

Using Commercial Suppliers — Barriers and Opportunities

DoD Customers and Suppliers Can Benefit From Basic Market Research

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Reducing acquisition costs by using commercial instead of military-unique practices and technologies is an increasing goal of government. A pilot project presently leveraging the commercial electronics manufacturing base is the Military Products From Commercial Lines (MPCL) program, a four-year project designed to demonstrate that high technology military hardware can be built on a highly automated commercial production line, with equivalent durability, functionality, and reliability, and at a significantly reduced price.

Sponsored by the Air Force Research Laboratory's Manufacturing Technology Division, TRW Avionics Systems Division was the prime contractor of the MPCL program, supported by the TRW Automotive Electronics Group — North America.

The initial phases of the MPCL program involved producing military products from commercial lines and then conducting two surveys of commercial industry to identify commercial manufacturers' receptivity to producing military products on their production lines.

Integrated teams of military and commercial professionals developed with commercial suppliers a partnering methodology that encompassed processing technology enhancements, im-



The partnerships necessary for the future success of commercial item acquisitions by DoD customers depend on both parties understanding the new rules of the game.

proving manufacturing infrastructure flexibility, and streamlining business practices. Following the initial phases of the pilot program, the program team conducted market research on the transferability of the military products from the commercial lines concept to the commercial sector. This article reflects the results of that research.

Production Project Yields Significant Savings

In the initial production test phase, avionics modules for the Air Force's F-22 Raptor Fighter Aircraft and the Army's RAH-66 Comanche Helicopter were redesigned using largely commercial off-the-shelf parts (Figure 1). A computer integrated manufacturing (CIM) system implemented at the TRW Automotive Electronics Group's Marshall, Ill., plant ensured minimal line interruption for the set-up and change-over between military and commercial products.

The team implemented a rigorous component reliability program, conducting "design-of-experiment" testing to prove that the redesigned hardware was as durable and reliable as the baseline military hardware. Most important, given the government's military Acquisition Reform processes, the MPCL team established a process for acquiring military-unique modules as commercial items, relying on price analysis instead of cost analysis.

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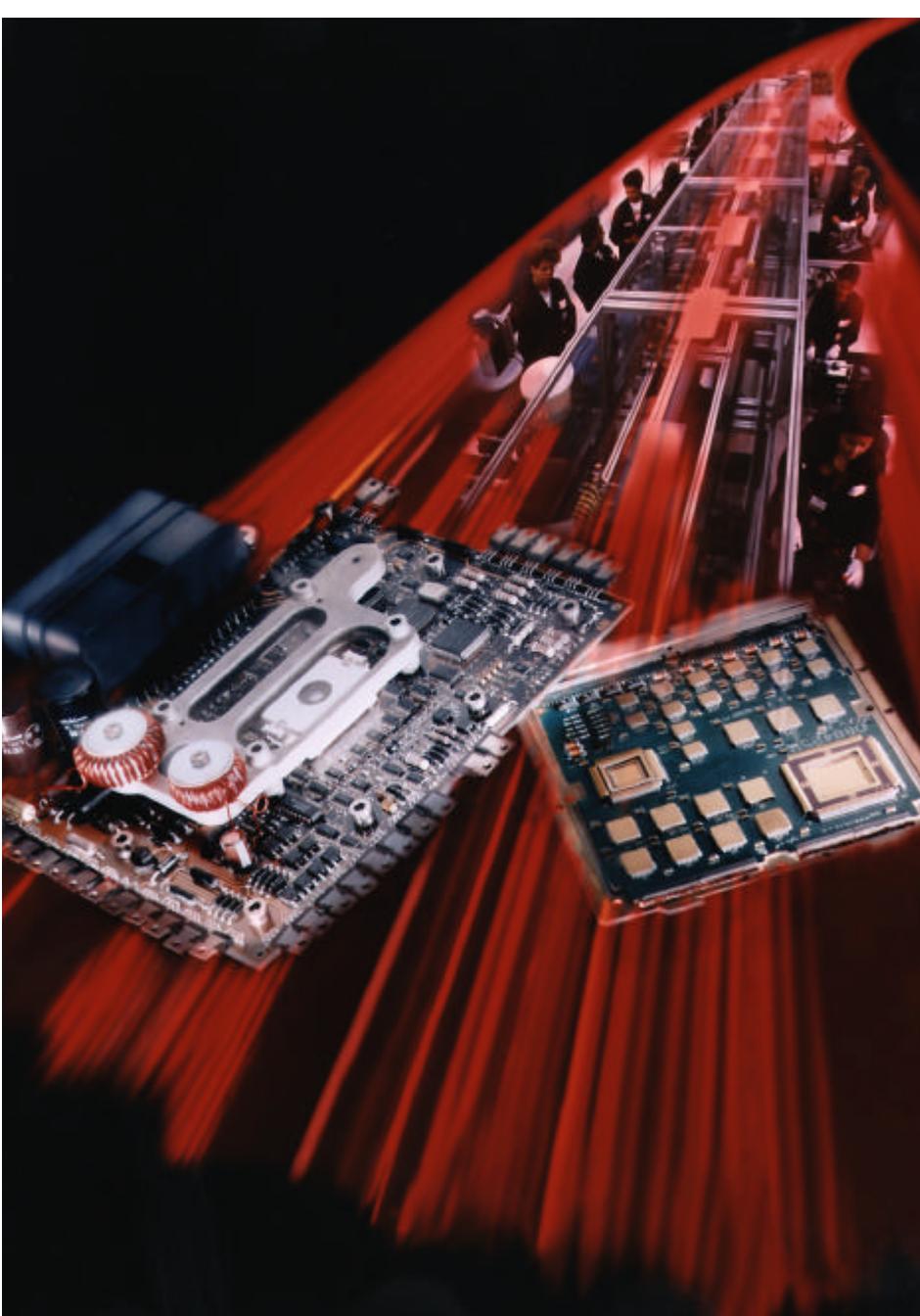


