

Barriers and Opportunities with Using Commercial Suppliers

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Recent government initiatives have sought to significantly reduce acquisition costs by using more commercial, instead of military-unique, practices and technologies. One pilot program specifically designed to leverage the commercial electronics manufacturing base is the Military Products From Commercial Lines (MPCL) program. The mission of the MPCL program is 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. This article will discuss experiences to date in producing military products from commercial lines, as well as the results of two surveys of commercial industry (one in-depth, the other broad-based) to identify commercial manufacturers' receptivity to producing military products on their production lines.

The MPCL program is a 4-year Industrial Base Pilot sponsored by the Air Force Research Lab, Manufacturing Technology Division. TRW Avionics Systems Division is the prime contractor, supported by the TRW Automotive Electronics Group - North America. The MPCL team has developed a methodology for partnering with commercial suppliers that encompasses process technology enhancements, improved manufacturing infrastructure flexibility, and streamlined business practices. The pilot program is approximately 80% complete, and the program team has added to its knowledge base through recently completed market research that attempted to test the transferability of the military products from commercial lines concept to the commercial sector.

As shown in Figure 1, under the MPCL program, avionics modules for the Air Force's F-22 Raptor Fighter Aircraft and the Army's RAH-66 Comanche Helicopter have been redesigned using largely commercial-off-the-shelf parts. A computer integrated manufacturing (CIM) system has been implemented at the TRW Automotive Electronics Group's Marshall, IL. plant to ensure that there is minimal line interruption due to set-up and changeover between military and commercial products. A rigorous component reliability program has been implemented and "design-of-experiment" testing programs have been conducted to prove that the redesigned hardware will be as durable and reliable as the baseline military hardware. Most important, in light of the government's attempts to reform military acquisition processes, the MPCL team has established a process for acquiring the military-unique modules as commercial items, relying on price analysis instead of cost analysis. The Air Force and Army program beneficiaries have realized greater than 50% cost avoidance over the baseline military versions of this hardware. Additionally, the technology to enable the commercial redesign of additional F-22 modules has been transferred to enable additional recurring cost reductions.

Key facilitators for the MPCL success in implementing a commercial contract for military-unique modules have been the development of a business practices handbook and commercial model contract. The handbook is a performance-based replacement for canceled military standards that was developed using integrated teams of both military and commercial sectors. This teaming approach helped to ensure that practices outlined in the handbook are both acceptable to TRW's commercial automotive group, and also satisfy the military's requirements. The requirements in the handbook can be applied in a cafeteria style, tailored to the individual procurement. The requirements include industry best practices, government best practices, and non-government standards such as ISO-9001. The model contract is similar to contracts used in TRW's commercial automotive business.

Going Beyond Demonstration to Transfer - Market Research Surveys

Having demonstrated the benefits of military products from commercial lines, the program team turned its attention to transferring the technology to industry. A key part of the MPCL strategy is to transfer the benefits of military products from commercial lines by transitioning the processes used to acquire these

products. To do this, the team recognized that additional commercial industry input to the handbook and model contract was necessary. The team established two surveys to obtain this input; a requirements validation survey done with a small number of commercial electronic manufacturing service (EMS) firms, and a commercial impact survey of over 1,340 EMS and printed wiring board (PWB) companies.

Market Research - Business Practices Requirements Validation Survey

To validate the transferability of the military products from commercial lines concept, the team constructed a validation survey process that was modeled after a typical commercial transaction for EMS services. The team used internet searches and industry trade journals to identify the major EMS industry firms. The MPCL team constructed a request for quotation package (RFQ) which included the business practices handbook requirements, the model contract terms and conditions, and a representative build and test quantity of IBP modules. A full technical data package was provided to each participant, although the team provided the same material pricing data to each firm to avoid needlessly exercising component suppliers. In addition to asking for pricing information, participants were also asked for qualitative feedback on the producibility of the commercial redesign and the commercial acceptability of the handbook and model contract.

To date, all five of the planned surveys have been completed, which involve a half-day business meeting to review supplier comments, and a brief plant tour. Participants were told that the purpose was research only, and the RFQ package would not result in a contract. Additionally, participants were offered compensation for their participation, however, each one participated voluntarily. Many of the firms related that the benchmark pricing data that was provided to the participants was well worth their time in putting together survey responses.

