

NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



THESIS

**THE USE OF COMMERCIAL STANDARDS IN
PLACE OF MILITARY STANDARDS IN ARMY
NDI ACQUISITIONS - M915 TRUCKS**

by

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December, 1995

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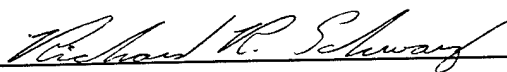
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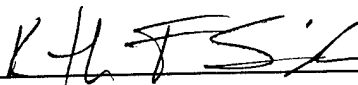


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ABSTRACT

This paper examines the United States Army's use of commercial standards in place of military standards (MIL-STDs) for the acquisition of Non Developmental Items (NDI). The recent acquisition of M915 series trucks is examined. The use of commercial quality standards in place of military quality standards is discussed. In addition, the future commercial quality standard, the ISO 9000 family of standards, is looked at.

The paper begins with a discussion of current and future commercial quality standards. Then the MIL-STDs used and the MIL-STDs replaced by commercial standards in the acquisition of M915 series trucks are discussed. Benefits and concerns arising from the use of commercial standards are followed by the final chapter which contains the paper's conclusion that the use of commercial standards for Army NDI acquisitions makes sense, and recommends that the Army move toward mandating the ISO 9000 commercial standards.

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I. INTRODUCTION

A. BACKGROUND.

When the Army contracts with a company to provide a product, standard specifications (standards) of some type are used to focus the product's capabilities and composition. "Specifications are the most detailed method of describing requirements" [Ref 8, pg 123]. "Standard specifications have been prepared for many goods in commercial trade" [Ref 8, pg 128]. Standards are "criteria considered essential to achieve uniformity in materials or products, or interchangeability of parts used in those products" [Ref 2, pg 7-8]. Standards are written into the contract to tell the company producing the item exactly what the Army wants. The standards included in a contract may cover everything from the specific manner in which a production process is to be performed to how the final item is to be painted.

Standards are divided into two main sub-groups, functional standards and design standards. Functional standards state what is desired as an end product, but do not tell the producer how to make the item. Design standards tell the producer exactly how the end item is to be made.

The Army buys a large number of items. Some of these items are military specific, such as armored vehicles, artillery, and attack helicopters. A number of the items are developed for military use, but have applications in the commercial marketplace as well. These items include tents, prepackaged field rations, and the Global Positioning System. Finally, there are Non Developmental Items (NDI) which are usually commercial products that may require minor modification before use by the Army. These items include M915A2 line haul trucks, or in common terms, "eighteen-wheelers". These trucks are classified as a modified NDI acquisition.

Secretary of Defense Perry published his guidance regarding specifications and standards used in Department of Defense procurement on 29 June 1994 [Ref 29]. This

has had a large impact upon procurements of military equipment and supplies.

Secretary Perry's memorandum clearly impacts upon line haul truck procurement in several places. First, he references the Vice President's National Performance Review with respect to the use of commercial items and avoidance of government-unique requirements. The procurement of military line haul trucks, with their similarity to commercial line haul trucks, appears to be just what the Vice President and Secretary Perry are talking about. Second, Secretary Perry directs the Military Departments and Defense Agencies to reduce Government oversight "by substituting process controls and non-government standards *in place of* development and/or production testing and inspection..." (emphasis added) [Ref 29, pg 3-4]. Third, the use of MIL-STDs in the future will require a waiver.

When procuring items for military use in the past, the Army used MIL-STDs to ensure quality. There were a large number of these standards, and they cover most conceivable aspects of the design and construction of equipment purchased for the military. Some of the technology required in these standards has been surpassed by current commercial technology, and this results in the Army procuring items that are less than state-of-the-art. Other MIL-STDs require manufacturers to use outmoded manufacturing processes. These problems with MIL-STDs have raised the cost of many items the Army purchases higher than is necessary. Still other MIL-STDs, such as MIL-STD-498 which addresses computer software and documentation, are the only good measures of quality in a given area.

B. OBJECTIVE.

The objective of this thesis is to study the issue of quality in the Army acquisition of an NDI product, such as Army M915A2 line haul trucks. Can MIL-STDs that address quality be replaced by current or soon-to-be-adopted commercial quality standards and provide the Army with quality NDI?

C. RESEARCH QUESTIONS.

1. Primary research question.

Will the use of commercial standards have a negative impact on the acquisition of Army NDI, such as M915 series trucks?

2. Subsidiary research questions.

a. Second research question.

What are current and future commercial standards that impact the recent M915 series truck acquisition?

b. Third research question.

What are the military standards that impact the M915 series truck?

c. Fourth research question.

How does the use of commercial standards impact the commercial seller of NDI and the military buyer?

D. SCOPE, LIMITATIONS AND ASSUMPTIONS.

The scope of this thesis is Army modified NDI acquisitions. The recent acquisition of M915 series trucks is used as a frame of reference. The thesis is limited to discussing this one acquisition regarding quality standards. It is assumed that current national and international trends in quality standards will continue.

E. LITERATURE REVIEW AND METHODOLOGY.

The research for this paper has been focused in five areas. First, several Defense Technical Information Center (DTIC) searches have been done, each from a slightly different approach in order to find the maximum number of references to the subject. Second, a Defense Logistics Studies Information Exchange (DLSIE) custom bibliography was requested. Then several selections from the bibliography were obtained from DLSIE. Three different key word groups were used for DLSIE searches, again to maximize the references located. The third area researched was the Naval Postgraduate School's Dudley Knox library. In particular, former thesis topics and transportation (commercial and military) related publications were checked for references to the topic. Included in this group of resources are the textbooks from various courses at the Naval Postgraduate School. The fourth area researched was Army agencies. Various offices in the Warren, MI., headquarters of Tank Automotive and Armaments Command (TACOM) have provided a wealth of information. This includes a General Accounting Office (GAO) report on the suitability of commercial vehicles for military use. A report from Military Transportation Management Center Transportation Engineering Agency discussed the strategic transport requirements missing from most commercial vehicles. The U.S. Army Tactical Vehicle Fleetbook 1995 gave information on the current procurement and fielding plans for Army tactical wheeled vehicles. The fifth and best source of information was interviews and correspondence between the author and representatives of Government agencies, commercial companies, and the International Organization for Standardization (ISO). These people provided great insight and information on the subject of this thesis.

F. DEFINITIONS AND ACRONYMS.

1. Definitions.

Commercial Item Descriptions (CIDs) are simplified Federal specifications that describe the key physical and functional characteristics of acceptable commercial or

modified commercial items. These documents are intended to be developed and used when the Government is acquiring a suitable item from a commercial supplier, and when the Government can be reasonably assured of the lack of necessity for specifying special design, testing, quality control, or packaging and marking requirements. If a minimum amount of special Government requirements are essential to receive an acceptable commercial or modified commercial item, these requirements may be included [Ref 33, pg xv].

Modified Non Developmental Items (NDI) are items requiring minor development or modification to hardware or software to meet Army needs [Ref 17, pg 2].

Performance specifications are normally less precise than design specifications. They describe performance characteristics desired of the end product without specifically directing how the contractor should design or assemble the item [Ref 2, pg 7-3].

Specifications are a technical description of the requirements for the material, product, or service that includes criteria for determining whether these requirements are met. Specifications state only the Government's actual minimum needs and are designed to promote full and open competition [Ref 9, part 10.001].

A standard is a document to establish engineering and technical limitations and applications of items, materials, processes, methods, designs, and engineering practices. Any related criteria essential to achieve the highest practical degree of uniformity in materials, products, or interchangeability of parts used in those products are included. Standards may be used in specifications, invitations for bids, requests for proposals, and contracts [Ref 9, part 10.001].

2. Acronyms.

See Appendix.

G. ORGANIZATION OF STUDY.

The thesis is organized as follows. The next chapter (Chapter II) will examine commercial quality standards, and the ISO 9000. Chapter III looks at the Army's quality standards up to this point, the MIL-STDs. Chapter IV will examine the use of commercial standards. Chapter V will provide a conclusion and recommendations.

II. COMMERCIAL QUALITY STANDARDS

A. INTRODUCTION

This chapter addresses the commercial standards that have impacted the recent (1994/1995) procurement of M915 series trucks by the United States Army. The United States Government defines a standard as:

A document that establishes engineering and technical requirements for items, equipments, processes, procedures, practices and methods that have been adopted as standard. Standards may also establish requirements for selection, application and design criteria for material [Ref 13, pg 9].