FIGURE 1. Key Features and Benefits of MPCL Concept

FEATURES

- Exploit Proven Quality and Cycle Time on High-Volume Commercial Lines
- Design for Manufacturability AND Commercial Practices
- Maximize Adoption of Best Practices via Team-Based Approach

BENEFITS

- 30-50% Cost Savings for F-22 and RAH-66 Electronic Modules
- Demonstrated Manufacture of Military Modules Using Commercial Processes and Practices
- Process and Model for Subcontracting to Commercial Suppliers

The Air Force and Army program beneficiaries realized a greater than 50 percent cost avoidance over the baseline military hardware versions. Additionally, the technology enabling the commercial redesign of additional F-22 modules resulted in recurring cost reductions.

Facilitating the MPCL success in implementing the commercial contract was a model contract similar to contracts used in TRW's commercial automotive business, and a performance-based business practices handbook that replaced canceled military standards. Integrated teams of personnel from both the military and the commercial sector developed the handbook. The teaming approach helped to ensure that the practices outlined in the handbook were both acceptable to TRW's commercial automotive group and satisfied the military's requirements. The handbook requirements, which could be tailored cafeteria-style to individual procurement, included the best practices from industry and government, and non-government standards, such as ISO-9001.

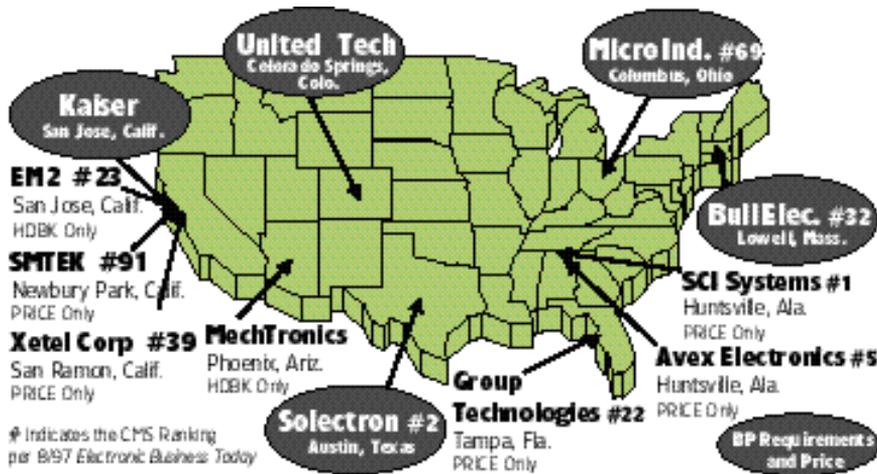
Going Beyond Demonstration to Transfer

Having demonstrated the benefits gained from producing military products from commercial lines, the program team turned its attention to the next MPCL strategy, transferring the technology to industry. The team recognized that additional commercial industry input to the handbook and model contract was necessary to achieve the transfer process.

To obtain the necessary input, the MPCL team conducted two surveys: an in-depth requirements validation survey of a small number of commercial electronic manufacturing service (EMS) firms, and a broad-based commercial impact survey of more than 1,340 EMS and printed wiring board (PWB) companies.

Business Practices Requirements Validation Survey. To validate the transferability of the military products from commercial lines, the team surveyed major EMS industry firms identified from industry trade journals and Internet searches. The survey was modeled

FIGURE 2. Requirements Validation Survey Participants



after a typical commercial transaction for EMS services. The MPCL team constructed a request for quotation package (RFQ) that included the business practices handbook requirements, the model contract terms and conditions, and a representative build and test quantity of MPCL modules.

