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PRICING: A MAJOR HURDLE IN ACQUISITION REFORM

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The Department of Defense (DoD) is increasingly turning to commercial sector to meet its military requirements. The advantages in doing so include affordability, shorter lead-times and access to a larger industrial base. In addition, commercial firms are increasingly keepers of advanced technologies and capabilities. This is particularly true for the electronics, computers, software and communications industries.

Legislative changes directed at acquisition reform are making it easier to take advantage of the commercial sector. A major theme of the reform initiatives is to use commercial products at all tiers to the maximum extent possible in meeting military requirements. The DoD, in theory, will benefit from a very competitive domestic and international market. The underlying assumption is that market forces will ensure a fair and reasonable price. This theory holds so long as: 1. the quantities produced are large, 2. there is competition, and 3. the product is essentially “homogeneous” among various manufacturers. When the DoD requirements call for a commercial-like or military-unique product that deviates from any of these three conditions, the issue of determining a fair and reasonable price becomes a problem.

THE AIR FORCE MANTECH PILOT PROGRAM

The Air Force has an Industrial Base Pilot (IBP) called the “Military Products From Commercial Lines (MPCL)” administered by the Materials and Manufacturing Technology Directorate of the Air Force Research Laboratory. The MPCL program objective is to demonstrate the production of military components for the Air Force F-22 Raptor Fighter and the Army RAH-66 Comanche Helicopter on a commercial line at lower cost and comparable quality to those produced on a dedicated military line. The MPCL program is in a unique position to provide a preview of the commercial acquisition environment of the future. Consequently, another major objective of the program is to identify and document those policies, practices or conditions that hinder or complicate DoD access to the commercial sector.

The pilot team found pricing to be one of the most challenging issues facing the program. Although price analysis and market research are key to purchasing commercial items, the pilot team found that the government contracting community has yet to fully develop the necessary skills in these two areas. The MPCL pricing experience and lessons learned are provided here to assist other military programs as they also begin to increasingly access the commercial sector.

LEGISLATIVE CHANGES AND PRICING

The Federal Acquisition Streamlining Act (FASA), and the Federal Acquisition Reform Act (FARA) establish a preference for the acquisition of commercial items to the maximum extent possible at all levels (prime contractor and subcontractor). Procurement policy now more closely resembles the commercial market. The revised acquisition regulations require agencies to:

- (a) Conduct market research to determine whether commercial items or non-developmental items are available that could meet agency requirements;

- (b) Acquire commercial items or non-developmental items when they are available to meet the needs of the agency; and
- (c) Require prime contractors and subcontractors at all tiers to incorporate, to the maximum extent possible, commercial items or non-developmental items as components of items supplied to the government.

The expanded commercial item definition has helped to relax a number of the reporting, compliance and oversight requirements that previously inhibited commercial access. FAR 15.804-1 expressly prohibits obtaining cost or pricing data if the contracting officer determines that the prices agreed upon are for commercial items. This includes modifications to contracts or subcontracts for commercial items. This does not, however, absolve the contracting officer of the responsibility to ascertain that the item being purchased is at a fair and reasonable price.

Although restricted from requesting *cost or pricing data* for commercial items, FAR 15.804-5 allows the contracting officer to request information *other than cost or pricing data* to the extent necessary to support a price reasonableness or cost realism determination.

The FAR establishes an order of preference for sources of pricing information with an emphasis on the least intrusive forms. If the basis for the price is not adequate price competition, the contracting officer should initially seek information *other than cost or pricing data*. The first source of information would be from within the Government. Next, in order of preference, would be from any source other than the offeror. The last (and least preferred) choice would be from the offeror.

Since there is no requirement for *cost or pricing data* when procuring commercial items, the contracting officer should perform a price analysis. The goal is to determine the reasonableness of the price and the need, if any, for further negotiation. The contracting officer should seek enough information to adequately evaluate the reasonableness of the price.

The contracting officer, however, needs to be aware of the limitations relating to commercial items. First, limit requests for sales data for the same, or similar, items during a relevant time period. Second, the contracting officer should, to the maximum extent possible, limit requests to include only information that is in the form regularly maintained by the offeror.

