promising technologies into the GTN.

4. Conclusion: The GTN is not taking full advantage of Intelligent Transportation Systems (ITS) systems and current technologies for surface transportation.

ITS has the potential for providing real-time information on surface transportation. Information available by using ITS includes, but is not limited to: real-time traffic speed and congestion information; information on route construction; weight and height limitations; data on average travel times dependent on time of day; and automatic toll, weigh, and border crossing stations.

Recommendation: USTRANSCOM should set up a liaison with the U. S. Department of Transportation concerning ITS so that the GTN can exploit information available through various ITS technologies.

C. FURTHER RESEARCH AREAS

1. What is the estimated cost of incorporating satellite technologies into the GTN?

2. If a satellite technology directorate were established by USTRANSCOM, how would the organizational structure be determined?
3. What is the most efficient and useful format for transferring data between feeder systems and the GTN?
4. How could the GTN benefit from, and what is the estimated cost of, exploiting emerging Intelligent Transportation technologies in the future?
5. Develop a cost/benefit analysis of adopting a single, standard tag or chip technology to replace the number of current technologies being used in AIT.

APPENDIX A

Current Sources of Information

Automated Air Load Planning System (AALPS)

GTN will have the capability to accept load plans and stow plans developed by applications such as Automated Air Load Planning System (AALPS). Information developed in these applications will be passed to GTN through established interfaces such as GDSS, TC AIMS II, and WPS. AALPS assists users in loading Air Force and commercial transport aircraft. It takes data input of personnel to establish gross load planning information, and it produces fully certified load plans for single mission, brigade sized or multiple division sized airlift deployment requirements.

Air Carrier Analysis Support System (ACAS)

ACAS provides automated support for trend analysis of the safety posture of commercial air carriers providing airlift to DOD. The mission of ACAS is to provide the DOD Air Carrier Survey and Analysis Office an integrated system for trend analysis, scheduling, and mission support requirements IAW Public Law 99-661 and DOD Directive 4500.53.

Asset Management System (AMS)

AMS is a transportation management system that automates the management of the DoD Interchange Freight Car Fleet and the Common User Container Fleet. It will provide greater asset visibility; enhance utilization, and improve maintenance, tracking and rail revenue auditing.

Command and Control Information Processing System (C2IPS)

C2IPS provides centralized "electronic grease board" capability for each functional area in airlift wings, air refueling wings, airlift squadrons, and air refueling squadrons, and mobility forces. C2IPS extends automated command and control capabilities to fixed and deployable field units, including ANG and Air Reserve Command, while interfacing with other C^2 systems to share critical tanker and airlift/aircrew information. The mission of C2IPS is to support wing-level airlift and tanker execution, tracking, and analysis during peacetime, crisis/contingency, and war.

Consolidated Air Mobility Planning System (CAMPS)

CAMPS is a migration system for ADANS and currently under development. It supports peacetime, crisis/contingency, and wartime mobility planning, scheduling, and analysis for air transportation assets. CAMPS primarily supports AMC military airlift, aerial refueling, and commercial aircraft missions. CAMPS and the Global Decision Support System (GDSS) do planning and scheduling for transportation airlift missions, thus providing planning visibility from origination of the mission requirement to the actual scheduling. CAMPS will provide GTN with channel requirements data, DD Form 1249 SAAM Airlift Requests, and air refueling quarterly planning schedules.

Canadian Transportation Automated Control system (CanTRACS)

CanTRACS is a system that automates transportation and contract administration processing and generates documents for shipments from DOD contractors throughout Canada. The mission of CanTRACS is to provide DCMC America and contractors with a system for the procurement of commercial freight transportation services in peace and war. It also provides DCMC Americas with a contract database including contract requirements for transportation including item descriptions, terms and conditions.

CONUS Freight Management (CFM)

CFM is MTMC's unclassified system providing automated support to TOs and MOs for transportation processing and planning. CFM receives EDI transactions from transportation systems. CFM will provide movement status (Implementation Convention 858) on cargo moved within CONUS.