The MPCL team provided each participant with a full technical data package. Each firm received the same material pricing data to avoid needlessly exercising component suppliers. In addition to pricing information, participants were asked for qualitative feedback on the producibility of the commercial redesign and the commercial acceptability of the handbook and model contract.

The five surveys involved a half-day business meeting to review supplier comments, and a brief plant tour. Participants were told that the purpose of the survey was only for research, and that the RFQ package would not result in a contract. Additionally, participants were offered compensation for their participation; however, each one participated voluntarily. Many firms related that the benchmark pricing data they were provided was well worth the time spent responding to the survey.

The companies surveyed represented a cross-section of the EMS industry, from very small (<\$30 million/year sales) to very large (>\$1 billion/year sales) firms (Figure 2). The firms identified in the ovals were the primary validation par-

ticipants who provided quantitative and qualitative feedback, and accommodated a site visit. The other firms either provided pricing information or handbook and model contract feedback.

The requirements validation survey results were important in that they suggested that many key aspects of the MPCL process were transferable to other commercial firms. Of all 76 requirements in the handbook, 53 (or 70 percent) were acceptable. Validation survey participants said that, while they would add cost, 17 requirements (or 22 percent) were acceptable. Participants considered only six requirements (8 percent) unacceptable.

The program team used the participants' comments in modifying the cost-adding and unacceptable requirements to make

the handbook commercially acceptable. The handbook revision was done with the consensus of the original team that developed the requirements and was reviewed by key survey participants.

What was noteworthy about the survey findings was the lack of consensus among the survey participants about the 17 cost-adding and six unacceptable requirements (Figure 3). One EMS firm not having a design capability considered Notification of Product Phase-out an unacceptable requirement. The firm stated that the designer should know more about the product life than the manufacturer. This firm, however, also indicated that it would perform this function for a customer with which it had a strategic alliance.

This position was common among many suppliers, which indicates that they are just as particular about their customer bases as many customers are about their supplier bases. This finding suggests that the Department of Defense (DoD) may want to revisit its role as a customer in the commercial sector.

The participant lacking a design function also expressed concern about the reliability program requirement, which applies only to firms that do some design work. Three suppliers surveyed were opposed to flowing down requirements to subcontractors, stating that this was not commercial practice. Three firms said Cost of Quality reporting was ob-

FIGURE 3. Handbook Requirements Validation Survey Results

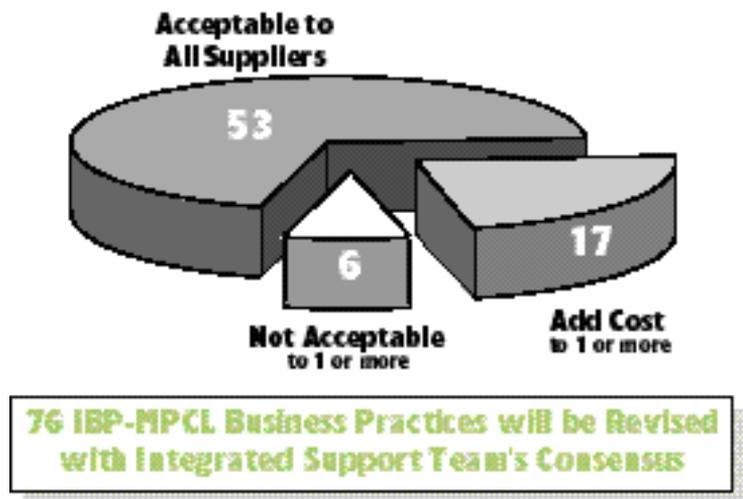
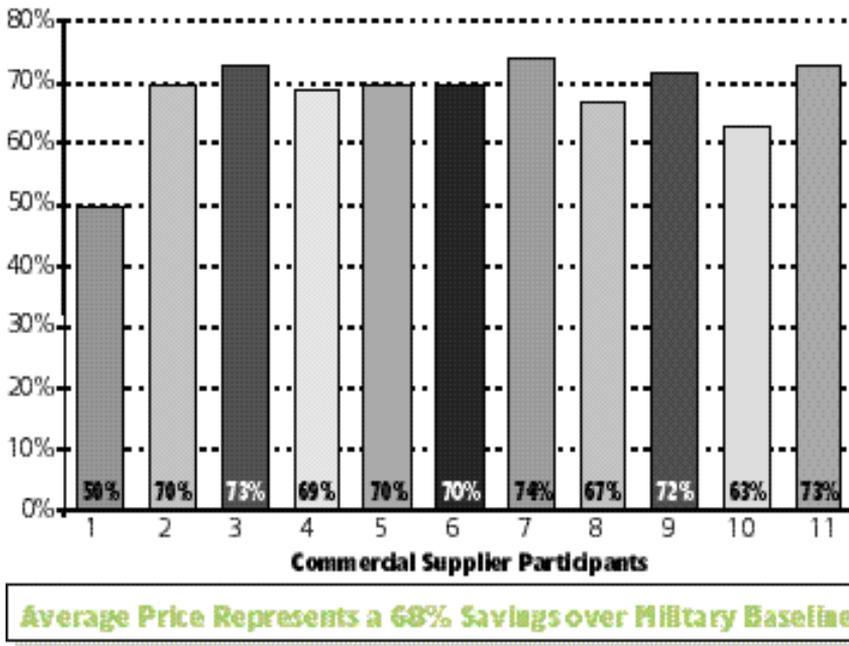