Before looking at the specific standards in question, we must define commercial standards. Commercial quality standards are standards that have been brought into being and promoted by commercial interests. These standards often began as attempts by the various providers of a good or service to bring some order to their segment of the marketplace. By bringing order to their activity, the providers of a good or service may concentrate their efforts and resources in a more productive manner. More important, an industry with some self-imposed order is more attractive to the consumer, and encourages the consumer to purchase the good or service. A somewhat recent example of this is the home computer market. The market started in the late 1970's with the Apple computer and the Radio Shack home computer. As the market expanded at an amazing pace, many producers entered the market. There were several major non-compatible operating systems among the many computers on the market. In the early 1980's, producers realized the damage this multitude of non-compatible systems was causing to the market by discouraging consumers. The majority of producers voluntarily chose to use the MS-DOS operating system, thereby becoming compatible with each other. More important, they were then compatible with IBM, the major influence on the overall computer market. With a standard present in the industry, many consumers that were previously concerned about the diversity in the home computer market were now confident of the market's

ability to support their needs. The home computer market continued to expand to amazing levels. Most producers of home computers that did not accept this new industry standard were soon gone from the market. This is an example of how a self-imposed standard affected a market.

Commercial quality standards come from several sources. Most come from professional organizations in various industries, while other commercial quality standards are actually Federal Government standards for some aspect or capability of the item. These Federal Government standards are included here as commercial standards because they are not Department of Defense specific, and because they cover all motor vehicles in the United States.

Some commercial standards were originally MIL-STDs. Over a period of time they were adopted by various industries. A professional organization in the industry would put its name on the standard, and promote its use among the industry's members [Ref 25]. Conversely, there are several commercial quality standards that replaced Military Standards in the latest (1994/1995) procurement of M915 series trucks.

Professional organizations are usually formed to promote standards of performance and thus improve the image of the profession. From these beginnings, many professional organizations have moved forward to developing and promoting further standards of performance and expertise in their fields of endeavor.

B. CURRENT COMMERCIAL STANDARDS AND ORGANIZATIONS THAT IMPACT THE RECENT (1994/1995) PROCUREMENT OF M915 SERIES TRUCKS.

The commercial standards used in the current procurement of M915 series trucks are commercial standards that are promoted by the following professional organizations.

1. SAE, International (SAE)

One such professional organization whose standards are used in M915 series trucks is SAE. SAE was founded in 1905. The present organization was formed by a merger of the American Society of Aeronautical Engineers and the Society of Tractor Engineers. It was formerly known as the Society of Automotive Engineers. The stated mission of the organization is to advance the arts, sciences, standards, and engineering practices related to the design, construction, and use of self-propelled mechanisms, prime movers, components thereof, and related equipment built to preserve and improve the quality of life. The local groups serve as forums for presentation of papers and discussion of technical problems and engineering standards. Through the Coordinating Research Council, SAE, International cooperates with the American Petroleum Institute in research on the use of fuels and lubricants for automotive apparatus. SAE, International also conducts research programs. The publications of SAE, International include the Book of Ground Vehicle Standards [Ref 16, pg 752].

2. American Society for Testing and Materials (ASTM)

Founded in 1898, the ASTM establishes standards for materials, products, systems, and services. There are 131 technical committees (each of which has five to 50 subcommittees). New committees are organized periodically to stay current with technological advances. ASTM has developed more than 9000 standard test methods, specifications, classifications, definitions, and recommended practices that are now in use. Its publications include the Annual Book of ASTM Standards and the Standardization News [Ref 16, pg 925].

3. American Welding Society (AWS)

Founded in 1919, the AWS is a professional engineering society in the field of welding. It maintains over 130 technical committees and handbook committees. Its publications include welding codes, standards and specifications [Ref 16, pg 993].

4. National Highway Traffic Safety Administration

The National Highway Traffic Safety Administration was established by the Highway Safety Act of 1970. The Administration conducts programs and research that relate to the safety performance of motor vehicles and related equipment, motor vehicle drivers, occupants, pedestrians, and a national uniform speed limit as directed by the National Traffic and Motor Vehicle Safety Act of 1966. The Administration further conducts programs and research directed at reducing economic losses in motor vehicle crashes and repairs. It was established to reduce the mounting number of deaths, injuries, and economic losses resulting from motor vehicle crashes on United States highways, and to provide motor vehicle damage susceptibility and ease of repair information.

Through the Administration's program, Federal Motor Vehicle Safety Standards are issued that prescribe safety features for motor vehicles and levels of safety-related performance for motor vehicles and motor vehicle equipment. An intensive testing program is conducted to ensure that motor vehicles and their equipment comply with the applicable standards. Damage susceptibility and crash impact information are to be reported to the Congress and the public. The Administration has the authority to require a motor vehicle or motor vehicle equipment manufacturer to take corrective action. A broad-scale program of demonstration, evaluation, research, and development of motor vehicles and motor vehicle equipment is carried out. The Administration maintains scientific and technical information related to motor vehicle safety [Ref 26, pg 470-471].

C. THE ISO 9000 FAMILY OF STANDARDS, THE NEXT GENERATION OF COMMERCIAL STANDARDS.

1. What is the ISO 9000?

The International Organization for Standardization (ISO) in Geneva, Switzerland, was founded in 1946 to promote the development of international standards and related activities, including conformity assessment. Conformity assessment includes testing,

inspection, laboratory accreditation, certification, quality system assessment, and other activities intended to assure the conformity of products to a set of standards and/or technical specifications. The purpose of the ISO is to facilitate the exchange of goods and services worldwide. The ISO is composed of member bodies from over 90 countries. The United States member body is the American National Standards Institute (ANSI). The ISO's efforts cover all areas except those related to electrical and electronic engineering, which are covered by a separate organization, the International Electrotechnical Commission (IEC). The results of the ISO's work are published as technical standards or guides [Ref 6, pg 3].

With the increased interaction of the global marketplace and the customer's emphasis on quality, dependability, deliverability, and cost, there is no argument over the need for an international system, free from undue legislative hindrance. Such a system is necessary for the continued development of international trade. The principal advantage of this international standardization system is that it is a self-imposed obligation, minimizing the need for regulatory or legislated requirements by governments or other organizations [Ref 32, pg 3].

The ISO published a series of five international standards in 1987: ISO 9000, ISO 9001, ISO 9002, ISO 9003, ISO 9004. These standards were developed by ISO Technical Committee 176 on quality systems. The series of standards, together with the terminology and definitions contained in ISO standard 8402, provides guidance on the selection of a quality management program for a supplier's operations [Ref 6, pg 3].

The original intent of the ISO 9000 standards was to be advisory; they were developed primarily for use in two-party contractual situations or for internal auditing. These standards have come to be applied in a much broader range of conditions than originally planned. In some situations, compliance with one or more of the ISO standards has been or will be mandated by a U.S., foreign national, or regional government body. Conformance to the ISO 9000 standards is being required in purchasing specifications with increasing frequency [Ref 6, pg 3].

The ISO 9000 standard series has been adopted in the United States as the ANSI/American Society for Quality Control (ASQC) Q 90 Series. In Europe, the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) have adopted the ISO 9000 as the European Norm (EN) 29000 Series. At least 48 countries have national standards that are identical or equivalent to the ISO 9000 standards [Ref 6, pp 3-4].

a. How to become ISO 9000 registered.

A company interested in becoming ISO 9000 registered has a journey of approximately two years ahead of it. After contacting the ISO and receiving the materials necessary to start the process, the hard work begins. The company must examine its entire operation. The management, accounting, inventory, design, engineering and manufacturing are all included in the registration process. This is not focused just on the manufacturing function of the company. The entire company is examined, from top to bottom. After self-examination, the company must decide on its goals and the route to meet them. When the process of change is complete at the company, it submits its formal application and requests a third party audit of the entire operation. Most companies fail their first audit. A common reason for the first-time failure is that documentation procedures have been overlooked in the drive to improvement and ISO 9000 registration [Ref 24].

b. How to lose ISO 9000 registration.

When a complaint is received by the ISO against a company's quality of goods or services there is an investigation. The investigation is usually performed by the same agency that performed the company's ISO 9000 registration audit. If the complaint is verified, the company will lose its ISO 9000 registration [Ref 24].

2. What are the ISO 9000 family of standards?

The ISO 9000 Standard series, or family of standards, is generic in scope, an international consensus on good business practices that may be applied to any organization. Whether the organization is in manufacturing or the service industry, the Government or private sector, the ISO 9000 family of standards is applicable [Ref 32, pg 2]. Each standard addresses a different aspect of quality assurance and is used based upon the needs of the user [Ref 6, pg 4].

a. The standards.

(1) . ISO 9000 (ANSI/ASQC Q90).

Quality Management and Quality Assurance Standards - Guidelines for Selection and Use. ISO 9000 explains the fundamental quality concepts. Key terms are defined, and guidance on selecting, using, and tailoring ISO 9001, ISO 9002, ISO 9003 is provided [Ref 6, pg 4].

(2) . ISO 9001 (ANSI/ASQC Q91).

Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation and Serving. This is the most comprehensive standard in the series. ISO 9001 covers all the areas that are listed in ISO 9002 and ISO 9003 [Ref 6, pg 4].

ISO 9001 is for use when conformance to specified requirements is to be assured by the supplier during the design, development, production, installation, and servicing of an item [Ref 22, pg 143].

(3) . ISO9002 (ANSI/ASQC Q92).