Defense Transportation Tracking System (DTTS)

DTTS is operated by the Naval Supply Systems Command/Navy Material Transportation Office for DoD. DTTS is the DoD unclassified system for near real-time tracking of Class I-IV explosives shipments moving via truck or train within CONUS. DTTS receives location reports every two hours from trucks and trains using commercial satellite-based tracking systems. An interface to GTN provides movement and shipment data.

Enhanced Logistics Intra-Theatre Support Tool (ELIST)

ELIST is a CONUS and theater transportation feasibility planning and modeling system for deployments analysis in CONUS and in an overseas theater of operation. The mission of ELIST is to provide DOD's transportation planners with a planning and analysis tool that evaluates if major deployments, reception, staging, onward movement, and integration (RSOI) are supportable by the theater's transportation assets and infrastructure.

Financial Air Clearance Transportation System (FACTS)

FACTS consolidates all Service/Agency Air Clearance Authority and transportation financial management systems' functionality into a single, automated DOD air clearance authority and financial management system.

Global Air Transportation Execution System (GATES)

GATES automates support for receipt, movement and billing of cargo and passengers. GATES replaces AMC's command and control transportation applications currently residing on a mainframe, which include the Headquarters On-line System for Transportation (HOST), the Passenger Reservation and Manifest System (PRAMS) and the Consolidated Aerial Port System, Second Generation (CAPS II). GATES will provide enhanced capability through a graphical user interface and increased architecture, which will improve communications from the aerial ports.

Global Decision Support System (GDSS)

GDSS, AMC's primary C2 system, is the source of planned and actual itineraries, and scheduled ULN allocations for all AMC carriers and tankers. GDSS provides GTN with real time updates as information changes. GDSS provides data concerning airlift mission schedules, actual departures and arrivals of aircraft, and summary information on what the aircraft (AMC organic or commercial) is carrying, to include OPLAN ULNs, short tons of cargo, and number of passengers being transported. Consolidated Air Mobility Planning System (CAMPS), the AMC system used to schedule airlift missions, including the planned cargo allocation, provides schedule/allocation data via GDSS. GDSS sends USMTF formatted messages to GTN.

Groups Operational Passenger (GOPAX) System

The GOPAX system is MTMC's automated support for movement of DoD groups of 21 or more passengers on air, bus, or rail carriers within CONUS. The GOPAX system receives requests for service from installations via Transportation Coordinator's Automated Information for Movements Systems (TCAIMS), telephone, mail, and direct access to GOPAX. Routing instructions are sent to the carrier and to the ITO/customer. GOPAX provides GTN with group movement data. GOPAX provides GTN bus carrier information pertaining to offer confirmation, requests, and passenger names.

Global Transportation Network (GTN)

GTN will provide the necessary automated support tools and have the interactive ability through state-of-the-art technology to manipulate transportation requirements for the DTS. GTN will provide customer information to lift providers so they can proactively support the stated needs of DTS customers.

Integrated Booking System (IBS)

IBS is the first automated system to standardize cargo booking procedures for unit and non-unit CONUS to OCONUS ocean-eligible cargo. IBS will receive cargo offerings from the shipper, recommend the cost favorable carrier and appropriate Sealift Port of Embarkation (SPOE) and pass the offering to the selected carrier. IBS then passes booking strategy, based on MSC contracts/agreements, to the port for booking. Additionally, it schedules unit arrivals at ports and issues port calls to units.

Integrated Command, Control, and Communication (IC3) System

IC3 is MSC's system for planning, monitoring, and controlling the movement of ships owned and chartered by MSC. IC3 will integrate Headquarters Locator Module (HELM), MSC Ship Register (P504), Sealift Strategic Analysis System (SEASTRAT), Operations Support System (OSS), and Bulk Petroleum, Oil and Lubricants (POL), all of which are existing C2, transportation, and planning systems. IC3 interface will provide GTN with ship schedules, ship position data, and ship port information.