PRICING GUIDELINES

When procuring commercial items, the contracting officer is responsible for selecting and using whatever price analysis techniques will ensure a fair and reasonable price. FAR 15.805-2 suggests using one or more of the following pricing techniques:

- Comparison of proposed prices received in response to the solicitation.
- Comparison of earlier proposed prices and contract prices with current proposed prices for the same or similar end items. [To provide a suitable basis for comparison, the contracting officer should consider differences in specifications, quantities ordered, time for delivery, Government-furnished materials, experienced trends of improvement in production efficiency, and when these acquisitions occurred. To be valid, the buyer should also establish the reasonableness of the earlier prices before making any comparison.]

- Application of rough yardsticks (such as dollars per pound or per horsepower, or other units) to highlight significant inconsistencies that warrant an additional pricing inquiry.
- Comparison with competitive published price lists, published market prices of commodities, similar indexes, and discount or rebate arrangements.
- Comparison of proposed prices with independent Government cost estimates.
- Comparison of proposed prices with prices for the same or similar items obtained through market research.

THE DEFENSE PRICING PROBLEM

FASA and FARA greatly expanded the definition of what constitutes a commercial item. This change ended the requirement for contractors to supply *cost or pricing data* if their products are designated as commercial. However, many inside and outside the acquisition community are having second thoughts over this particular reform initiative. This is especially true in light of the increasing number of procurement horror stories reminiscent of the '80s. The following headline appeared on the front page of the November 2, 1997 issue of *Defense News*: "Did 'Reform' Boost Costs?, Pentagon Official Fears Another \$700 Hammer Story." *Aerospace Daily* quotes Sen. Tom Harkin as saying "The Pentagon is allowing defense contractors to overcharge the U.S. Government by claiming that certain products are available in the commercial sector. Senator Harkin has asked Defense Secretary Cohen to work to change acquisition policy, particularly regarding what contractor products can be deemed "commercial."

This concern is misplaced. We have a pricing problem, not a definition problem. Simply stating that a product is "commercial" was never meant to imply that its price is "fair and reasonable." It is incumbent upon the contracting officer to verify that the "commercial price" is, in fact, fair and reasonable.

For several reasons, there is no turning back to the days when defense suppliers provided reams of *cost and pricing data* to support their offer. First, there are far fewer purely defense suppliers left to do business with today. Defense firms have gone out of the business, merged with other firms, or have become more-commercial-than-military in their orientation and product lines. The most significant reason, however, is that commercial firms are unwilling or unable to comply with DoD cost or pricing disclosure requirements. They view such information as proprietary and key to their competitive advantage. They do not want to provide the DoD with this kind of pricing data to accommodate what may be a *small*, one time-customer. Consequently, reinstating *the cost or pricing data* disclosure requirements of the Cold War era is, in reality, no longer an option.

In this new environment, price analysis will increasingly replace cost analysis as the primary tool for establishing a "fair and reasonable price." However, price analysis of military items made by commercial firms, or commercial items modified for military use, is very difficult. Unless these types of products have a long history (and a high volume) of U.S. and foreign military sales, it is unlikely that there will be sufficient pricing data with which to evaluate the reasonableness of the price.

There is rarely a catalog or market price with which to compare military items made by commercial firms or commercial items modified for military use. Even with a catalog, the price analysis can be complicated. For example, catalog prices in the aerospace industry frequently

represent not only the price of “one” item, but also servicing and transportation costs to support a rapid turnaround. The military services, however, will usually buy multiple spares for storage and provide their own logistical support. Consequently, it is possible for a commercial catalog price to actually be higher than the prices paid for that item before acquisition reform.

Defense buyers, in many respects, have a far greater price analysis challenge than do their commercial counterparts. As the pricing guidelines section above indicates, there are many pricing approaches to consider. The basis for most of these relies on some type of comparison (similar item catalogs, or market price). Consequently, the more divergent the military item is from an existing commercial one, the less applicable are these comparison pricing techniques.