FIGURE 4. Requirements Validation Pricing Validates MPCL Savings Potential



solete, having been replaced by Statistical Process Control (SPC) and real-time process monitoring capabilities.

The Defense Priorities and Allocation System (DPAS) requirement resulted in the largest number of unacceptable responses from the survey participants. EMS firms do not want government involved in setting their priorities and scheduling their factories, which is required by DPAS.

Figure 3 also provides the cost-adding requirements identified by the EMS suppliers. It is important to note that these firms are positioned to accommodate unique customer requirements. Consequently, some would argue that they do not represent a good industry for testing the acceptability of replacements for military requirements.

The consensus feedback from the survey participants was that requirements accommodation occurs in all industries. It is dependent upon the level of customer commitment. That is, firms will do what you want if you commit to a long-term relationship. Many MPCL requirements were acceptable to the participants if they came from a strategic customer. However, for a one-time customer, these requirements were identi-

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fied as out of the norm, and therefore viewed as contributors to cost.

The MPCL team did not ask the survey participants to quantify the added cost for each requirement, recognizing that the requirements costs vary from customer to customer, depending on the nature of the supplier-customer relationship. Some firms might perform a requirement for some customers at no additional cost. Military customers with fiscal-year funding constraints could have difficulty dealing with commercial suppliers. Many commercial firms view the lack of multi-year funding associated with most military programs as a key barrier to commercial-military partnerships.

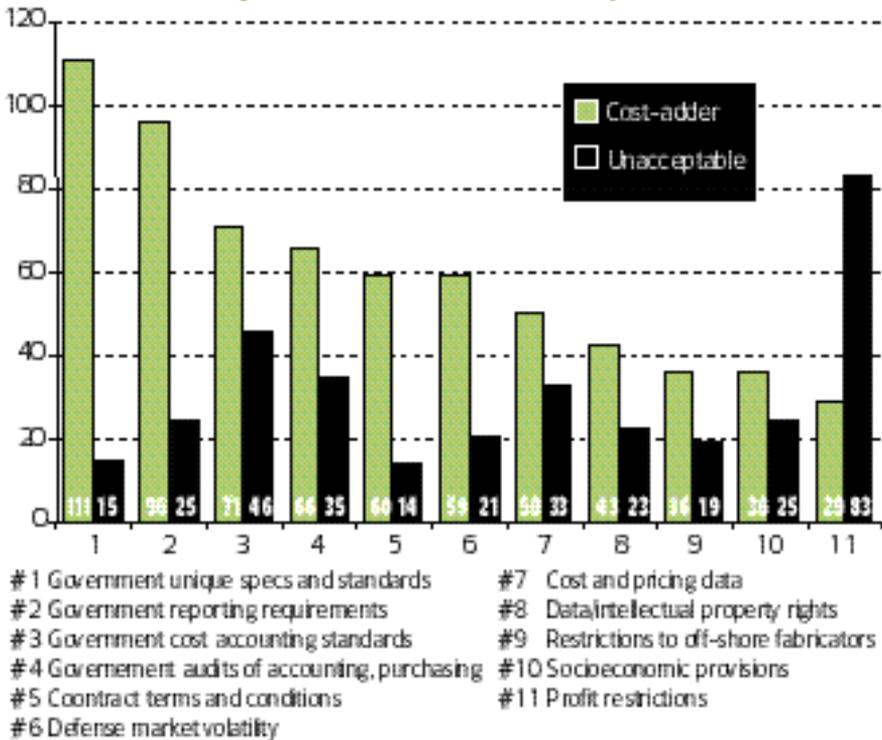
Of particular interest among the cost-adding requirements shown in Figure 3, are the following:

- Customer Verification at Production Verification with Physical Configuration Audit
- Customer Verification at Manufacturing Readiness Review with Functional Configuration Audit
- In-process Inspection Witnessed By Customer
- Final Acceptance Inspection Witnessed by Customer
- Each of these requirements involves the customer in the supplier's production process.

In general, the participants expect these, accommodate them, and only a small percentage of them charge customers extra for them. In other words, it is acceptable commercial practice to accommodate customer audits and inspections. The key distinction here is customer. The commercial world generally does not have the equivalent of the military's large customer structure. The type of audits and inspections are those done by the direct customer (not the Defense Contract Audit Agency, not the Defense Contract Management Command, and not prime contract representatives).