Integrated Computerized Deployment System (ICODES)

ICODES supports vessel-loading requirements for all Services and provides the opportunity to develop and evaluate alternative solutions by predicting problems and preventing their occurrence.

Joint Air Logistics Information System (JALIS)

JALIS assists USTRANSCOM with schedule coordination for operational support aircraft from all Services. It provides schedules, itineraries, and information for OSA aircraft to GTN.

Mobilization Control (MOBCON)

MOBCON is a DOD mobility system resource that supports surface road movements within CONUS. The system links an automated router and scheduler to a national highway database to manage conflicts in military wheeled vehicle movements and facilities permitting of over-dimensional loads.

Transportation Coordinator's-Automated Information for Movements System II (TC-AIMS II)

TC-AIMS II consolidates the management of the installation-level transportation functions of unit movement; load planning, and ITO/TMO operations. TC-AIMS II becomes the standard installation-level unit deployment and sustainment system for all Services. The functionality contained in the cargo and passenger movement portions of the ITO/TMO segment of TC-AIMS II are the core of the application. While the planning of unit movements has several unique aspects, the execution of unit movement operations is largely a specialized case of personnel and cargo movement. TC-AIMS II must have the capability to create container-content relationship records for Exercise cargo before interface with WPS and IBS. TC-AIMS II will use the same core of functionality to support routine ITO/TMO operations and unit movement execution.

Transportation Operational Personal Property System (TOPS)

TOPS is an OSD chartered joint service project to automate and standardize personal property movement, storage, and management functions at DOD/Coast Guard Personal Property Shipping and Processing Offices worldwide.

TRANSCOM Regulating and Command and Control Evacuation System (TRAC2ES)

TRAC2ES is the DoD medical regulating and aero medical evacuation patient movement system. TRAC2ES merges medical regulating and aero medical evacuation flight planning into a single comprehensive system to support the cost effective transportation of DoD patients in peace and war. TRAC2ES will provide GTN ITV of patients, patient attendants, and aero medical evacuation crews and equipment, via planned and actual information for medical evacuation missions manifested in TRAC2ES. GTN will provide TRAC2ES with visibility of inter- and intra- theater lift assets and movements of lift capable of being used for medical evacuation.

Worldwide Port System (WPS)

WPS is the MTMC worldwide-unclassified system for managing export and import of DOD cargo at water ports. It provides detailed data concerning items of cargo arriving, departing, and on-hand at water ports. WPS records cargo data for surface movements at MTMC area commands; receipt, staging, and loading cargo at ports; and generates the ship manifest/booking upon completion of vessel loading.

Appendix B

LEGACY SYSTEM TERMINATION

MIGRATION SYSTEM LEGACY SYTEM(S)	ORIGINAL TERMINATION DATE	ACTUAL TERMINATION DATE	PROJECTED TERMINATION DATE
AALPS			
CALM	Mar-97		TBD
ACAS			
AMS			
D(F)RIF	Nov-95	Aug-95	
JCCOS	Nov-95	Jun-96	
C2IPS			
WINGS	Jul-95	Jul-95	
TAMS	Dec-97	Sep-96	
CAASS(AMC)	TBD		Sep-02
EARLO	Sep-94	Sep-94	
CAMPS			
AMS(AMC) INTO CMARPS	Nov-95	Nov-95	
ADANS	Sep-98		Feb-01
ATS (HORSEBLANKET)	Jun-94	Jun-94	
CMARPS	Sep-98		Feb-01
CanTRACS			
CFM			
TRAMS	Mar-97	Sep-97	
FINS	Jun-95	Jun-95	
FL & D	Jun-95	Jun-95	
GOBILS	Jan-97	Jan-97	
NTOA TMS	Sep-95	Sep-95	
DSOATS	TBD	Mar-98	
DTTS			
ELIST			
STADSS	Mar-97	Mar-97	
FACTS			
NATDS	Mar-97	Oct-97	
AACA (Army)	Jan-98		Aug-00
TRANSBAL	Oct-98	Dec-96	
ETADS	Feb-99		Jun-00
TFM	Jan-99		Jun-00
MC ACA	Jan-99		Mar-00
GATES			
FSS	Sep-96	Sep-96	
PRAMS	Nov-97	Nov-97	
ITRAM	TBD		TBD
Comm Gateway	Nov-97		Nov-99
HOST-CRQS	Nov-97	Nov-97	
HOST-CONVERTER	Feb-95	Nov-97	
HOST-MACA	Nov-97	Nov-97	