Quality Systems - Model for Quality Assurance in Production and Installation, covers the prevention, detection, and correction of problems during production and installation. ISO 9002 is more extensive and more sophisticated than ISO 9003 [Ref 6, pg 4].

(4) . ISO9003 (ANSI/ASQC Q93).

Quality Systems - Model for Quality Assurance in Final Inspection and Test is the least comprehensive of the ISO standards. (Ref 5, pg 4) ISO 9003 is used when conformance to specified requirements is to be assured by the supplier only at the final inspection and test [Ref 22, pg 143].

(5) . ISO9004 (ANSI/ASQC Q94).

Quality Management and Quality System Elements - Guidelines provides guidance for a supplier to use in the development and implementation of a quality system. ISO 9004 guides the supplier in determining the extent to which each quality system element is applicable. Each of the quality system elements is addressed in greater detail and may be used for internal and external auditing purposes [Ref 6, pg 4].

In the next few years, it is expected that a trend will develop for using the quality assurance models, ISO 9001, ISO 9002, and ISO 9003, to verify the broader process challenges for eliminating variation in internal management structures and processes. This will result in a shift of emphasis from demonstrating the meeting of stated and implied needs. The new emphasis is to include verification of how the customer's needs have been met. The fulfillment of the customer's needs is subjected to continuous improvement which benefits all involved [Ref 32, pg 3].

b. ISO 9000 advantages.

The advantages from ISO 9000 registration vary somewhat from one company to another. However, of the numerous benefits reported, the following are the most commonly reported, regardless of the country in which the company is located or industry in which it competes [Ref 28, pg 3].

1. Achieving reproducible and predictable results.
2. Standardizing the "already invented" in order to reduce unnecessary variations.

3. Releasing the individual creativity and “mind power” of employees in product development, and the promotion of the company and its operations.
4. Streamlining job responsibilities and defining the criteria of good workmanship.
5. Increasing the flow of information within the company.
6. Increasing the learning from mistakes, and the establishing of preventive routines/procedures.
7. Improving customer satisfaction and loyalty.
8. Increasing employee participation.

Additional reported benefits of ISO 9000 registration include:

9. Streamlining and improving of procedures.
10. Improving productivity, customer satisfaction, and employee morale.
11. Improving significant benefits from quality certification by coupling it with continuous improvement techniques such as Total Quality Management (TQM).

Experience to date shows that quality systems by themselves will not necessarily lead to important benefits and/or improvements in an organization. But if there is an awareness of quality improvement techniques and the employment of a culture of continuous improvement, then the quality management system can indeed produce significant benefits. The experience of companies to this point shows that quality assurance needs to be part of the overall quality journey [Ref 15, pg 12].

c. ISO 9000 disadvantages.

When a company implements the process to work toward ISO 9000 registration, it must understand that it requires hard work to reap the benefits. If a company treats ISO 9000 registration like just one more trendy management technique, it is doomed to failure. The company fails to understand the importance of the process and

fails to invest the required time and effort to achieve ISO 9000 registration, so it fails to reap the benefits. Thus it falls behind its peers that successfully implement the ISO 9000. The ISO 9000 is not the latest trendy management technique. It is a culture change in the company, affecting the way the company perceives itself and the quality of the goods and/or services that it provides to the marketplace. The ISO 9000 family of standards is not a move-by-move road map to quality for a company. It is a generic framework or background formed by the consensus of the countries involved. Each company must work within the framework to plot its journey to quality. Because of the generic nature of the ISO 9000, an organization in any field of endeavor can use it to build an internal quality program. But the organization must invest the time and effort to map its particular strategy; the ISO 9000 does not provide the exact steps to take [Ref 32].

3. Are the ISO 9000 standards widely used?

a. Worldwide use.

As of August 1995, more than 80 countries around the globe have adopted the ISO 9000 as national quality management standards. The list of countries includes the United States and its major trading partners. It also includes most emerging nations in the former Warsaw Pact and the Pacific Rim [Ref 20].

b. United States of America usage.

As of June 1994, over 4000 companies in the United States were ISO 9000 registered. It is estimated that as of August 1995, the total number of companies with ISO 9000 registration in the United States of America is greater than 4500 [Ref 28, Ref 24].

III. MILITARY STANDARDS

A. WHAT ARE MILITARY STANDARDS?

The purpose of this chapter is to look at what military quality standards are. In the second part of the chapter, the MIL-STDs for the M915 series truck that were replaced by commercial standards are looked at. The chapter closes with the MIL-STDs that remain in the procurement of the M915 series truck, and explores why these MIL-STDs remained.

1. Background.

When the United States' various military branches purchase goods from suppliers, it is rarely a case of purchasing a ready made item from the producer's stock. Since the beginning of our country, the military has purchased goods from commercial suppliers. There were many good and honest suppliers. However, there were many unscrupulous suppliers as well. These suppliers provided spoiled food, substandard equipment, or just took the money and ran. The Federal Government was not pleased with these events. A series of procurement or acquisition rules and regulations came into being over time. These included the Federal Acquisition Regulation (FAR) and Military Standards (MIL-STDs). The MIL-STDs are guidelines on what the military was purchasing. These standards spell out specific features of the item being purchased. Some may refer to the strength of the material used in the item. Temperature tolerances for operation of equipment, noise levels, and exact dimensions or weight of the item are all included in various MIL-STDs. Specific manufacturing processes are included in some MIL-STDs.

The use of MIL-STDs is not always in the best interest of the Government. This has led to several acquisition reform efforts. Finally, on 29 June 1994, Secretary of Defense William Perry issued a memo to military acquisition officials. Military acquisition would use commercial standards, not MIL-STDs. In special cases MIL-STDs may be

requested and a waiver may be granted for their use. But commercial specifications are now the rule:

To meet future needs, the Department of Defense must increase access to commercial state-of-the-art technology and must facilitate the adoption by its suppliers of business processes characteristic of world class suppliers. In addition, integration of commercial and military development and manufacturing facilitates the development of dual-use processes and products and contributes to an expanded industrial base that is capable of meeting defense needs at lower costs [Ref 29].

2. Current definitions.

What are standards? First we will define standards (also referred to as commercial standards) and discuss what they are used for. Then we will look at military standards and what they are. They provide a detailed requirement for some aspect of a military acquisition. Normal standards are derived from the commercial sector or professional organizations such as SAE International. They provide detailed requirements for commercial acquisitions. Standards are usually not as encompassing as MIL-STDs. For example, a standard may prescribe a lubricant's capabilities in low temperatures. A related MIL-STD usually has a much lower temperature rating and some anti-corrosive considerations [Ref 1].

a. Standards.

Standards. Standards are documents used to define terms, document practices and procedures, and establish codes and items that are selected as standard for design, engineering, acquisition, and supply management operations. These documents are created primarily to control variety and serve the needs of designers. Standards represent a recommended or required solution for recurring design, engineering, and logistics problems. Areas covered by standards include materials, items, features of items, engineering practices, processes, codes, type definitions, symbols, tests, inspections,

packaging, classification of defects, marking of items, and components of equipment [Ref 13, pg 10].

Standards may refer to one or more features of an item, procedure, process, or practice, such as detail of configuration, size, or value. For equipment standards, they are referenced to design and testing requirements that are essential to interoperability, interchangeability, performance, reliability, maintainability, and compatibility. Standards describe the technical features of an item in terms of what it is and what it will do.

b. Military standards.

Military standards are defined as documents issued within the Department of Defense in accordance with the basic policy of the Defense Standardization and Specification Program. They are used to provide comprehensive presentation of engineering practices, test methods, safety requirements, symbols, procedures, processes, codes, abbreviations, type designations and characteristics for standard equipments or items. Military standards also cover overall characteristics of families of end items or major components. These characteristics may include envelope dimensions, performance ratings, primary structural features, and data required for component interchangeability. Military standards are usually more demanding than commercial standards. For example, in addition to specifying a certain viscosity for a lubricant, they may also include requirements to function at extreme low temperatures, and to prevent corrosion from salt water [Ref 12, pg 27].

The purpose and use of standards in the Department of Defense are described by MIL-STD-962 as follows. A standard shall be prepared to establish engineering and technical requirements for processes, procedures, practices, and methods, and to establish requirements for the selection, application, and design criteria for material. It is intended that standards be up-to-date records of the decisions and recommendations of military and industry experts in each respective field or area. Their primary purpose is to provide designers and users with the data and descriptions essential to the selection and application of items, equipment, material, and processes in the development and

production of services and material for the military Services. Standards are intended to establish and define levels of quality and reliability commensurate with the needs of the military Services. At the same time, standards are intended to identify and limit the selection of items and equipment to those designated as preferred or standard in order to constrain the proliferation of material in the inventory. They should be complete in their description and should use information as required for normal application decisions.