By and large, the fairly tight distribution of pricing that the validation survey respondents provided (Figure 4) indicated the real measure of the transfer-

FIGURE 5. Ranking of Contractual Barriers by Commercial Firms



ability and acceptability of the MPCL commercial redesign and streamlined business practices. The average price represents a 68-percent savings over the military baseline cost for the F-22 and RAH-66 versions of these modules. A less-than-20-percent standard deviation from average price attests both to the competitive nature of this market and the transferability of the MPCL commercialization approach.

The MPCL validation survey demonstrated that several commercial suppliers could build the redesigned military hardware at a competitive price. The team was initially concerned that the low volumes associated with military products might deter many firms. A few very large firms declined to participate because of the low volume associated with a military product. However, most firms considered the level of customer commitment in total, not merely one business opportunity.

Strategic alliances and partnerships are important in the EMS industry. The commercial sector's emphasis on partnerships runs counter to the standard government practice of funding programs on a fiscal-year basis. Commer-

cial firms prefer to deal with customers who can commit to a long-term relationship.

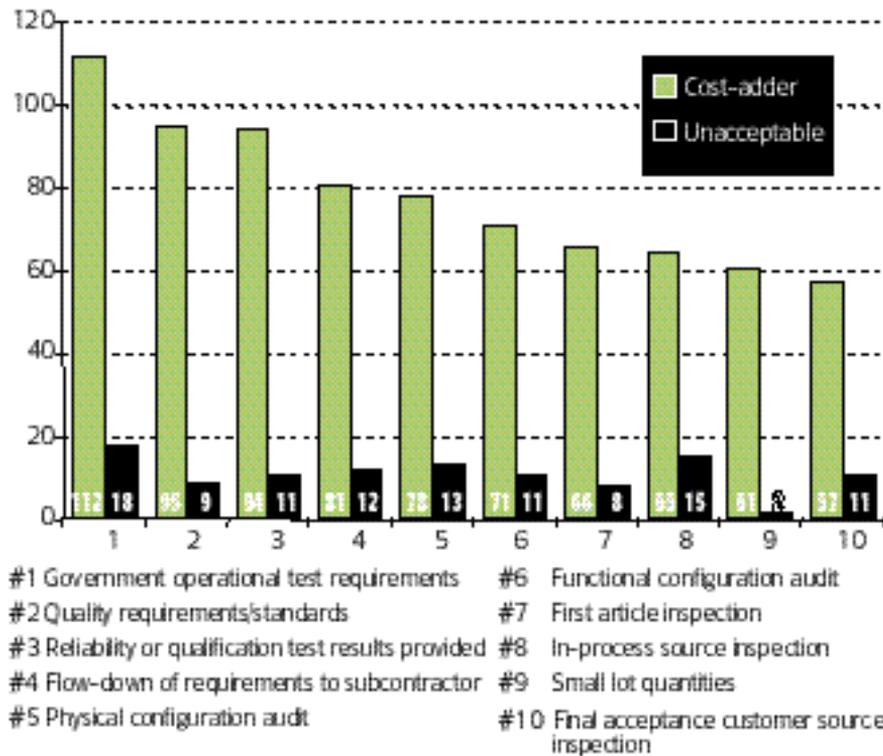
Interestingly, the general feedback was that the commercial model contract was too favorable to the customer and was largely unacceptable to the suppliers. It is important to note that the MPCL team used typical commercial automotive industry terms and conditions. This indicates that some business practices in commercial contracts are not universally acceptable. To ensure a win-win contractual approach, the MPCL team will revise these practices based on the feedback from the validation participants.

Market Research – Commercial Impact Survey. To get a better sense of the commercial electronics suppliers' understanding of the impact of recent Acquisition Reforms, and to gauge their willingness to bid on military business,

FIGURE 6. Requirements Survey Feedback – Unacceptable and Cost-Adding Requirements

Specific Requirements Determined Cost-adding by Survey Participants	
Requirements Description	No. of Firms
Operational Requirements Matrix	1
Program Control Plan	1
Customer Verification @ Manufacturing Readiness	
Review w/Functional Configuration Audit	1
Customer Verification @ Production Verification	
w/Physical Configuration Audit	2
Parts Control Program	1
Configuration Status Record	1
As-Built Configuration Report	1
Functional Configuration Audit	1
In-process Inspection Witnessed by Customer	1
Final Acceptance Inspection Witnessed by Customer	1
Control of Non-Conforming Product	1
Customer-Owned Property (Tracking/Reporting)	1
Bar Code Symbology	1
Reporting of Manufacturing Process Controls	2
Control of Process Parameters & Key Characteristics	1
Reliability Program	2
Product Failure Reports	1
Specific Requirements Determined to be Unacceptable by Participants	
Requirements Description	No. of Firms
Notification of Product Phaseout or Process Change	1
Subcontractor Flowdown of Configuration Management	3
Cost of Quality Demonstration or Reporting	3
DPAS Ratings on Purchase Orders	4
Customer Property Recording & Reporting	1
Reliability Program	1

FIGURE 7. Ranking of Technical Barriers by Commercial Firms



the MPCL team conducted a broad-based survey of both the EMS and PWB industries. This research covered issues not addressed in earlier surveys focusing on commercialization barriers, such as the Coopers & Lybrand/TASC study that highlighted areas in which additional Acquisition Reforms may be necessary.