If the military simply wanted commercial-off-the-shelf (COTS) items made by multiple suppliers in very large quantities, the pricing problem would be minimal. Unfortunately, this is rarely the case. The military tends to want *commercial-like* products (not COTS, but still commercial by the expanded definition) in small quantities with “extras” (testing, higher performance, longevity, etc.). The combination of these two factors, “small quantities” and “extras,” have the synergistic effect of magnifying the pricing problem for the defense buyer.

There are two other complicating issues to address: profit and the non-recurring costs. When a commercial company embarks on a new product line, many will initially price the product at a loss. They do this for several reasons. First, they want to enter and capture market share. The second reason involves non-recurring costs. These will be significant until the volumes produced are large. Consequently, the goal is to spread these expenses over many units to minimize the impact.

What happens when a customer (military or commercial) wants a unique or customized product in small quantities? Under this situation, the supplier will price the product very differently. First, they will price it so as to fully make their profit on just this order. They do not intend to lose money in the near term for a product that may have no future market. Second, they will apply all of the non-recurring costs to just this order. This will make these products very expensive relative to a similar commercial-off-the-shelf item. The comparison pricing techniques listed above are not readily adaptable under these circumstances, that is when the DoD requires small quantities and “extras.”

Higher Performance Requirements. The commercial approach is to design products for a narrower operating environment. The smaller the performance operating band, the lower the cost will be for that item. In contrast, military requirements cover greater operating environments. Unique military requirements exist because a particular component may need to work under greater extremes of temperature, humidity, or vibration than are necessary in the commercial environment. A system must be able to operate in Antarctica one day, in the deserts of the Middle East the next and in the humid jungles of central Africa on the following day. The more the requirements deviate from commercial versions, the more costly and less likely there will be a commercial-off-the-shelf solution. Commercial products (without modification) are frequently unsuitable for defense systems that have high performance requirements.

This situation suggests that the establishment of military requirements needs to go hand-in-hand with a thorough understanding of the capabilities and limitations of commercial products,

technologies, and manufacturing. There needs to be a three-way tradeoff in the requirements generation process between: performance, cost and commercial availability. As a side benefit, this process will also help to mitigate the pricing problem.

Buying in Small Lot Sizes. The Cold War defense market was geared to a high-performance, high cost, low-volume production environment. Today, when the DoD turns to the commercial sector, it finds a market that largely focuses on moderate performance, low cost, and high volume production. We are starting to enter a new era of lean and flexible manufacturing. This allows companies to economically manufacture products (military or commercial) in small lot sizes. Unfortunately, producing the items in small lot sizes is only half the problem. The other half is to be able to buy the parts *that go into the products* in small lot sizes. While commercial firms do produce in small lot sizes, they produce *many* small lot sizes. This equates to cumulative large volumes that minimizes the parts buying problem. However, in the case of military products, the total volume is small. Many commercial parts suppliers have minimum order size requirements that they impose on customers. If the order is under this amount, these firms will either not sell their products or they will charge a premium for the low quantity.

We should expect future defense requirements to remain small relative to the orders of other commercial customers. Therefore, it is imperative that the DoD take steps to make the manufacturing transition from commercial products to military products as seamless as possible. In addition to a design for manufacturing philosophy, pooling requirements across and within services whenever possible is another way DoD can take advantage of the capabilities of the commercial sector. Even though the F-22 and RAH-66 are very different systems with very different missions, commonality exists at the subsystem level. The MPCL program illustrates that by consolidating requirements, two services are able to economically leverage the commercial manufacturing process.

HOW DOES THE COMMERCIAL SECTOR HANDLE PRICING?

In the DoD there is a great deal of concern with pricing because it involves taxpayer money. However, stockholders and senior management in the private sector are just as concerned that their companies obtain fair and reasonable prices, perhaps more so. If a firm has poor procurement practices, the market is unforgiving. Overpriced products could lead to bankruptcy.