3. Military standards for quality

The standards for quality in military procurement are MIL-I-45208A, and MIL-Q-9858A.

a. MIL-I-45208A

The contractor's requirement to have inspection systems is established through this standard. The standard requires the inspections and tests necessary to validate product conformance to drawings, specifications, and contract requirements, and the tests and inspections required by the contract. The requirements of this standard are in addition to any tests and inspections required by other contract specifications [Ref 10, pg 1].

b. MIL-Q-9858A.

This standard requires that the contractor have an effective and economical quality program, planned and developed in consonance with the contractor's other administrative and technical programs. Consideration of the technical and manufacturing aspects of production and related engineering design and materials will be included in the program design. The contractor's quality program will assure adequate quality throughout all areas of contract performance. The standard requires that all supplies and services under contract to the Government, whether manufactured or performed within the contractor's plant will be controlled at all points necessary to assure that contractual

requirements are followed. The requirements in this standard are in excess of those in standard MIL-I-45208A. Standard MIL-Q-9858A is concerned with design, management, and process [Ref 11, pg 1].

c. Military standards guarantee a level of quality

The use of MIL-STDs is sometimes a mixed blessing. When a military standard is followed, the quality of the end product is known. However, military standards rarely keep pace with technology. This may prove to be a problem when they require a particular way of performing a task or process, if there are new, less expensive and more efficient ways of performing the task or process.

B. MILITARY STANDARDS FOR THE M915 SERIES TRUCK

During the recent procurement of M915 series trucks, the personnel at the United States Army's Tank Automotive and Armaments Command (TACOM) were able to eliminate thirty-four military standards. These military standards were replaced with either commercial standards or performance specifications. Performance specifications tell the contractor what performance is required from the end product they produce, without telling the contractor how they must achieve that level of performance. From the original requirement of fifty-three military standards, only nineteen were retained. This action was in compliance with Secretary of Defense Perry's memo that requires the use of commercial standards in place of MIL-STDs for defense acquisitions. The retention of these nineteen military standards was coordinated with both the U.S. Army Engineer School and the Combined Arms Support Command. Both of these organizations endorsed the retention of the nineteen MIL-STDs [Ref 25].

1. Military standards that were replaced by commercial standards in the procurement of M915 series trucks.

Table 1 shows the MIL-STDs that were replaced by commercial standards, declared redundant, or were covered by performance specifications.

Before	After
DOD-P-16232 Phosphate coating	ASTM B633-85 Electrodeposited coatings
MIL-B-11188 Batteries, storage	MIL-B-62346 Batteries, storage
MIL-B-62346 Batteries, storage	
MIL-C-20696 Cloth, coated	CID A-A-55252 Cloth, coated
MIL-HDBK-157 Transportability criteria	Redundant - deleted
MIL-P-14105 Paint, heat resisting	Redundant
MIL-P-53084 Primer	CID A-A-52474 Electrocoating primer
MIL-R-46164 Rustproofing	Performance
MIL-STD-1180 Safety standards	FMVSS 208 Occupant crash protection
MIL-STD-1180 Safety standards	FMVSS 209 Seat belt assembly
MIL-STD-1180 Safety standards	FMVSS 210 Seat belt assembly anchorages
MIL-STD-1261 Arc welding	AWS D1.1 Structural welding code steel
MIL-STD-1366 Material transportation	Redundant
MIL-STD-1472 Human engineering	Performance
MIL-STD-1474 Noise limits	SAE J336 Sound level for truck cab
MIL-STD-1791 Aerial delivery	Redundant
MIL-STD-810 Environmental test methods	Performance
MIL-STD-889 Dissimilar metals	Performance
MIL-V-31940 Valve, sampling	Performance
MIL-W-45205 Welding	AWS D1.2 Structural welding, aluminum
MS 35000 Battery, storage	MS 52149 Battery storage
MS 51317 Light, warning	CID A-A-52418 Light, warning
MS 52149 Padlocks	Performance
RR-W-1817 Warning device	FMVSS 125 Warning devices

Table 1 - Standards replacement. Source: M915 Weapon System Manager

**2. Military standards, used with waiver, to procure M915 series trucks.
[Ref 7]**

Since Secretary of Defense Perry published his June 29, 1994 memorandum on standards and specifications, a waiver is required when military standards are used in military acquisitions. Military standards must be used sometimes to get a required capability in a piece of military equipment. Because of the unique or harsh conditions in which military equipment is required to operate, compared to commercial equipment, military standards are essential for certain capabilities. There were nineteen MIL-STDs retained for this procurement. Each required a waiver, which was granted. The nineteen MIL-STDs follow, with the reason given for keeping each of them in this procurement.

a. MIL-G-10924, Grease, Automotive and Artillery.

This standard covers one grade of a multi-purpose grease for lubrication of ground vehicles and equipment. The closest commercial equivalent is ASTM D 4950 Automotive Grease Specification. However, the commercial standard does not have a low temperature capability (-54 degrees C) or heavy corrosion protection. There is no commercial standard available because of the very low temperature, corrosion, and salt water requirements. The use of commercial grease will result in the premature failure of critical suspension components. The Engineer School requested that this specification be retained in the purchase description.

b. MIL-L-2104, Lubricating Oil, Internal Combustion and MIL-L-2105, Lubricating Oil, Gear, Multipurpose.

These standards cover engine oils suitable for lubrication of reciprocating internal combustion engines for both spark-ignition and compression-ignition engines. They are also for power transmission fluid applications in equipment used in tactical service. Commercial standards do not include characteristics such as foaming tendencies, product compatibility, shear stability, flash and pour point. There are also no provisions in industry standards for review and verification of product conformance and quality. With

no guarantee of advertised performance level for commercial products, the military could find itself accepting oils which are not adequate in performance and result in field operational deficiencies.

c. MIL-C-46167, Lubricating Oils, Internal Combustion Engine.

This standard covers one grade of engine oil. This oil is suitable for the lubrication of reciprocating internal combustion engines, both spark-ignition and compression-ignition types. The oil is also used for power transmission fluid applications in ground equipment for all types of service, when the ambient temperature is in the range of 5 to -55 degrees C, and for use in Arctic regions as an all weather power transmission fluid for tactical ground equipment. Commercial standards do not include characteristics such as foaming tendencies, product compatibility, shear stability, flash and pour point. There are also no provisions in industry standards for review and verification of product conformance and quality. Also, commercial standards defining low-temperature visometrics and flow are not adequate for military needs. There is no single or completely integrated commercial standard for engine oils which provides consolidated viscosity grade and performance requirements necessary to meet the Army's equipment and operational needs. There is also a total lack of standards which establish the requirements for a dual-use (engine-transmission) lubricant. This is of major importance to the Army, as historically military engine oils have allowed combat/tactical vehicles and equipment (except for the turbine-powered M1 tank) to use one type oil for both applications. Lack of guaranteed performance levels could lead to the acceptance of oils which are not adequate in performance, resulting in operational deficiencies. Lack of commercial dual-use oils would require an increase in the different types and grades of oils used. This would burden the supply system and increase the potential for mis-use. The inability to adequately define low-temperature characteristics would adversely affect military operational capabilities.

d. MIL-C-46168 or MIL-C-53039, Coating Aliphatic Polyurethane, Chemical Agent Resistant or Single Component and MIL-STD-193, Painting Procedures and Marking for Vehicles, Construction equipment and Material Handling Equipment.

These standards cover both camouflage and non-camouflage, chemical agent resistant, aliphatic polyurethane coating for use as the finish coating on military equipment and the minimum requirements for materials and procedures for surface preparation, surface treatment, plating and painting of vehicles, construction and material handling equipment, and markings to provide protection from the adverse effect of chemical and environmental conditions. There are no commercial equivalents. Nuclear, biological, and chemical decontamination procedures cannot remove chemical agents absorbed by commercial polyurethane paints. Once a vehicle is contaminated, it may not be used until decontamination is complete. One of the Army's principal decontaminants, DS2, will dissolve commercial paint.

e. MIL-STD-642, Identification Marking of Combat and Tactical Transport Vehicles.

This standard gives mandatory requirements for the marking of military tactical and tracked vehicles, self propelled guns and military transport vehicles. There are no commercial equivalents. This standard was established to provide a uniform system for the marking of military equipment and vehicles, and implements International Standardization Agreements (STANAGs) on the marking of military vehicles. The lack of a uniform marking standard for military vehicles and equipment will hamper the identification of U.S. military equipment and vehicles.

f. MIL-STD-973, Configuration Management.

This standard delineates configuration control requirements, providing instructions for preparing and submitting proposed engineering changes and related information. This includes requirements for submittal of engineering change proposals, requests for deviations/waivers, specification changes and notices of revision. There are no commercial equivalents. MIL-STD-973 requires that documentation submitted with

engineering change proposals contain descriptions of all known interface effects and information concerning changes required in the functional/allocated/product configuration identification. This standard is required to ensure that the contractor provides information needed by the Government to properly evaluate a contractor's proposed engineering change.

g. MIL-M-9868, Requirements for the 35mm Microfilming of Engineering Data.