MIGRATION SYSTEM LEGACY SYTEM(S)	ORIGINAL TERMINATION DATE	ACTUAL TERMINATION DATE	PROJECTED TERMINATION DATE
GATES (cont.)			
HOST-OVER/SHORT	Nov-97	Nov-97	
HOST-REQUEST	Nov-97	Nov-97	
HOST-TRAIS	Nov-97	Nov-97	
HOST-UPDATE	Nov-97	Nov-97	
RCAPS-CARGO	Nov-98		Nov-99
RCAPS-PASSENGER	Nov-98		Nov-99
CAPS II APACCS	Nov-98	Aug-99	
CAPS II CARGO	Nov-98	Aug-99	
CAPS-ADAM III	Dec-94	Dec-94	
CAPS II SPRACS	Nov-98	Aug-99	
CAPS-PACS	Dec-94	Dec-94	
GDSS			
AIMS	Dec-94	Dec-94	
TKACT	Sep-95	Sep-95	
MAIRS	Mar-96	Apr-97	
GDSS(Legacy)	Sep-96	Oct-97	
TAMIS	Mar-97	Jan-99	
GOPAX			
GTN			
AMP			
JFAST			
STRADS	Sep-97	Mar-99	
SEASTRAT	Sep-97		Oct-99
IBS			
ASPUR	Jul-96	Aug-96	
TACOS	Nov-96	Oct-97	
CDOP	Nov-96	Oct-97	
SRFS	Jan-98	Oct-97	
METS II	Nov-96	Jan-99	
IC3			
BLITS	Sep-96	Sep-98	
VIPS	Sep-96	Sep-98	
P504	Sep-96	Sep-98	
ICODES			
CODES	Sep-97	Sep-98	
CAEMS	Dec-97		Mar-01
JALIS			
NALIS (CONUS)	Jul-95	Oct-95	
NALIS (OCONUS)	Jul-95	Jul-99	
SIMS	Jun-96	Oct-96	
OASIS	Oct-96	Oct-96	
CAASS Army (CONUS)	Sep-96	Apr-97	
CAASS Army (OCONUS)	Sep-96	Feb-99	
MOBCON			
TC-AIMS II			
ATCCS	Sep-00	Sep-97	
CFM-FM	TBD		TBD

MIGRATION SYSTEM LEGACY SYTEM(S)	ORIGINAL TERMINATION DATE	ACTUAL TERMINATION DATE	PROJECTED TERMINATION DATE
TC-AIMS II (cont.)			
CMOS	Sep-00		TBD
TMS-Freight*	Sep-00	Jul-98	
DAMMS-R	TBD		TBD
DeMS	Sep-00	Sep-98	
MDSS II	Sep-00		TBD
TC-ACCIS	Sep-00		TBD
TC-AIMS (MC)	Sep-00		TBD
TOPS			
WHIST	Mar-98	Mar-98	
TRAC2ES			
APES	Dec-00		Dec-00
DMRIS	Dec-00		Dec-00
WPS			
DASPS-E	Jul-95	Jul-95	
TSM	Dec-95	Dec-95	
TERMS/TOLS	Dec-95	Dec-95	
MED-P	Dec-96	Jun-96	

* NOTE: Though TMS-Freight has been terminated, one site, Camp Lejune still uses TMS-Freight for RR shipments.

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