

# **PART I**

# **OVERVIEW**

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## 1.0 INTRODUCTION

### 1.1 Background

*"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."*

With these words, Dr. William Perry, Secretary of Defense, began his 29 June 1994 memorandum calling for "A New Way of Doing Business" to overhaul the Department of Defense's (DoD) acquisition process. The memorandum resulted from a realization that the DoD can no longer afford to operate under the old acquisition system. Dr. Perry's memorandum directs the DoD to increase the use of "best commercial practices" and products. The move to commercial products and practices is part of a DoD strategy to promote the expansion of a national industrial base which is capable of meeting DoD needs, while competing effectively in the world marketplace.

The need for reform of the DoD acquisition system is attributed to several factors. DoD budget cuts over the past decade have reduced the DoD's market influence and subsequently caused a decrease in the number of vendors dedicated to the military market. Program managers have not always tailored military specifications and standards (MILSPECs) for each contract. This lack of tailoring resulted in non value-added requirements being placed on contractors, often requiring military-dedicated manufacturing lines, unnecessarily increasing DoD system costs, and discouraging many commercial companies from bidding on military contracts. Finally, technological advances in the commercial sector are often outpacing the Government-sponsored research. Since these technologies are available to the world marketplace, the military advantage will go to nations that are able to most rapidly incorporate these commercial technologies into military systems.

The increased emphasis on commercial products and processes in military system acquisitions set forth by Dr. Perry was reinforced by the revisions to DoD Directive 5000.1 and DoD Regulation 5000.2-R. These documents require program managers to minimize the use of existing military specifications and standards (MILSPECs) and incorporate, to the maximum extent practicable, commercial items and practices. Original Equipment Manufacturers (OEMs) also are encouraged to select commercial items for military systems.

The culture change of moving away from MILSPECs has raised many questions in the acquisition community, both from the System Program Offices (SPO) and the OEMs. These questions center around determining what constitutes commercial practices, sometimes referred to as "best commercial practices", and how well suited are commercial items for harsh military environments. To assist the SPO program manager and OEMs in facing the challenge of assessing best commercial parts and practices, this text provides guidance on selecting quality vendors by evaluating their processes for product design, manufacturing, and testing.

### 1.2 Objective

This reference book for SPOs and OEMs is intended to assist program managers and engineers in determining quality vendors by evaluating their commercial processes and products. The successful application of commercial parts to military systems requires an

understanding of the importance of concurrent engineering, critical part selection, design and fabrication activities, and electronic device reliability screens and qualification testing. Practices of world-class suppliers are presented which are used for planning and implementing the most efficient, reliable and cost effective processes for the design, manufacture and test of both hardware and software. These practices include:

- Integrated product development (concurrent engineering)
- Realistic and cost effective reliability and quality requirements
- Understanding of supplier's part capabilities and manufacturing practices
- Thorough program proposal evaluation and technical reviews

The topics presented in this text should not be interpreted as program requirements. The material is intended to assist SPO managers and OEMs in identifying world-class commercial parts and processes, meeting the military performance requirements, and identifying problem areas based on lessons learned.

### 1.3 Best Commercial Practices

"Best commercial practices" can best be described as all activities which are driven by the move within industry toward continuous improvement with the ultimate goal of achieving high degrees of quality, reliability, cost effectiveness, and customer satisfaction. Commitment to this continuous improvement philosophy must be fostered and implemented from initial design of a product through the end of its useful life. It should be recognized that each company will implement these practices differently. Therefore, each company must be assessed in order to determine if their practices are best suited for meeting the customer's requirements.

The commercial practices listed in DoD Regulation 5000.2-R, which the DoD acquisition community is to emulate, include use of past performance data as part of market research and the application of concurrent engineering principles to problem solving by forming Integrated Product Teams (IPTs).

Part II provides a discussion of concurrent engineering which is a cornerstone to the new IPT approach for risk management. The principles of best commercial practices (BCP) and several BCPs of world-class suppliers are presented to assist in conducting market analysis. Part II also includes an overview of the activities which should be considered for acquiring reliable products.

### 1.4 Commercial Product

Commercial items are defined in DoD Regulation 5000.2 as "Items regularly used in the course of normal business operations for other than Government purposes which: (a) have been sold or licensed to the general public; (b) have not been sold or licensed, but have been offered for sale or license to the general public; (c) are not yet available in the commercial marketplace, but will be available for commercial delivery in a reasonable period of time; or (d) are described in (a) through (c) above, that would require only minor modification in order to meet the requirements of the procuring agency (**DFARS, Part 211**)."

The discussion of commercial parts in this text focuses primarily on the integration of plastic encapsulated microcircuits (PEMs) into military systems. This is in response to the uncertainty that currently exists both on the part of the DoD SPOs and OEMs in giving first preference to PEMs. These devices have almost exclusively been designed for and supplied to the commercial market, whereas military systems have predominantly utilized hermetic devices.

Part III presents the risks that must be managed during component procurement, acceptance, design, application and assembly. One of the most critical activities in assuring system reliability is a sound parts management program. The risks associated with a parts management program are provided based on lessons learned in acquiring reliable electronic components for military systems. Many of the concerns at the component level also apply to higher levels of integration.

Part IV provides an overview of the analysis and test tools that can be used to evaluate parts/vendors, and includes a comparison of the strengths and weaknesses of both PEM and hermetic devices.

Appendix A highlights the concerns which arise when parts are assembled into higher levels of integration, covering topics in hardware reliability.

Finally, Appendix B provides several case studies which deal with the topic of incorporating PEMs into military systems.