Commercial customers of one-of-a-kind products avoid unfair prices through negotiations and a thorough understanding of relative market values. Estimates of the value of a commercial product that does not yet have competitive pricing history are established using various price analysis methods. Part of the negotiation strategy is a willingness to forego certain purchases if the proposed price exceeds their estimated value.

Buyers in the private sector become very specialized in particular products and commodities. They use price analysis and market research extensively to verify price reasonableness. The commercial buyer's willingness to pay for a product is a function of not just price, but also of quality, customer service, performance and delivery. While the government sector is struggling with best value contracting, this is common practice within the private sector.

A commercial firm's end product must be competitive if it is to stay in business. Consequently, these firms will routinely assess their practices in an effort to minimize inefficiencies and remain competitive. All of the component parts must contribute to the final product's marketability. If a company finds that its end product is no longer competitive, it will take steps to reduce the product's price. There are six ways that the private sector establishes a price:

1. A request for quotes. This will help to establish a price if there is no other information available. Limit this approach to existing homogenous products made by multiple producers.
2. An established catalog or market price.
3. A customer works very closely with a supplier to design-to-cost or target price the required items. The customer and supplier firms jointly establish a more competitive price (target price) for an item. To accomplish this, they use value analysis. Together, they take steps to achieve the lower price. A long term buyer-supplier relationship facilitates this process. Commercial buyers seek out suppliers of high-quality, low-priced products and then stay with them as long as the relationship remains beneficial.
4. A customer goes to a supplier with the following requirement: To be competitive, the customer needs item "X" (quality and other factors included) at price "\$Y" or below. If the supplier cannot meet this not-to-exceed price, the customer goes on to the next supplier until finding one that can meet the requirement at the required price.
5. A customer goes to an industry leader who offers the required item at what amounts to a "take-it-or-leave-it" price. The market for leading edge commercial items is frequently dominated by monopolists. Commercial products, especially those that are state-of-the-art, will likely have features that products of competitors do not. Prices for leading edge commercial items are not likely to be supported by published catalog or market prices. This is especially true if the technology is changing rapidly as is the case in the electronics field. This is the situation that we would find in the monopoly environment. In this situation, the price may be neither fair nor reasonable. It is simply the "best price available." The buyer accepts this price because: 1. there is no alternative, and 2. its competitors face the same dilemma.
6. A buyer begins with an established market or catalog price and combines this information with any other available information to establish a foundation or base price. Using price analysis, the buyer then changes this base price up or down adjusting for technical differences (which we will assume can be priced or estimated).

Many of these commercial situations and approaches are similar to those found in the DoD. In the past the DoD was able to minimize its pricing problem by requiring cost or pricing data from its suppliers. This is, however, becoming less and less of an option. The commercial sector never did have this option. They have been forced to become very well versed in the use of market research and price analysis. With a few exceptions, the DoD has yet to establish this level of expertise. The MPCL pilot approach that follows is provided as one example to help facilitate the government learning process in market research and price analysis.

THE PILOT PRICING APPROACH

The pricing objective was to establish the price reasonableness of electronic modules built by TRW Automotive Electronics Group - North America (AEN) for TRW Avionics Systems Division (ASD) on the Industrial Base Pilot (IBP) program. The charter of the IBP program was to redesign two F-22 Communication, Navigation, and Identification (CNI) modules using

commercial parts and design practices. One of the modules selected, the Pulse Narrowband Preprocessor (PNP), performs sophisticated processing of incoming signals. It then passes these signals to downstream processing elements of the F-22 CNI system. The PNP operates at very high processing rates handling large amounts of incoming signal data. As such, this module functions in a manner very similar to commercially available signal processing units.