This standard gives microfilming requirements and testing guidance for engineering data source filming. The standard also covers the delivery of the filmed images to primary DOD repositories. There are no commercial equivalents. The reproduction hardware is restricted to scan images with a specific quality/density in order to properly scan images into the Government's database. Without this standard, images received from the contractor may not be of the required quality to be scanned into the Government database.

h. DOD-D-1000B, Drawings, Engineering and Associated Lists and DOD-STD-00100D(AR), Engineering Drawing Practices.

These standards establish the requirements and reference documents applicable to preparing and revising engineering drawings and give the requirements for engineering drawings and associated lists acquired in support of DOD material. There are no commercial equivalents. Without this standard, some assemblies which would otherwise be procured competitively would be sole source from the primary contractor, and there would be no guarantee that the Technical Data Package (TDP) obtained from the primary contractor would be suitable for use in future competitive procurements.

i. MIL-STD-1388-1A, Logistic Support Analysis (LSA) and MIL-STD-1388A-2A, DOD Requirements for a Logistic Support Analysis Record (LSAR).

This standard provides a methodology for systematically recording, storing, processing and displaying system/equipment analysis data. This is the system for the organized delivery of logistics data to the Government's computer database through all phases of the system/equipment life cycle. The TACOM computer system that provides for provisioning, maintenance data, logistics support and technical manual development is dependent upon LSA/LSAR format input. There are no commercial equivalents. This standard enables the logistics data submitted by the contractor to be entered into the TACOM database.

j. MIL-S-83129A, Spectrometer, Fluid Analysis.

This standard requires the submission of the necessary information to analyze oil samples. The Army Oil Analysis Program is the standard used to conduct maintenance on engines, transmissions, transfers, and selected hydraulic systems. Use of this standard ensures that the Oil Analysis Program may be used for the M915 series trucks.

k. MIL-M-63036D, Preparation of Operator's Technical Manuals. MIL-M-63038D, Technical Manual Requirements: Unit or Aviation Unit, Direct Support, Aviation Intermediate, and General Support Maintenance. MIL-M-38784C, Technical Manuals: General Style and Format Requirements. MIL-STD-335(TM), Technical Manuals: Repair Parts and Special Tools List.

These standards contain the requirements for each of the listed manuals. They also cover what must be contained in each manual and the level of detail required. There are no commercial equivalents. These manuals must be standardized to allow their use for all Army equipment operators and maintainers. Common manual format provides ease of use to soldiers. The lack of a standard technical manual format would cause confusion, and in the worst case provide manuals too difficult to understand.

1. MIL-STD-105E, Sampling Procedure and Tables for Inspection by Attributes

This standard establishes the sample size to be inspected for any given amount of items to be accepted. There are no commercial equivalents. The standard provides a means of sampling that will give the Government adequate protection when purchasing any number of an item. Without this standard there would be no means of determining the size of a sample. This could result in increased costs or not provide assurance of quality for procured items.

This MIL-STD was recently canceled, to be replaced by a specific commercial standard, American National Standards Institute (ANSI)/American Society for Quality Control (ASQC) standard Z1.4. However, this cancellation and replacement took place too late to impact this procurement. This action shows that Army Material Command (AMC) continues to work on increasing the use of commercial standards in place of MIL-STDs, and gives some idea of the large volume of work remaining to find commercial standards to use in place of specific MIL-STDs [Ref 18, pg 4].

IV. THE USE OF COMMERCIAL STANDARDS

A. INTRODUCTION

This chapter looks at the use of commercial standards for Army NDI acquisitions. First, benefits from the use of current and future commercial standards are examined. Then concerns from the use of commercial standards in place of military standards for future Army NDI acquisitions are discussed. The chapter ends with a look at current and future commercial standards that impact M915 series trucks.

B. BENEFITS FROM USING CURRENT AND FUTURE COMMERCIAL STANDARDS IN ARMY NDI ACQUISITIONS.

1. Current commercial standards.

There are several advantages in the current use of commercial standards in the purchase of Non Developmental Items (NDI) by the Army.

a. Commercial sector.

For the commercial sector in the United States, the primary advantage to the continued use of the current group of commercial standards is that United States companies are familiar with them. Manufacturers in the United States have "grown up" with the current commercial standards. They are comfortable with these standards, and have designed some operations around them. They can smoothly incorporate current commercial standards into their operations. Their personnel know and understand the reason for, and implementation of, these standards. To include these standards into new production is not a major challenge [Ref 23].

b. Government sector.

The Government is also use to current commercial standards in the United States. The Government knows how to inspect for them and which commercial standards are important to its need for quality. Some of the current commercial standards are exactly the same as certain military standards [Ref 25]. Thus the recent change by the Department of Defense from military standards to commercial standards is not too much of a problem to implement in most cases. Whole offices in the Government draw their reason for existence from the requirement to oversee the use of current commercial standards in Government procurement [Ref 34]. The Government bureaucracy is well versed in current commercial standards and how to implement them.

2. Future commercial standards (ISO 9000).

Whether the United States Government recognizes the fact officially or not, the ISO 9000 family of standards is becoming the world quality standard [Ref 28, Ref 31]. While not an exact, step-by-step mandated process, the ISO 9000 family of standards does provide a common framework for companies to build a quality system to meet their needs. The common framework provides a recognized level of quality between users, whether they are located in the same city or on different continents [Ref 28].

a. Commercial sector.

(1) . Worldwide competition and marketability.

In the present and future business world, a business must consider the international marketplace that the world has become, if it is to grow and prosper. It is not necessary for a business to have plans to expand beyond its country of origin. Competitors from other countries will enter its home market, and the United States-based business must be prepared to deal with this international competition. In this highly competitive environment, the quality of the product a company offers will determine if the company becomes and remains a viable commercial entity [Ref 31, Ref 21 pg 2-3].

Many companies and governments around the world are beginning to require ISO 9000 registration for any company that they do business with. This trend is expanding. It is already necessary for United States companies wishing to remain competitive in European markets to have ISO 9000 registration. Some producers in the United States have also adopted the business practice of "if you want to do business with me, you must be ISO 9000 registered". This is a strong reason to explain why five thousand United States companies, and more than seventy thousand companies around the world, have become ISO 9000 registered. In the not so distant future, a company without ISO 9000 registration to warranty its quality will find itself with an ever-shrinking market for its goods or services [Ref 28, Ref 24, Ref 19].

The ISO 9000 family of standards has been adopted by more than eighty countries around the world. Most notably, the ISO 9000 standards have been adopted by those countries that are termed "emerging markets", such as Eastern Europe and the Pacific Rim countries [Ref 20]. Companies from these countries will enter the world marketplace with increasing strength. To be successful, they must offer quality goods and services at a reasonable price. To remain in the world marketplace with these new companies, existing companies must ensure that their internal costs are under control, their market price is reasonable and competitive, and that their goods and services are of high quality. Compliance with the ISO 9000 family of standards will guide a company to reach these goals. In addition, the ISO 9000 promotes continuous improvement to keep a company competitive. By offering high quality goods and services to the marketplace, companies remain viable. For the United States Government this means high quality goods from a company that remains competitive and in business. A company that is not competitive will leave the marketplace, and the United States Government will not be able to turn to them for additional units or spare parts [Ref 32, Ref 20, Ref 28, Ref 31].

(2) . Less Government oversight.

As companies must increase their quality to remain competitive, they should be able to look forward to less Government oversight. ISO 9000 registration is a validation of quality in all that the company does. Cost control procedures, inventory management, design processes, and documentation control procedures are all areas that the ISO 9000 family of standards covers. These standards are not just for the factory floor where materials are treated and products formed, although they apply there as well. The United States Government will have less need to inspect and control the processes used by companies providing goods and services to it [Ref 23, Ref 34, Ref 31].

(3) . Reduce costs.

Companies around the world, in many different markets, industries, and of many different sizes all report the same result after achieving ISO 9000 registration. Their costs have decreased. For companies that are ISO 9000 registered, not necessarily all of their costs have decreased, but there is a very noticeable decrease in their cost of operation. The use of ISO 9000 standards reduced operating costs and caused the quality of the goods and/or services that the company offered to rise. This benefit from ISO 9000 registration was not always foreseen or expected [Ref 31].

b. Government sector.

(1) . Reduction of oversight.

To become a registered ISO 9000 company, a company must pass a rigorous audit from an outside agency. This audit encompasses every aspect of a company's operation. Each area must pass the audit before the company may become ISO 9000 registered. A company usually spends two years preparing for the audit. Most companies fail their first audit [Ref 24, Ref 31]. In addition, each company is audited every two or three years to ensure their continued adherence to the ISO 9000 family of standards [Ref 28, Ref 24, Ref 31].

When the company is ISO 9000 registered, it is following quality practices in all aspects of its operations that are higher or stricter than most of those practiced today in non-registered companies. There is a very good reason that it requires a two year period for a company to prepare for its ISO 9000 audit. The entire company must become quality-oriented. Quality procedures in every area must be established, trained for, and followed. Given the massive change that this may involve in a company, it is no wonder that most companies fail their first audit [Ref 28, Ref 24, Ref 31].