Participating in the survey with TRW were the Institute for Interconnecting and Packaging Electronic Circuits (IPC) and the Massachusetts Institute of Technology (MIT). IPC Director of Market Research, Kimberly Sterling provided access to the member and non-member mailing lists for both the EMS and PWB industries. The MIT Lean Aircraft Initiative (LAI) representative on the team, Dr. Eric Rebentisch, tabulated and analyzed the results of all the completed surveys. Dr. Michael Heberling, formerly a researcher for Anteon Corporation, assisted TRW's Ron McDonald and Mike Nanzer and the other team members with the survey questionnaire content. The survey received an 11-percent (153/1,340) response rate, a good percentage for a cold-survey, according to IPC, which frequently surveys its membership firms.

Prior IPC surveys show that the EMS industry in the United States (a \$14 billion industry in 1996) earned only 2 percent of its CY 1996 sales from government customers, which agrees with the authors' data. Because of data collection limitations, we can't conclude whether that number has changed appreciably in the time period since Congress enacted major Acquisition Reforms.

The survey also sought to establish answers to the following questions:

- Are commercial suppliers aware of the significant government Acquisition Reform changes? The Federal Acquisition Streamlining Act (FASA) and the Federal Acquisition Reform Act (FARA) hold great promise for increased sales to the government by commercial firms.
- If commercial suppliers are aware of reforms, are they even interested in doing government work?
- Do they see the military as a potential strategic customer?
- What are the barriers that prevent more commercial involvement in military programs?

The survey participants indicated that the word is not getting out on Acquisition Reform. While the majority (65 percent) have heard about military specifications and standards cancellation, only 10 percent were aware of the contractual changes (FASA and FARA) offering the best inducement for increased partnering between commercial suppliers and military customers.

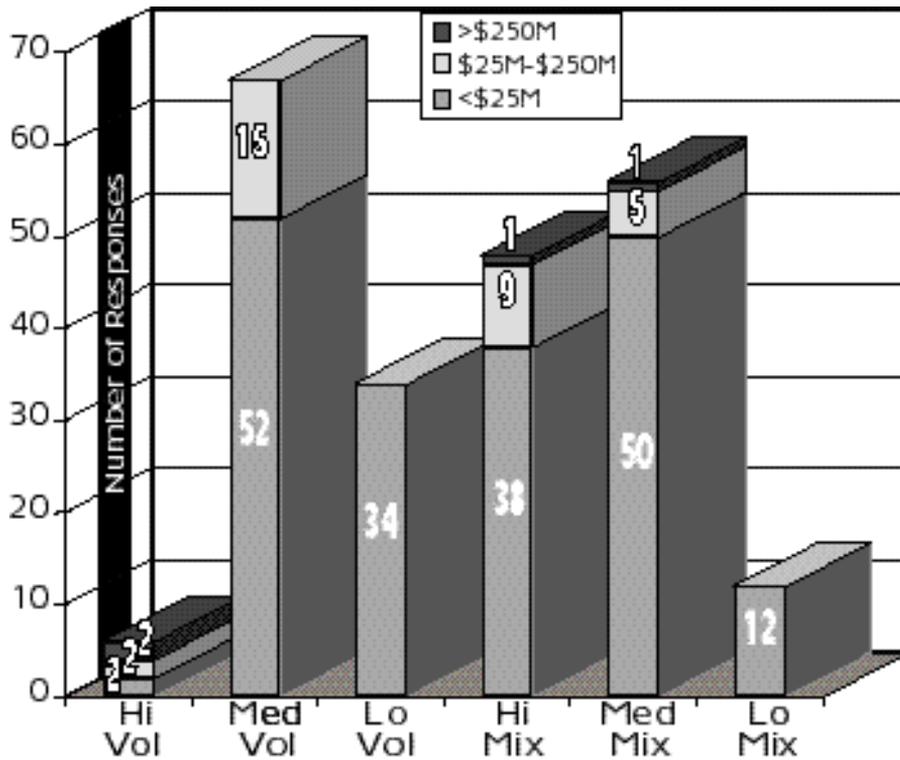
The survey also addressed contractual barriers (Figure 5) to commercial success, such as cost accounting standards (CAS), Truth in Negotiations Act (TINA), and unique reporting requirements. In contrast to other studies focusing on the defense contractors' view of barriers to using commercial suppliers, this survey addresses only commercial firms.