There were five major pricing approaches to consider:

- 1. Comparison with another competition for same item with similar terms and conditions**
This was a new acquisition. Consequently, there had not been a previous buy with which to compare.
- 2. Comparison with another competition for a similar item** -- The F-16 system was reviewed for similarities. In the F-16, the function of the PNP was accomplished by multiple systems. This arrangement precluded making a one-for-one price comparison.
- 3. Use of a pricing model** -- A number of popular pricing models were reviewed. They all required a significant amount of training to use. In addition, a great deal of engineering interpretation was required to enter data. As a result, there could be extensive price fluctuations. The pricing model that was used to establish the PNP price was not robust. Almost any price could be justified through a manipulation of the entry data assumptions. "What price would you like?"
- 4. Comparison with government estimate** -- The price offered by TRW AEN was already 50 percent lower than the military baseline price. The pricing exercise could have stopped right here. However, the pilot team wanted to establish a price analysis approach that would be transferable. Also, future acquisitions may not have the benefit of a government estimate with which to compare.
- 5. Comparison with a "similar" commercial item** -- This is the approach that was pursued. The narrative that follows chronicles this pricing methodology.

Market Research

Research into the commercial DSP market has shown that it operates similar to many high technology electronic markets. Product prices reflect not only the recurring costs to produce the item, but also the amortization of non-recurring research and development costs. This manifests itself in higher prices for new technology items upon initial product introduction and a downward price trend as new product innovations are brought to the market. It is, therefore felt that the 3% price difference can be attributed to these factors which differ from the environment most military products are developed in. In the military market, a supplier's non-recurring research and development costs are typically paid for separately by the customer. This leaves the recurring production cost of military items composed solely of the recurring costs to produce the item.

The commercial DSP market is highly competitive, with numerous firms supplying standard products. Prices in this market are stable with a slight downward trend, reflecting the growth in commercial application uses. The IBP modules, as demonstrated earlier, share many of the same drivers of price with this market. This was true in terms of functionality, labor content, and sales volume. This establishes the basis for determining that a significant portion of the IBP module price is fair and reasonable, given the similarities to a robust commercial market.

Similarities Between IBP and Commercial Modules

IBP modules for the F-22 CNI application are similar to commercial digital signal processing modules in many respects. The IBP modules rely on Texas Instruments digital signal processors (DSP) to take incoming analog signals and convert them to digital data that can be processed and stored for later use. This function is identical to the commercial use of DSP that also takes analog signals like video input signals and converts them to digital data which can be stored for later use. The IBP team selected one commercial DSP firm to base its price comparison on after conducting market research using the internet, electronics trade journals, and discussions with design engineers. This firm's product line features high performance signal processors used in a variety of applications such as:

- Digital Receiver Subsystems
- Medical, Photographic, IR, & CCD Imaging
- Radar, Sonar
- Telecommunications
- Test Instrumentation, Data Acquisition

Areas of Similarity

1. **Functionality** - Digital signal processing (DSP) is the ability to convert and process continuous analog signals into digital signals that can be understood by conventional data processing technology. This function, while considered a necessity for avionics applications, has found commercial application in areas such as telecommunications, test instrumentation, data acquisition, and medical imaging (photographic and infrared). The signal complexities and processing differ between the typical military or avionics application of DSP and DSPT's commercial applications. These differences drive the military users of DSP to the use of more complex circuitry and more expensive component parts. Primary among the higher cost parts are the ASIC components. These parts perform the unique signal processing requirements in the avionics application, and are more expensive because they are built to specifically address the avionics requirements. This reduces the volume demands for ASIC components while driving up the price.
2. **Packaging** - Commercial DSP modules from DSPT are packaged using a mixture of surface-mount (parts mounted on the surface of a printed wiring board) and through-hole (parts inserted through holes in a printed wiring board) technology. The IBP modules rely solely on surface-mount technology which is more expensive in many respects. Surface mount component parts are more expensive, as are the printed wiring boards (PWB) that hold the parts. Also, the equipment and processes required for assembling surface-mount parts on the PWB are more expensive. These factors are price drivers for the IBP modules when compared to the commercial DSP packaging techniques. The military avionics built by AEN for IBP rely exclusively on surface mount components and are packaged in the Standard Electronic Module (SEM) format. This SEM format is smaller than most commercial formats and therefore drives the military DSP user to design tradeoffs that favor miniaturization of functions. Commercial DSP applications are less sensitive to size and weight, and therefore can accommodate lower cost packaging technologies.