Companies that have achieved ISO 9000 registration are practicing quality and continuous improvement in every part of their business. The Government is now reducing oversight on some companies that have established their credibility in some areas of their operations. When a company is ISO 9000 registered it is following quality procedures that are at least as stringent, and usually more demanding, than those imposed by Government observers [Ref 24, Ref 23, Ref 34, Ref 31, Ref 3 app B, C, D].

(2) . Easier to terminate a contractor for default.

The Government currently has two means of terminating a contract with a supplier of goods or services. Briefly, when a contractor fails in some part to fulfill its contract with the Government, the Government may wish to terminate the contract. Some key differences between the two types of termination follow. With Termination for Convenience (T for C), the Government pays for costs incurred by the contractor to that point. In a Termination for Default (T for D), the Government may collect damages incurred and reprocurement costs. The problem with the T for D contract, from the Government's view, is that it must have excellent records and documentation to support its claim.

When a company is ISO 9000 registered, an additional means of supporting a T for D may become available. ISO 9000 registration must be required for the company fulfilling the contract. The company's retention of ISO 9000 registration throughout contract performance must be required in the contract [Ref 14]. When the company fails to provide quality goods, services, or accountability it is open to an outside

audit. The Government customer may request an audit of the company's ISO 9000 compliance. The problem must be verifiable to the auditors. If the quality problem is upheld by the audit, the company loses its ISO 9000 registration. This result is then published in trade journals by the ISO. The contractor losing its ISO 9000 registration is now not capable of meeting the requirements of the contract through its own action. This situation has yet to arise, so it cannot be predicted with absolute certainty what would result. But a strong case can be made that the Government's capability to T for D a poorly performing contractor may increase [Ref 24, Ref 23, Ref 34, Ref 31, Ref 14].

(3) . Promotes continuous improvement.

The ISO 9000 family of standards is not just an inspection for quality such as current MIL-STDs; it is a cultural shift in a company towards quality. Part of this change is the new emphasis on continuous improvement in the company. The ISO 9000 standards are not only concerned with the current quality in a company's operations, they also address continuous improvement in the company's operations. This can be quite a change of a company's view of itself. The end result is a company with quality built into all aspects of its operations and with continuous improvement as a constant goal. This is good for the company and good for the Government customer [Ref 28, Ref 24, Ref 23, Ref 34, Ref 31].

C. CONCERNS FROM THE USE OF COMMERCIAL STANDARDS IN PLACE OF MILITARY STANDARDS FOR FUTURE ARMY NDI ACQUISITIONS.

By its very definition, Army NDI acquisitions are made primarily to commercial standards. Some MIL-STDs may be added to an item, changing it to a modified NDI acquisition. But if MIL-STDs effect a major change in the nature of the item, then it is no longer an NDI acquisition [Ref 1, pg 3].

1. Commercial sector.

a. *Perceived cost to become ISO 9000 registered.*

As with any change in a business, there is a cost to the company that seeks ISO 9000 registration. The cost is in money (capital), time, and effort. How a business views these costs and the results of the company's investment of them in the ISO 9000 registration process says a great deal about management's attitude toward quality and the company's position in the marketplace. Some companies find themselves believing that they cannot afford the cost of ISO 9000 registration [Ref 31].

b. *Companies don't see the need.*

Many companies may balk at seeking ISO 9000 registration. Resistance to change in the quality arena is significant, primarily because companies don't recognize the need for improved quality. It is believed that companies that resist the change to improve quality will not be players in the next century [Ref 31].

This resistance to change may erode quickly in the world marketplace as the necessities of survival in the future business climate impact decisions. A recent survey of ISO 9000 registered companies was performed. More than one thousand companies in ten different countries were questioned. Fully 79% of the organizations surveyed replied that they actively encourage their suppliers to achieve ISO 9000 registration [Ref 15].

c. *Companies see any change from MIL-STDs as a threat.*

Some companies, comfortable with the status quo, see any change from MIL-STDs as a threat. These companies have designed and built large portions of their operations on the compliance with MIL-STDs. Some believe that the Government is changing the rules of the game for no reason. Others think that the Government is trying to gain more control over their operations. These companies don't see the move to commercial standards as a move forward; they see it as a disturbance of a working Government-commercial relationship [Ref 24, Ref 23, Ref 34].

2. Government sector.

a. Government bureaucracies lose some control.

The change from Government mandated MIL-STDs to commercial standards for future acquisitions is a major cultural shift. All of the people, Government and commercial sector, that were interviewed during the research for this paper believe that this is a smart decision and good for the Government. Their belief comes from many years of working in the Government acquisition business, either as a buyer or a seller. Many stated that this should have taken place years ago. They also acknowledged that it wouldn't be working as well as it is without strong direction from above [Ref 25, Ref 24, Ref 23, Ref 34, Ref 31].

Government oversight agencies perform a vital service, checking that the government is correctly charged for goods and services it contracts for. The oversight agencies also check the allowability of costs charged to the Government. Business costs such as entertainment may not be charged to Government work [Ref 2, pg 5-11]. While Government oversight agencies perform valuable work for the Government, there is concern that they cause too much disruption and cost to the contractor. Oversight agencies have not reduced their manpower in proportion to the reduced volume and dollar value of Government contracts.

The major problem with the change to commercial standards was consistently stated as that Government personnel and bureaucracies will see the change as an attack upon their function of Government oversight. While it was stated that many in Government service are strong supporters of the change, there are enough that are not to cause problems. Some people in various Government oversight agencies are concerned that they will lose their job, status or personal power. These agencies and people have spent their careers as Government watchdogs. They see no reason to change now [Ref 25, Ref 24, Ref 23, Ref 34, Ref 31].

Government oversight continues to be important. As the Government downsizes and embraces commercial business practices, the question becomes "How much is enough?"

b. Are Government agencies now too large?

With the end of the Soviet Union and fall of the Berlin Wall, United States Government Department of Defense spending has been reduced dramatically. Defense spending in the United States no longer has the emphasis that it did in the 1980's. The number and size of defense contracts has dwindled. The perception among program management personnel is that Government oversight agencies have not reduced their personnel as the volume and size of Government contracts to oversee has been reduced. The use of ISO 9000 commercial standards in place of MIL-STDs will further reduce the need for oversight. The result may be that our Government has an excess of Government oversight experts for the available work [Ref 23, Ref 24, Ref 25].

3. ISO registration.

In many of the countries that subscribe to the ISO 9000 family of standards, there is a central registration authority. The United States and several other countries do not have central registration authorities. In the United States, a company may achieve ISO 9000 registration through an audit from an outside agent or agency. The American Society for Quality Control (ASQC) oversees ISO 9000 registrations in the United States through the Registration Accreditation Board (RAB). For the United States Army, the Army Material Command (AMC) is performing ISO 9000 registrations for companies that do business with the United States Army [Ref 24, Ref 31].

a. *Are all registrations equal?*

In an ideal situation, all inspections for ISO 9000 registrations would be of equal depth and exactness. This has not proved to be the case. The registration process in Great Britain, for example, is viewed as almost worthless by those in other nations. In Belgium, there is an agency that performs ISO 9000 audits and has a very good reputation. Before being considered for business with some European ISO 9000 registered companies, other companies are directed to have an ISO registration audit by the Belgian agency. In Germany, there is a central audit/registration authority, which provides a certain level of quality for individual audits. This has provided the German ISO 9000 registered companies with an admired quality audit system [Ref 25, Ref 28, Ref 24, Ref 23].

b. *Who should oversee registrations?*

There is a fundamental issue that a country must address at some point as it adopts the ISO 9000 family of standards. Will the country have some national level audit and registration authority, or will the country officially distance itself from the registration process?

(1) . No central body.

One option open to a country is the practice of hands-off management. The country's leadership may decide to stay completely out of the ISO 9000 audit and registration process. They may even discourage the formation of a national professional organization that would oversee the audit and registration process. This type of practice may give rise to a situation such as that found in Great Britain. In Great Britain the entire ISO 9000 audit and registration process is suspect. Companies from other countries view ISO 9000 registration in Great Britain as almost worthless. Unless this situation is reversed, companies operating in this environment will find themselves at a disadvantage when operating outside of Great Britain [Ref 28, Ref 24, Ref 23].

(2) . A professional organization.

The United States has a history of using professional organizations to oversee or self-regulate the activities of practitioners of various professions. The most well known of these organizations are the American Medical Association and the American Bar Association. These organizations control or strongly influence the education requirements for their professions and the licensing necessary to practice these professions. For ISO 9000 registration in the United States, actions are leading us in the same general direction [Ref 6, pg 11].

(3) . The Government.

Control of the ISO 9000 registration process is under the direct control of the Government in some countries, such as Germany. The United States does not have the cultural background to support total Government control of such an aspect of the commercial sector [Ref 28, Ref 24].