A cross-section of the EMS industry was included in the survey; from very small (<\$30M / year sales) to very large (>\$1B / year sales) firms. The firms identified as ovals in Figure 2 are the primary validation participants who provided quantitative and qualitative feedback, and accommodated a site visit. The other firms represented on the map either provided pricing information, or handbook and model contract feedback.

The results from the requirements validation survey were important in that they suggest that many of the key aspects of the MPCL process are transferable to other commercial firms. Figure 3 shows how the participants rated the acceptability of the MPCL requirements handbook. Of the total 76 requirements in the handbook, 53 (or 70%) were acceptable. Seventeen requirements (or 22%), while acceptable, would add cost. Only 6 requirements (8%) were considered unacceptable to the validation participants. Comments from the participants will be used to help modify those requirements that add cost or were unacceptable to make them commercially acceptable in a future revision to the handbook. This will be done with the consensus of the original team that developed the requirements. It will also be reviewed by key validation survey participants.

The 17 cost adding and six unacceptable requirements are shown in Table 1. Note the lack of consensus among the participants on these requirements. Notification of Product Phaseout was a problem for one EMS firm, due mainly to the fact that it does not have a design capability. Its position is that the designer should know more about the product life than the manufacturer. This firm did indicate that it would perform this function for a customer with whom it had a strategic alliance. This was a common theme for many suppliers. They are just as particular about their customer bases as many customers are about their supplier bases. This situation suggests that the DoD may want to revisit its role as a customer in the commercial sector.

Three suppliers were opposed to flowing down requirements to subcontractors. They did not view this as a commercial practice. Cost of Quality reporting was also a problem for three firms. The process is deemed to be obsolete by these firms, and has been replaced by Statistical Process Control (SPC) and real-time process monitoring capabilities. The Defense Priorities and Allocation System (DPAS) was the

requirement that garnered the most disapproval from the participants. EMS firms do not want government involvement in the prioritization and scheduling of their factories, as is required by DPAS. One firm also expressed concern regarding the reliability program requirement. This would obviously apply only to firms doing some design work; again, one of the participants has no design function.

Table 1 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. So, some would argue that they do not represent a good industry for testing the acceptability of a new set of replacements for military requirements. These concerns were discussed with each participant and the consensus feedback was that requirements accommodation occurs in all industries, dependent upon the level of customer commitment.. That is firms will do what you want, if you commit to a long-term relationship. Many of the MPCL requirements were acceptable to the participants if they came from a strategic customer. However, for a one-time customer, these requirements were identified as out of the norm, and therefore viewed as contributors to cost. The MPCL team did not endeavor to get participants to provide the level of cost added for each requirement. Universally, they agreed that this varies from customer to customer, again, depending on the nature of the relationship. Some of these may be done for some customers without additional cost. This suggests that military customers with fiscal-year funding constraints would have difficulty dealing with commercial suppliers from these industries. The lack of multi-year funding associated with most military programs is seen as a key barrier to commercial-military partnerships.

Of particular interest among the cost adding requirements are 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, and 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 were talking about here are those done by the direct customer (not DCAA, not DCMC, and not prime contract representatives).

The real measure of the transferability and acceptability of the MPCL commercial redesign, and streamlined business practices is measured by the pricing data received from participants. Figure 4 shows a fairly tight distribution of pricing submitted by the validation participants. The average price represents a 68% savings over the military baseline cost for the F-22 and RAH-66 versions of these modules. A standard deviation at less than 20% of the 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 would be a deterrent to many of these firms. There were a few very large firms who declined to participate because of the volume associated with a military product. However, most firms look at the level of customer commitment in total, not at just one individual business opportunity. Strategic alliances and partnerships are important in the EMS industry. This emphasis on partnerships in the commercial sector runs counter to the standard government practice of funding programs on a fiscal year basis. Commercial 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 there are also business practices in commercial contracts which are not universally acceptable. These practices will be revised based on the feedback of the validation participants to ensure a win-win contractual approach.