Figure 6 lists cost-adding or unacceptable barriers to commercial access by military customers. The responses indicate that commercial suppliers are adamantly opposed to any profitability restrictions imposed by government contracting regulations. Other practices that the commercial firms considered unacceptable include the imposition of government CAS and the requirement for cost and pricing data. These, of course, all represent significant deviations from general practice in the commercial marketplace.

The findings also indicate that many commercial suppliers still perceive as barriers government requirements, such as CAS and TINA, that have been eliminated by expansion of the commercial item definition. As a result of FASA and FARA, commercial item suppliers should no longer be holding up CAS and TINA as barriers on commercial item contracts.

This situation suggests an education problem exists. We could not determine from this survey whether the problem lies with the commercial supplier who is not seeking this information, or with the military customer who is not implementing the changes brought about by FASA and FARA. But clearly, these ground-breaking changes have not filtered down to the commercial suppliers, who would be among the primary beneficiaries.

FIGURE 8. Commercial EMS and PWB Firm Sales Volume/Mix Data



low-volume, high-mix products are more likely to consider DoD sales "vital" than do larger firms. This suggests, perhaps, that military products don't provide enough of a revenue stream for large, high-volume firms with large capital asset structures. While this may preclude the firms with the greatest scale economies from producing defense products, it does indicate clearly where DoD contract solicitation and education efforts should be directed.

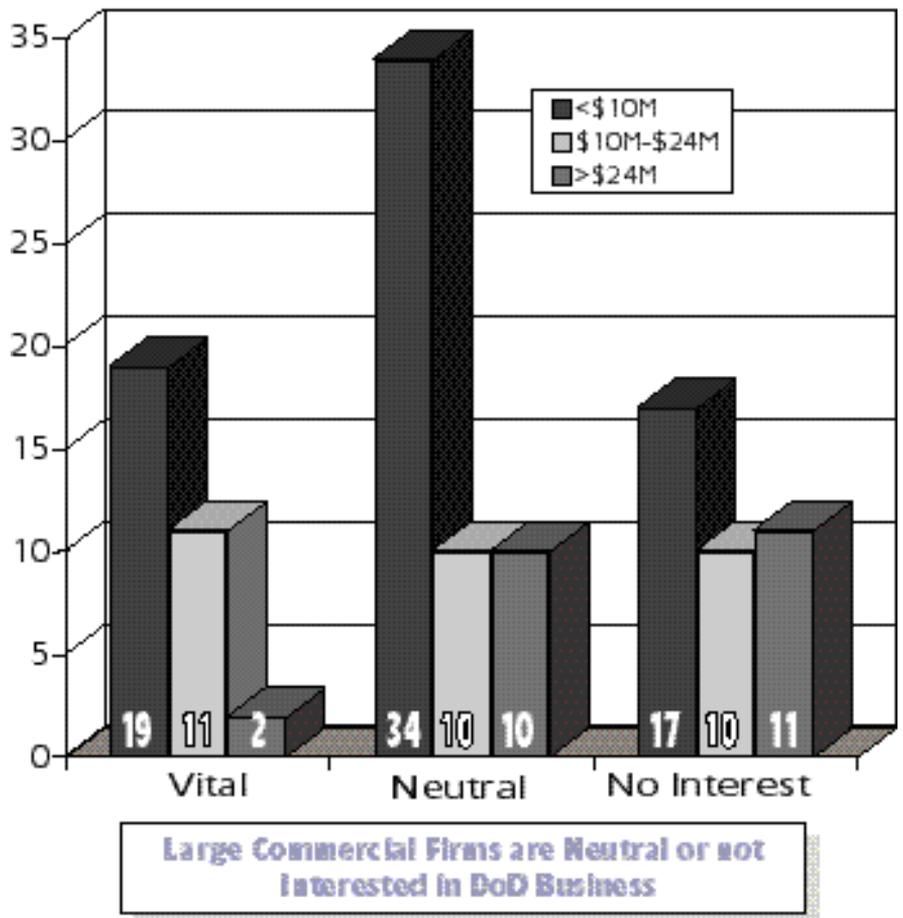
Additionally, the firms most likely to view DoD sales as vital produce a medium to high mix of products in low to medium volume. Given that most DoD customers have a high mix of low-volume products, this finding is important. So the good news is that a commercial market segment is interested or potentially interested in DoD work, and can bring the DoD many advantages in commercial items, specifically lower cost, quicker time to market, and higher quality lev-

The survey also asked participants to rank technical barriers, such as special test, quality and reliability requirements, to doing military contract work (Figure 7). Significantly, fewer suppliers consider these technical requirements unacceptable. Though this may seem like good news, it illustrates that commercial suppliers are now more willing to contract for unique customer (commercial or military) requirements, but at a price. The military customer will have to expect to pay higher prices for imposing any unique specifications, regulations or oversight.