D. CURRENT AND FUTURE COMMERCIAL STANDARDS FOR M915 SERIES TRUCKS.

1. Current commercial standards for M915 series trucks.

The M915 series trucks that are currently produced by the Freightliner Corporation are produced under the guidance of the Freightliner Quality System. This system is superior to MIL-I-45208A and almost meets MIL-Q-9858A. The United States Army recognizes the Freightliner Quality System as a means of ensuring that trucks of high quality are produced [Ref 30, Ref 5].

2. Future commercial standards for M915 series trucks.

The Freightliner Corporation has completed an ISO 9000 baseline audit. With this important step completed, the company is working to meet the high standards required by the ISO 9000 registration audit. Freightliner expects to be ISO 9000 registered by the end of calendar year 1995. This is a somewhat faster pace towards ISO 9000 registration than many other companies achieve. However, Freightliner was well aware of the ISO 9000 registration process and requirements long before it had its baseline audit. It was already working towards quality systems in all areas when it formally started the ISO 9000 registration process with its baseline audit [Ref 30].

Future M915 series trucks built by the Freightliner Corporation will be built under the quality guidance of the ISO 9000 family of standards.

3. United States Army concerns with commercial standards.

Various agencies and personnel within the United States Army have concerns with the use of commercial standards in place of MIL-STDs in Army procurement. Most of these concerns relate to acquisitions other than NDI which is used for the M915 series of trucks and will not be discussed here.

The major concern regarding the use of commercial standards for future Army acquisitions is in the area of change control. With the use of MIL-STDs, the Army could tell a producer that when it makes incremental changes and improvements in a product, to keep the Army product the same as it was at the beginning. But with the use of commercial standards there is a strong concern that a company may change some aspect of a product during an Army acquisition of the product, without informing the Army of the change. The concern is that replacement parts for the first products off the assembly line may not work in later items from the same assembly. In addition, more replacement parts would need to be kept on hand. This increase in parts inventory for just one product may not be too difficult. But when this happens to several products, then there is a large increase in parts inventories. This is not acceptable in an Army that is designed to be highly mobile and deployable [Ref 5].

a. *Freightliner Corporation and M915 series trucks.*

Freightliner Corporation keeps a by-serial-number database of all the vehicles that it produces. When a change is made in a truck, Freightliner notifies the owners of all previously produced trucks that may be affected by the change. The TACOM Quality Assurance personnel are not concerned with changes that Freightliner Corporation may make in the future. They express a strong confidence in the manner in which Freightliner conducts business [Ref 30, Ref 5].

b. *Other commercial suppliers.*

Quality Assurance personnel at TACOM have strong confidence in Freightliner Corporation's business practices regarding change control. This confidence has been gained through years of experience. However the confidence expressed towards the Freightliner Corporation's business practices was mirrored by TACOM's Quality Assurance personnel's strong concern over the business practices of other companies regarding change control. Companies that were not named had proven to TACOM that they were far less concerned with the documentation of change or with notifying TACOM of the changes [Ref 5].

V. CONCLUSIONS AND RECOMENDATIONS

A. CONCLUSION.

1. Research questions and answers.

a. Will the use of commercial standards have a negative impact on the acquisition of Army NDI, such as M915 series trucks?

The use of commercial standards will not have a negative impact upon the acquisition of Army NDI such as M915 series trucks. The Army buys the M915 series truck from the Freightliner Corporation in Portland, Oregon. Freightliner is a major producer of trucks for the commercial sector. It produces eighty trucks a day. Of the eighty trucks, only one or two is a truck being built to fill a Government contract. The majority of these trucks are headed for the commercial market. For Freightliner to change the way it builds trucks or institute special controls and oversight procedures for the construction of two trucks would be very expensive to the customer (the Government) [Ref 25].

The nature of the commercial market is competition. To remain in business, a company such as Freightliner must offer a quality product at a reasonable price. Further, the truck must have the features desired by the commercial market. Many of the features Freightliner Corporation offers in its trucks result from competition in the civilian truck market. For a feature to survive in the commercial truck market, it must add value to the product. In other words, the feature is usually something that the Army would also like to have in its trucks. An exception to this is the electrical system on the M915 series truck. The commercial electrical system standards provide good quality. But the system is too "noisy" by military standards. The noise referred to is not the noise that

you hear, but the electro-magnetic interference (EMI) produced by the system. This EMI produces interference affecting military radios and radars [Ref 25].

A counterexample of how commercial standards have made military operations easier is in the area of support. Freightliner is a subsidiary company of Mercedes-Benz. Between the two companies, they have dealerships in most parts of the world. When the Army National Guard in a state goes on a long convoy, the support representative at Freightliner is notified. The Freightliner representative alerts all dealers along the route. The dealers are then ready to provide emergency support to the Army National Guard if needed. When the Army deployed M915 series trucks as part of the mission in Somalia, it received support from the Mercedes-Benz dealership in nearby Kenya [Ref 25].

The overall effect of using commercial standards for Army NDI acquisitions like the M915 series truck is good. The Army receives state-of-the-art equipment and technology. The Army also has the benefit of accessing an existing world-wide support structure. The requirement for oversight is reduced through the acquisition of an existing product of known quality. The Army feels strongly enough about the quality of the M915 series truck that it is not conducting any testing for the current procurement. The trucks will go from the factory directly to the Army unit the trucks are designated for [Ref 25].

b. What are current and future commercial standards that impact the recent M915 series truck acquisition?

(1) . Current commercial standards.

The current commercial quality standard used in place of military standards that impact the recent acquisition of M915 series trucks is the Freightliner Quality System. Freightliner's quality system has been accepted by TACOM as a means of providing quality trucks for the Army. This commercial standard covers all aspects of the construction of the basic truck and the inclusion of safety features.

(2) . Future commercial standards.

The Freightliner Corporation has completed its baseline ISO 9000 audit. The company is currently working to pass its ISO registration audit. It expects to complete the process and be ISO 9000 registered by the end of calendar year 1995. This means that the ISO 9000 family of standards will govern the construction of future M915 series trucks that the Army acquires from the Freightliner Corporation [Ref 30, Ref 5].

In the coming years, more and more United States' companies will seek and achieve ISO 9000 registration. The trend toward a common commercial standard that is recognized world-wide is increasing. This trend will benefit the Army as it continues to buy NDI built to commercial standards. The improved internal controls, reduced cost, and the increased quality of items produced by ISO 9000 registered companies is good for the Army. Costs will be reduced, quality increased, and the need for Government oversight reduced. The challenge in the coming years will be to improve the knowledge of Army Acquisition Corps (AAC) personnel in this area. As the knowledge and experience base of the AAC grows, benefits to the Army will increase [Ref 25, Ref 24, Ref 23, Ref 31].

c. *What are the military standards that impact the M915 series truck?*

The M915 series truck is a NDI Army acquisition. As such, it is built using primarily commercial standards. The use of some MIL-STDs in the creation of the M915 series truck changes it from a Commercial Off The Shelf (COTS) acquisition to a modified NDI acquisition.

(1) . Military quality standards.

The Freightliner Corporation has its own quality system, called simply the Freightliner Quality System. This quality system exceeds the military's MIL-I-45208A, and comes close to MIL-Q-9858A. In the acquisition of M915 series trucks, the MIL-I-45208A was the quality standard desired by the Army. Because of the superior

Freightliner Corporation quality system, the Army accepted its use in place of MIL-I-45208A [Ref 25, Ref 30, Ref 5].

(2) . Other military standards.

The MIL-STDs that will continue to impact the M915 series trucks and the reasons that they must be retained are listed in section B of Chapter III. Briefly, the two most common reasons for the retention of these MIL-STDs are the requirement that the vehicle function in an extremely harsh environmental condition and the requirement to facilitate chemical decontamination of the vehicle.

d. How does the use of commercial standards impact the commercial seller of NDI and the military buyer?

(1) . Commercial seller.

The use of an international commercial standard for Army NDI acquisitions will reduce some of the problems that the Army has with suppliers. No longer will the Army require a separate way of doing things at a supplier's production facility. Costly and inefficient (from the production point of view) Government specific requirements will be relaxed or removed. The commercial supplier will be able to maximize savings through streamlined production and reduced oversight [Ref 25, Ref 24, Ref 23, Ref 34, Ref 31].

(2) . Military buyer.

For the United States Government to fail to require ISO 9000 registration will not be in the best interests of the Government. Suppliers of goods and services that rely on the Government for most of their work will have little incentive to improve their operations. They may continue to compete on the basis of price for sealed bid type contracts. The Government will not achieve best value for many contracts if this happens. Companies with ISO 9000 registration have better internal controls, reduced

costs, and continuous improvement in their operations. Requiring ISO 9000 registration will include these and other factors in contracts. These factors will contribute to best value for the Government [Ref 25, Ref 24, Ref 23, Ref 31, Ref 27].

2. Conclusion.

a. Benefits from the use of commercial standards.