Market Research - Commercial Impact Survey

To get a better sense of the commercial electronics suppliers' general understanding of the impact of recent acquisition reforms, and to gauge their willingness to bid on military business, the MPCL team conducted a broad-based survey of both the EMS and PWB industries. This research was designed to cover issues not addressed in two previous Coopers & Lybrand surveys focusing on commercialization barriers, as well as highlight areas where 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 was Dr. Eric Rebentisch, who received all the completed surveys and tabulated and analyzed results. Anteon Corporation researcher Dr. Michael Heberling assisted TRW's Ron McDonald and Mike Nanzer and the other team members with the survey questionnaire content. The survey received an 11% (153/1340) response rate, which is good for a cold-survey like this, according to IPC, which frequently surveys its membership firms.

Prior IPC surveys show that the EMS industry (a \$14B US industry in 1996) earned only 2% of its CY 1996 sales from government customers. Our data agrees with that percentage. Because of data collection limitations, we can't conclude whether that number has changed appreciably in the time period since major acquisition reforms were enacted.

The survey also sought to establish:

- Are commercial suppliers aware of the significant changes made by the government in acquisition reform. 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. Are suppliers aware of this?
- And further, if they are aware, 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%) have heard about military specification and standard cancellation, only 10% were aware of the contractual changes (FASA and FARA) that would seem to offer the best inducement for increased partnering between commercial suppliers and military customers.

Contractual barriers to commercial access were also addressed by the survey. A number of other studies have focused on the defense contractors' view on barriers to using commercial suppliers (see for instance, the TASC/Cooper's and Lybrand report, "The DoD Regulatory Cost Premium: A Quantitative Assessment", December 1994). In contrast, this survey addresses only commercial firms. The bar chart in Figure 5 ranks such contractual practice barriers as cost accounting standards, truth in negotiations, and unique reporting requirements. The chart shows the ranking of barriers that either add cost if complied with, or are unacceptable barriers to commercial access by military customers. The most significant observation in Figure 5 is that commercial suppliers are adamantly opposed to any restrictions on their profitability imposed by government contracting regulations. Other practices considered unacceptable by many of these commercial firms include the imposition of government cost accounting standards 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 of the government's requirements eliminated by expansion of the commercial item definition (barriers such as CAS and TINA) are still perceived as barriers by commercial

suppliers. 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 there is an education problem. It can't be determined 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, the ground breaking changes that are in place due to FASA and FARA have not filtered down to the commercial suppliers who would seem to be among their primary beneficiaries.

The survey also asked the participants to rank technical barriers to doing military contract work (see Figure 6). Technical barriers include such items as special test, quality, and reliability requirements. One notes immediately that significantly fewer suppliers consider technical barriers to be unacceptable when compared with the contractual barriers shown in Figure 5. Though this may seem like good news, it still reinforces the idea that while commercial suppliers are willing to contract for commercial work, the military customer will have to expect to pay higher prices for any unique specifications, regulations, or oversight that it chooses to impose. This suggests that some of the beneficial cost reductions the DoD had hoped to realize through using the commercial supplier base will not occur if the military customer itself 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 7 and 8 show that smaller firms, and firms specializing in 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 see DoD sales as vital are producing products in low to medium volume, with a medium to high mix of products. This is important, in that most DoD customers have a high mix of low volume products. So the good news is that there is a segment of the commercial market that is interested or potentially interested in DoD work, and can bring the DoD many of the advantages it is looking for in commercial items - specifically lower cost, quicker time to market and higher quality levels. The bad news is that commercial suppliers do not realize that significant changes have taken place which now makes 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, while small firms showed the greater interest levels. It is important to note that among the many streamlining measures enacted by the US government, the area of small business preference was largely unchanged. So a good match would appear to be in place for military customers looking to "go commercial" and small commercial suppliers.

Conclusion

The MPCL team's experience with the requirements validation surveys conducted with EMS firms highlight 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 the fiscal year funding constraints of military programs. Participating EMS firms in the validation surveys also indicated that the military-unique MPCL modules are producible. This indicates that the use of commercial parts and practices by military customers is a key tool for gaining access to the commercial supplier base. 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's results can be summarized with three key findings and one important message for military contractors. First, smaller commercial firms may be a better fit with military customers. They are better because they appear willing to do military work and can offer increased flexibility along

with the cost savings desired by the military. 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. This is important for military buyers to recognize as they increasingly attempt to access the commercial market.

A final point to be made is that 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. However, 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 this the military buyer's fault (failure to educate the supplier base, failure to implement FASA and FARA including market research, commercial item preference, etc.)? Or is it a failure of the supplier to learn more about their changing customer environment? A key lesson 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.