This suggests that some of the beneficial cost reductions that the DoD had hoped to realize through using the commercial supplier base will not occur if the military customer doesn't fully embrace general commercial contracting and oversight practices. Those practices ranked most frequently as unacceptable by the survey respondents include special operational test requirements, in-process source inspection, and physical configuration audits.

The data in Figures 8 and 9 show that smaller firms, and firms specializing in

FIGURE 9. Interest in DoD Business by Firm Size



els. The bad news is that commercial suppliers do not realize that significant changes have taken place that now make doing business with the DoD far more attractive.

The data showed that the biggest EMS and PWB firms were generally not interested in DoD work; small firms showed the greater interest levels. Among the government's many streamlining measures, the area of small business preference was largely unchanged. So a good match would appear to be in place between military customers looking to "go commercial" and small commercial suppliers.

Three Key Findings & One Important Message

The MPCL team's experience with the requirements validation surveys of EMS firms highlights the importance of customer-supplier partnerships. Commercial suppliers are much more likely to cater to those customers who can provide long-term commitments. Military customers wishing to engage in such partnerships must find ways of overcoming fiscal year funding constraints of military programs.

Participating EMS firms in the validation surveys also found that the military-unique MPCL modules are producible. This indicates that the key to gaining access to the commercial supplier base is for military customers to use more commercial parts and practices. The resulting prices bid by the EMS participants validated the significant cost savings potential of the military products from commercial lines concept.

The broad-based survey results can be summarized with three key findings and one important message for military contractors.

First, military customers may be better served by smaller commercial firms because they seem willing to do military work and can offer increased flexibility along with the desired cost savings. They also offer the benefit of assisting the military customers' socioeconomic purchasing objectives.

Second, the commercial supplier base still perceives barriers in place to doing military work. They feel that many of the contractual barriers are unacceptable and therefore deal-breakers, while technical barriers primarily just add cost. Military buyers must recognize this problem of perception as they increasingly attempt to access the commercial market.

Finally, the survey results clearly show that both DoD customers and suppliers can benefit from basic market research. A mixed message on knowledge of Acquisition Reform was evident from the survey results. Apparently the word is out on knowledge of the cancellation of large numbers of military specifications and standards, due largely, we think, to the press coverage for former Defense Secretary Perry's initiative in 1994. How-

ever, the streamlining measures that stand to offer commercial suppliers the greatest access to military work (FASA and FARA) are largely unknown to these suppliers.

Is the military buyer at fault for failing to educate the supplier base, failing to implement such FASA and FARA measures, and so forth? Or, are suppliers at fault for failing to learn more about their changing customer environment? A key lesson to be learned from this survey is that both DoD customers and suppliers can benefit from basic market research. The partnerships necessary for the future success of commercial item acquisitions by DoD customers depend on both parties understanding the new rules of the game.

BETTER LATE THAN NEVER...

WHEN CLASS 97-2 GRADUATED FROM THE ADVANCED PROGRAM MANAGEMENT COURSE, DEFENSE SYSTEMS MANAGEMENT COLLEGE (DSMC) IN MID-1997, THEY FOLLOWED THE TIME-HONORED TRADITION OF LEAVING BEHIND A MEMENTO OF THEIR CLASS. IT RECENTLY ARRIVED — ONE FULL YEAR LATER. THE BEAUTIFUL, PERMANENTLY MOUNTED SUNDIAL IS A WELCOME ADDITION TO THE COLLEGE'S LANDSCAPE AND NOW GRACES THE LAWN OF THE MAIN CAMPUS, FORT BELVOIR, VA.



RETURNING TO THE COLLEGE IN JUNE 1998 FOR THE PRESENTATION WERE SEVERAL GRADUATES OF APMC 97-2. PICTURED FROM LEFT: GEORGE MERCHANT, ASSOCIATE DIRECTOR, APMC; AIR FORCE MAJ. NANCY COMBS; JOHN ACTON, MARINE CORPS CIVILIAN; DR. MARY-JO HALL, PROFESSOR OF MANAGERIAL DEVELOPMENT, DSMC; ARMY MAJ. BOB HEATHCOCK; NAVY CAPT. SCOTT GRAVES; KATHY MILLS, NAVY CIVILIAN; ANDREW SCHUTT, ARMY CIVILIAN; AIR FORCE LT. COL. DAVE BACHMAN; NAVY CIVILIAN SUSAN LINN; ARMY LT. COL. MIKE BONHEIM; AIR FORCE MAJ. ANITA LATIN.