3. **Material Content** - The price drivers in commercial DSP are the DSP chips and the memory devices. Large, well-capitalized firms such as Texas Instruments (TI), a market leader, typically develop the DSP chips. TI has invested heavily in several generations of DSP chips in anticipation of an explosion of application uses. These are similar to that seen for the preeminent data processing chip maker Intel and its personal computer chips. The application use rate for DSP remains shallow when compared with that of Intel's market, and therefore the price for DSP chips remains somewhat high. Additionally, as previously mentioned, the military modules incorporate ASIC components for custom processing functions. ASIC components cost more than standard integrated circuits because they are customized for the application. Other material cost drivers include the printed circuit, and the general use of rare materials to reduce weight and provide for the better thermal and shock handling characteristics. The rare IBP materials include aluminum-infiltrated carbon for the module covers and epoxy composites for the PWBs. These materials are non-standard and therefore drive a higher price for IBP versus the commercially available modules.
4. **Labor Content** - Commercial DSP boards are built on automated assembly lines in low to medium volume. The IBP modules were redesigned to be built on an automated assembly line. Both products, therefore have similar labor content in their price.
5. **Sales Volume** - AEN bases its price on a build of 75 PNP and 41 RF-FEC modules. This volume is well below the volume AEN builds for other customers. This has a negative impact on the material cost. Due to the low volume, AEN could not obtain discounts for the majority of the components. Commercial DSP modules from DSPT are typically built to stock in low-medium volume. Scale economies due to volume are seen most predominantly in the material cost. The typical material content of DSPT module represents 25% of the price. In contrast, the typical IBP material content accounts for 55-60% of the price.

Price Comparison

The Commercial DSP module is produced to a standard configuration with a range of 2-channel to 16-channel signal analysis capability. The Commercial DSP configuration closest to the IBP PNP is the 8-channel unit that sells for \$16,990.

The IBP PNP module has: a digital signal processor, eight megabytes of (SRAM), one megabyte of erasable programmable read only memory (EEPROM), and five megabytes of flash memory. The PNP also has additional processing capability from 12 application specific integrated circuit (ASIC) components used to perform custom processing functions. These ASIC components are significant price drivers of the IBP modules. The price for the IBP PNP unit is \$16,525. The 3% price difference between the commercial DSP unit and the IBP PNP module is explained by the fact that the commercial unit includes amortized development expenses. The IBP PNP development expenses were paid as part of the pilot program, and therefore are not amortized into the unit price.

Based on this analysis, the team concluded that the price offered by TRW AEN was fair and reasonable.

CONCLUSION AND LESSONS LEARNED

The Military Products From Commercial Lines pilot was ruled a commercial item acquisition by the contracting officer. This significantly reduced the number of terms and conditions associated with this procurement. The contracting officer must now establish the fairness and the reasonableness of the contractor's offer without the benefit of cost or pricing data. The MPCL pilot found that the price analysis of "military-unique commercial" items is very difficult. There is no easily identified catalog or market price with which to compare. In addition, commercial firms will not provide cost or pricing data, nor will they accept TINA and CAS disclosure requirements. Until the government becomes well versed in price analysis and market research, this will continue to be a major obstacle in the adoption of commercial practices. The following MPCL lessons learned are provided to aid in the price analysis education process.

- Move away from pricing point estimates to the use of pricing band estimates.
- Ask what goes into the commercial catalog price. This price frequently includes servicing and premium transportation fees, which the DoD customer probably does not want.
- Do not forget to consider the non-recurring costs.
- The more a product deviates from a COTS item, the more the price will increase.
- Small quantities equate to a large pricing problem.
- Pool requirements whenever possible for different subsystems within and across services.
- Do market research to maximize the use of COTS items in the requirements generation phase.
- Involve all interested parties early in the design phase to make cost, performance, and commercial availability trade-offs.
- A team effort between the government engineers and contracting officers facilitates price analysis.
- Simply calling an item commercial does not mean that its price is fair and reasonable.
- Defense buyers must now learn to deal with a new concept: "best price available."
- There is a clear need for better training in market research and price analysis techniques.

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