The use of commercial standards for Army NDI acquisitions will benefit the Army in several ways. The Army will have access to state-of-the-art commercial technology for production. Commercial producers look for the most efficient means of taking their product from the drawing board to the customer. Now the Army will benefit from this by not stating or requiring a specific means of doing things.

Use of a common standard such as ISO 9000 will ease the Army's transition from one supplier to another. The use of the common standard does not mean that all producers operate in exactly the same way. But it does give some commonality to how they look at problems and how their company's systems work.

b. Concerns with the use of commercial standards for the acquisition of Army NDI.

The use of commercial standards for Army NDI acquisitions such as the M915 series truck has raised several concerns from various Army representatives.

One issue raised is that of change control, oversight, and notification. If the producer of a product makes a small change during the production run, the Army is concerned about how the change (or a series of small changes) may impact the Army's ability to stock the correct replacement parts. As changes take place, replacement parts for the earlier version may not fit the later version. Maintenance procedures for the earlier and later versions may be different. How does the Army gain knowledge of this? The Army would prefer that all the products it buys in a production run be exactly the same. Then there are no additional concerns on the support and maintenance of the product.

Imagine if half of the Army's M-16 rifles required a different size magazine to hold the ammunition [Ref 5].

The other major issue raised by numerous Army representatives is that of suitability and capability. Do products manufactured to commercial standards have the toughness to perform in the extremely demanding environment of a military mission? Each military mission, whether peacekeeping, humanitarian aid, or combat, places demands upon military equipment that exceed anything a product designed for the commercial-civilian market is expected to endure [Ref 25, Ref 24, Ref 23, Ref 34].

c. Summary.

The use of commercial standards for Army NDI acquisitions such as the M915 series truck makes sense. Costs may be reduced by not stating or requiring specific ways for the item to be produced. The time from signing the contract for the item to fielding the units should be reduced by the minimal impact upon the contractor's standard production processes. The use of commercial standards for Army acquisitions other than NDI, most notably combat systems, is of some level of concern, but is not the issue here [Ref 25, Ref 23, Ref 34, Ref 31].

The use of commercial standards for Army NDI acquisitions should allow producers to maximize their operations. Their hands will no longer be tied by Government standards affecting production methods. The producer will be able to use one method of producing its product, which will hopefully provide some cost savings to the Government buyer. Widespread use of future commercial standards like the ISO 9000 will benefit the Government. The producer's entire operation, not just the production floor, will be forced to become more efficient, cost-effective, and geared toward continuous improvement of quality.

B. RECOMMENDATIONS.

1. Move toward mandating ISO 9000 standards.

The Army should strongly encourage producers to achieve ISO 9000 registration. A possible method for this would be through the use of ISO 9000 registration as one of several evaluation criteria during the source selection process for negotiated contracts. For sealed bid contracts, ISO 9000 registration may be listed as a requirement. Because of the large number of companies in the United States that have achieved ISO 9000 registration, this contractual requirement should not limit competition. Currently, TACOM offers many contractors the choice between complying with MIL-STDs, such as MIL-Q-9858A, or complying with ISO 9000. Producers are used to the idea of ISO 9000 registration.

a. Why ISO 9000?

While the ISO 9000 is not a "silver bullet" for all the Army's quality problems with NDI, it is a great step forward. The ISO 9000 moves a company into the realm of company-wide quality practices and continuous improvement. These can only benefit the Army.

Oversight functions should become easier, as more producers of Army goods and services move to a common standard for quality in their organizations. When oversight personnel move from company to company, there will be the underlying foundation of the ISO 9000 family of standards. Reduced Army contract dollars means that the Army has reduced impact in the market. Producers are less likely to modify their operations to meet Government oversight requirements. They are just as likely to stop working on Government contracts.

As an internationally recognized quality standard, ISO 9000 gives United States companies the capability of competing more effectively in international markets. This will contribute to the financial health of a company. The financial health of a

company is important to the Army, because we want to be able to continue acquiring spare parts for existing systems.

b. Army NDI.

Army NDI acquisitions, by definition, are products or services governed by commercial standards. The use of the ISO 9000 family of standards provides a guarantee of a level of quality. It also provides a new means to handle providers of goods or services that don't meet their established quality guideline. Further, it provides a framework for each company to work on continuous improvement of its systems and product, which can only benefit the customer (the Army).

c. Other Army acquisitions.

The ISO 9000 is a family of standards that is applicable to all the contractors the Army does business with, whether they provide goods, services, or both. It has proven its worth in many different industries, and has almost always reduced the producer's operating cost. Reduced cost to the producer should mean reduced cost to the customer (the Army).

2. Carefully scrub lists of military standards for Army acquisitions.

The biggest concern in substituting commercial standards for MIL-STDs is subject knowledge. While many MIL-STDs have commercial equivalents, there are also many that don't. The people that look for NDI to fulfill Army needs must understand two critical pieces of information. First, what exactly does the user want? The requirement must be clear. Second, what exactly is the commercial product designed to do? What are the tolerances required by the user and what are the tolerances built into the commercial product? These factors must be understood for the acquisition to meet the user's requirement.

a. Not all military standards are necessary.

There were many MIL-STDs written into contracts over the past years that were not necessary. These MIL-STDs may even decrease the capability of the end product, or increase the cost to the Army, for no added value. These MIL-STDs may mandate a particular means of performing a process or require that a specific process be included in the construction of the product. Many of these types of MIL-STDs have been overcome by technological improvements in various industries. The producer may often have an equal or better (or less expensive) means of accomplishing the desired result.

b. Some military standards are necessary.

The Army must be prepared to fight a war, provide humanitarian aid, or conduct peacekeeping operations on no notice anywhere in the world. This unique mission requires equipment that will function in many extreme environments. There are no commercial standards that will fulfill special military needs such as corrosion fighting lubricants that work in extreme cold. The requirement for equipment paint that aids chemical decontamination by not chemically combining or breaking down under the onslaught of chemicals and decontaminants is military unique.

Because the military must be capable of functioning in many extreme environments that are not covered by commercial standards, the need for some MIL-STDs will never go away completely.

A new contract must be carefully scrubbed for MIL-STDs that add no value. But equally, the new contract must be scrubbed to ensure that necessary MIL-STDs are included, and that waivers for their use are granted by the appropriate authority.

C. AREAS FOR FURTHER RESEARCH.

1. Implementation of the ISO 9000 family of standards in Department of Defense contracts.

How are the ISO 9000 family of standards implemented by the Department of Defense? Are they mandatory or voluntary? Is implementation the same in different departments (Army, Navy, Air Force)? Is ISO 9000 used only for certain types of contracts (manufacturing versus service)?

2. The effect of using the ISO 9000 family of standards on Government oversight.

Do Defense Contract Audit Agency (DCAA) personnel think that ISO 9000 registration of a company allows them to reduce oversight of Government contracts won by that company? Do program office personnel have any thoughts on ISO 9000 and its ability to take the place of some level of oversight on a program at a defense contractor's plant? How do defense contractors think ISO 9000 registration and Government oversight are related/redundant?

3. Skipping production testing and moving the equipment directly to the user.

In what type of program does the program office think that skipping production testing is a valid decision? What factors contribute to the decision?

4. Government contract oversight before the drawdown compared to now.

What is the difference in the number of Government oversight personnel for a major program? Since 1989 the number and dollar value of defense contracts has decreased substantially. Has the number of Government oversight personnel decreased by the same percentage? Is the level of oversight directly related to the dollar value of the

contract? Is more oversight than before 1989 needed? Is less oversight than we have now needed?

5. Compare the use of ISO 9000 by major defense contractors, in fields with competition and in areas with just one or two producers.

Are defense contractors that have no customers other than the Department of Defense reacting to commercial standards such as the ISO 9000 differently from defense contractors that also have a large commercial business? If so, why might they do this? Is this good or bad for the Department of Defense?

APPENDIX

This appendix contains the acronyms used in this paper.

AAC	Army Acquisition Corps
AMC	Army Material Command
ANSI	American National Standards Institute
ASQC	American Society for Quality Control
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CID	Commercial Item Description
COTS	Commercial Off The Shelf
DLSIE	Defense Logistics Studies Information Exchange
DOD	Department of Defense
DTIC	Defense Technical Information Center
EN	European Norm
FAR	Federal Acquisition Regulation
FMVSS	Federal Motor Vehicle Safety Standard
FY	Fiscal Year
GAO	General Accounting Office
IBM	International Business Machines
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
LSA	Logistics Support Analysis
LSAR	Logistics Support Analysis Record

MTMCTEA	Military Traffic Management Command Transportation Engineering Agency
MIL-STD	Military standard
MS-DOS	Micro Soft Disk Operating System
NDI	Non Developmental Item.
STANAGS	Standardization Agreements
TACOM	Tank Automotive and Armaments Command
TARDEC	Tank Automotive Research, Development and Engineering Center
TDP	Technical Data Package
TQM	Total Quality Management

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